PROJECT MANUAL

CONSTRUCTION DOCUMENTS
VOLUME 1 OF 3

19 December 2025

Worcester South Division Fire Station Project

Worcester, MA

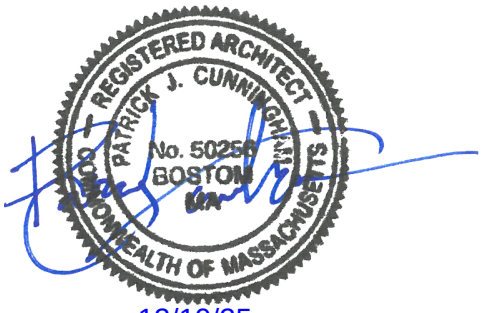
Perkins&Will Project Number: 157132.000

Perkins&Will

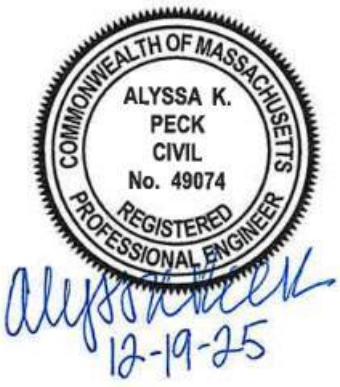
225 Franklin Street, Suite 700, Boston, MA 02110 | 617.478.0300

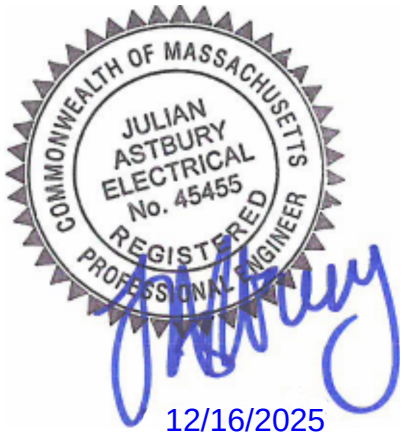
SECTION 00 01 07

PROFESSIONAL SEALS PAGE

ARCHITECT  12/19/25	**NOT USED**
NOT USED	**NOT USED**

STRUCTURAL ENGINEER 	**NOT USED**
NOT USED	**NOT USED**

CIVIL ENGINEER	LANDSCAPE ARCHITECT
	
NOT USED	**NOT USED**

MECHANICAL ENGINEER & PLUMBING ENGINEER 	**ELECTRICAL ENGINEER & FIRE ALARM ENGINEER** 
FIRE PROTECTION ENGINEER 	**NOT USED**

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FP	21 05 18	Escutcheons for Fire-Suppression Piping	19 Dec 2025
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CITY OF WORCESTER
INVITATION TO BID / NOTICE TO CONTRACTORS
NEW WORCESTER SOUTH DIVISION FIRE STATION PROJECT
25 Madison Street
Worcester, Massachusetts 01608

The City of Worcester, the Awarding Authority, invites sealed pre-qualified trade bids for: NEW WORCESTER SOUTH DIVISION FIRE STATION PROJECT in accordance with documents prepared by Perkins and Will, Inc., 225 Franklin Street, Suite 1100, Boston, MA 02110.

The New Worcester South Division Fire Station will be located at 25 Madison Street, commonly referred to as the Registry of Motor Vehicles Ancillary Parking Lot located at the southwest corner of the intersection of Southbridge Street and Madison Street. The proposed building site is 22, 24, 26 Beacon Street, 25 Madison Street (currently owned by the Commonwealth of Massachusetts), and a portion of 165 Southbridge Street (to be conveyed to the City later). There are no known site conditions that would impact the potential project.

The new building will be a two-story mostly brick façade of approximately 30,000 square feet. The new building has six (6) overhead doors, multiple storage rooms, decontamination laundry facilities, apparatus floor bathrooms, workroom, SCBA room, custodial closet, radio watch/ready room, training tower, conference rooms, office support work room, dining/kitchen, study room, exercise room, locker/bathroom(s), mechanical room, bunk room, etc.

This work may consider early packages including but not limited to early sitework, structural (concrete and steel) bid, including foundation waterproofing. **Refer to the detailed schedule and phasing plan published herein.**

Trade Bidders have been pre-qualified for this project. Bids will be received only from bidders that will be notified by the City as being pre-qualified. See below list of Pre-Qualified Trade Bidders.

SEALED FILED TRADE-BIDS for the NEW WORCESTER SOUTH DIVISION FIRE STATION PROJECT will be received at the Department of Public Facilities, 50 Officer Manny Familia Way (formerly Skyline Drive), Worcester, MA 01605 no later than 10:00 a.m., Wednesday, January 28, 2025.

Pre-Qualified Filed Trade-Bids are required. Pre-Qualified Trade Bidders are as follows:

UNIT MASONRY:
AMI Boston
Cantarella & Son, Inc.
Costa Brothers Masonry
Empire Masonry
Fernandes Masonry, Inc.
Lighthouse Masonry, Inc.
Marmello Bros. Construction Co., Inc.
Sullivan & Narey Construction Co., Inc.
TWC Operations, LLC.

MISCELLANEOUS AND ORNAMENTAL IRON:
Avid Ironworks, Inc.
The Berlin Steel Construction Company
EDM Construction
L & L Contracting, Inc.
Quinn Bros. Of Essexs, Inc.
SMJ Metal Company, Inc.
Superior Rail & Iron Works
United Steel, Inc.
V & G Ironworks

WATERPROOFING, DAMPPROOFING & CAULKING:
Armani Restoration, Inc.
Folan Waterproofing & Construction Co. Inc.
Superior Caulking and Waterproofing, Inc.
TWC Operations, LLC
P.J. Spillane

ROOFING AND FLASHING:
Capeway Roofing Systems, Inc.
Gibsons Roofs Inc.
Greenwood Industries
J.D. Rivett & Co., Inc.
Rockwell Roofing, Inc.
Silktown Roofing
Stanley Roofing

GLASS AND GLAZING:
A & A Window Products, Inc.
Aluminum & Glass Concepts Inc.
Chandler Architectural Products
Greenfield Glass Company, Inc.
J.J. Cardosi
Kapiloffs Glass, Inc.
Lizotte Glass, Inc.
Lockheed Architectural Solutions, Inc.
Middlesex Glass Company
R & R Window Contractors, Inc.

TILING:
Alleghany Contract Flooring, Inc.
Ayotte & King for Tile, Inc.
Capital Carpet & Flooring Specialists, Inc.
Joseph Cohn & Sons
M. Frank Higgins & Co, Inc.
Pavilion Floors, Inc.
Select Tile

ACOUSTICAL CEILINGS:
Central Ceilings, Inc.
H. Carr & Sons, LLC
K & K Acoustical Ceilings
M.L. McDonald Sales Company, LLC
New England Finish Systems

RESILIENT FLOORS:
Alleghany Contract Flooring, Inc.
Ayotte & King for Tile, Inc.
Capital Carpet & Flooring Specialists, Inc.
CJM Services, Inc.
M. Frank Higgins & Co, Inc.
Massfloors, Inc.
Pavilion Floors, Inc.
Select Tile

PAINTING:
Bello Painting Co., Inc.
Dandis Painting, Inc.
Homer Contracting
John W. Egan Co., Inc.
Keltic Painting, LLC
King Painting Inc.
M.G. Painting Contractors, LLC
M.L. McDonald Sales Company
New Generation Painting, Inc.
Soep Painting
Top Quality Painting Company

ELEVATOR:
None Submitted

FIRE SUPPRESSION:
Arden Engineering
Boston Fire Sprinkler Protection & Plumbing
Carlysle Engineering, Inc.
Davis-Ulmer Sprinkler (DBA Cogswell Sprinkler)
E. Armanti & Sons, Inc.
J.C. Cannistranro, LLC
Rustic Fire Protection, Inc.
Wolverine Fire Protection co.
XCEL Fire Protection

PLUMBING:
Araujo Bros. Plumbing & Heating
Arden Engineering
Boston Fire Sprinkler Protection & Painting
E. Armanti & Sons, Inc.
Grasseschi Plumbing and Heating, Inc.
Harold Brothers Mechanical Contractors
KMD Mechanical Corp.
Lapan Mechanical Contractors, Inc.
N.B. Kenney Company, Inc.
Royal Steam Heater
William F. Lynch Co., Inc.

HVAC:
Adams Plumbing & Heating, Inc.
Araujo Bros. Plumbing & Heating
Arden Engineering
CAM HVAC & Construction, LLC
E. Amanti& Sons, Inc.
Fimbarr Mechanical
General Mechanical Contractors, Inc.
Harold Brothers Mechanical Contractors
KMD Mechanical Corp.
Royal Steam Heater
Thomas E, Snowden
Veterans Development Corporation, Inc
William F. Lynch Co., Inc.

ELECTRICAL:
American Electrical Construction, Inc.
AMP Electrical, Inc.
Annese Electrical Services, Inc.
Jupiter Electric, Inc.
M.L. Scmitt, Inc.
Ostrow Electrical Co., Inc.
Renaud Electric & Communications, Inc.
Systems Contracting, Inc.
Universal Electric Co., Inc.

Wayne J Griffin Electric, Inc.

PREQUALIFIED TRADE-BIDS must be accompanied by:

(01) A fully executed **Trade Contractor Bid Form**, Specification Section 00 16 00

(02) **Informational Sheet**, See Section 3.3.

(03) **Non-Collusion Affidavit**, See Section 3.3.

(04) **Affidavit of Compliance**, See Section 3.3.

(05) **Tax Payment Certificate,** Specification Section 00 85 00.

(06) **Affidavit of Acknowledgment and Certificate of Compliance** for the City of Worcester Minority/Women Business Enterprise & Worker Utilization, **Form M/WBEP-Form EOO-101,** See Specification Section 00 95 00.

(07) I**nitial Statement and Certification of Compliance** with the Responsible Employer Ordinance**, Form REO-101 page 2,** See Specification Section 00 95 00.

(08) Provide Evidence of **Compliance with the Responsible Employer Ordinance (REO),** as per Specification Section 00 95 00.

(09) **Cori Compliance/Gender Identity & Expression Form,** See Specification Section 00 95 00.

(10) **Wage Theft Prevention Certification,** See Specification Section 00 95 00.

(11) **A Certificate of Eligibility** certifying the bidder's qualification, in the respective filed sub trade category being bid, issued by the Division of Capital Asset Management and Maintenance, DCAMM, showing that the Bidder has been approved to bid on projects the size and nature of this project. In order to be eligible to be awarded this contract, a bidder must be certified in the appropriate category and for the total Cost of the respective work including all alternates elected (if applicable) to be taken by the Owner.

(12) **Sub-Bidder Update Statement**, DCAMM Form. It is the Bidder's responsibility to obtain the necessary forms and make application to DCAMM in sufficient time for DCAMM to evaluate the application and issue a Certificate of Eligibility. A sample of the **Sub-Bidder Update Statement** (Updated March 30, 2023) is located at the end of Specification Section 00 15 00.

(13) **Bid deposit** for the sub-bid in the amount of **five (5) percent** of the value of the bid, or a bid bond.

(14) **Foreign Corporation Certificate of Registration** from the Commonwealth of Massachusetts State Secretary (if applicable).

Plans and Specifications will be available on week of December 22nd and can be downloaded at: www.worcesterma.gov/. For any bid or document and any addenda that are received electronically, it is the responsibility of every bidder who receives this bid and all associated documents to check this website for any addenda. The City of Worcester accepts no liability to provide accommodation to bidders who submit a response based upon information obtained from its website. Bidders may not alter (manually or electronically) the bid language or any bid documents. Unauthorized modifications to the body of the bid, specifications, terms or conditions, which change the intent of this bid are prohibited and will disqualify a response.

WAGE RATES - Bids are subject to the provisions of M.G.L., Chapter 149, Section 44A to J inclusive, as amended to date, and such other Federal, State and Municipal laws or regulations.

Attention of bidders is particularly called to the requirements as to conditions of employment to be observed and to the fact that not less than the minimum wage rates set forth in the Contract Documents shall be paid on this project. Minimum wage rates are per M.G.L., Chapter 149, Sections 26 & 27 inclusive.

MINORITY/WOMEN BUSINESS ENTERPRISE PROGRAM - The City of Worcester has established goals for the participation of minorities and women workers, contractors, subcontractors, and suppliers on all City projects. Bids must demonstrate the contractor's ability to utilize minorities and women in all phases of this project. The City of Worcester has established a program to enhance contract opportunities to minority and women-owned businesses through its Minority/Women Business Enterprise Program. This program contains minimum participation goals of ten (10) percent by MBE's and fifteen (15) percent by WBE's calculated as a percentage of the total bid price. Further, each contractor shall make a good faith effort to maintain a workforce that is 38% people of color and 10% women. Accordingly, all general bidders and filed sub-bidders must execute and submit with their respective bids M/WBEP **Form EOO-101**, Contractor's and Filed Subcontractor's Certification.

RESPONSIBLE EMPLOYER ORDINANCE - The performance of the work derived from this bid is subject to the City's Responsible Employer Ordinance, Chapter 2, Section 35 of WRO (2008). Accordingly, all general bidders and filed sub-bidders must execute and submit with their respective bids **Form REO-101 page 2**, Contractor's and Filed Subcontractor's Initial Certification.

NOISE ORDINANCE – All Contractors must adhere to the provision of § 1A(e)(9) of chapter nine of the Revised Ordinances of the city by limiting their on-site, noise producing construction and related work to the hours specified by said ordinance.

PRE-BID CONFERENCE - The pre-bid conference will be held on Thursday, January 15, 2025, at 11:00 a.m. at the project site, 25 Madison Street, Worcester MA 01605 with a brief overview and tour of the construction area. It is recommended that all Bidders attend this meeting.

QUESTIONS - All questions and requests for clarifications or interpretations of the meaning of the Contract Documents shall be in writing or E-Mail, addressed to Jeremy C. Flansburg, Assistant Purchasing Director, City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605, phone: (508) 799-1220, email: flansburgjc@worcesterma.gov and to be given consideration must be received by 10:00 a.m., Wednesday, January 21, 2025.

WORK UNDER SEPARATE CONTRACTS AND BY OWNER – The Owner may do other work during construction with its own forces or by separate contract.

COMMENCEMENT OF WORK AND TIME OF COMPLETION – Is as published in the specifications.

The Awarding Authority reserves the right to waive any informality in, or to reject any or all bids, if it were in the public interest to do so. In inviting trade bids in connection with such a contract, the Awarding Authority shall reserve the right to reject any trade bid on any sub-trade, if it determines that such trade bid does not represent the trade bid of a person competent to perform the work as specified, or that less than three (3) such trade bids were received and that the prices are not reasonable for acceptance without further competition.

The City of Worcester is an equal opportunity/affirmative action employer.

City of Worcester, Massachusetts

Executive Office of the City Manager

END OF 001000 DOCUMENT

CITY OF WORCESTER

INSTRUCTIONS TO BIDDERS

SECTION 1 - INTRODUCTION; DEFINISIONS

The City of Worcester, the Awarding Authority, invites sealed pre-qualified trade bids for: NEW WORCESTER SOUTH DIVISION FIRE STATION PROJECT in accordance with documents prepared by Perkins and Will, Inc., 225 Franklin Street, Suite 700, Boston, MA 02110.

The New Worcester South Division Fire Station will be located at 25 Madison Street, commonly referred to as the Registry of Motor Vehicles Ancillary Parking Lot located at the southwest corner of the intersection of Southbridge Street and Madison Street. The proposed building site is 22, 24, 26 Beacon Street, 25 Madison Street. There are no known site conditions that would impact the potential project.

The new building will be a two-story mostly brick façade of approximately 30,000 square feet. The new building has six (6) overhead doors, multiple storage rooms, decontamination laundry facilities, apparatus floor bathrooms, workroom, SCBA room, custodial closet, radio watch/ready room, training tower, conference rooms, office support work room, dining/kitchen, study room, exercise room, locker/bathroom(s), mechanical room, bunk room, etc.

This work may consider early packages including but not limited to early sitework, structural (concrete and steel) bid, including foundation waterproofing. **Refer to the detailed schedule and phasing plan published herein.**

Trade Bidders have been pre-qualified for this project. Bids will be received only from bidders that will be notified by the City as being pre-qualified. Refer to Invitation to Bid for a list of pre-qualified bidders.

1.1 These Instructions to bidders (the "Instructions") are intended to assist bidders (which term as used in these Instructions shall include general bidders and sub-bidders if applicable) in the preparation of their bids, to call attention to various legal requirements and to set forth certain conditions upon which bids are submitted and received.

1.2 The award of the contract is governed by Chapter 149A, Chapter 149, Sections 44A-44J of the Massachusetts General Laws. Certain provisions of the foregoing statute and of other applicable statutes are summarized in these Instructions.

Whenever these Instructions or any other contract documents set forth or summarize applicable statutory provisions, whether or not the statutes have been specifically referred to, such summaries are for convenience only, do not purport to be complete or correct as summaries of any particular material, and shall in no respect supersede, expand or limit rights or duties of the Owner or bidders in matters governed by the statute.

1.3 The following definitions shall apply in these Instructions and in the other Contract Documents:

(1) The term "bidding documents" shall, these Instructions, the bid forms, contract forms and other Contract Documents bound herewith, the Drawings, the Specifications, and all Addenda issued prior to receipt of bids.

(2) The terms "Addenda" and "Addendum" shall mean written documents and/or drawings issued by the Owner prior to execution of the contract, which supplement, modify, correct, explain or interpret the bidding documents.

(3) All definitions set forth in the Conditions of the Contract or the other Contract Documents as therein defined are applicable to these Instructions and to the other bidding documents.

SECTION 2 - AVAILABILITY OF CONTRACT DOCUMENTS

2.1 Refer to Invitation to bid, Prequalification letter.

SECTION 3 - EXAMINATION OF SITE AND CONTRACT DOCUMENTS; PRE-BID CONFERENCE

3.1 Before submitting a bid, each bidder must: (a) thoroughly examine the Contract Documents (b) visit the site to fully examine and acquaint himself with local conditions that may in any manner affect cost, progress or performance of the Work, (c) familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work, and (d) study and carefully correlate his observations with the requirements of the Contract Documents. Failure of a bidder to visit the site and acquaint himself with the Contract Documents or to attend the pre-bid conference, if any, shall in no way relieve the bidder from any obligation with respect to his bid.

3.2 On request, the Owner will provide each bidder access to the site to conduct such reasonable investigations and tests as such bidder deems necessary to prepare his bid.

3.3 Each bidder shall promptly notify Jeremy C. Flansburg, Assistant Purchasing Director, City of Worcester, Purchasing Division, 455 Main Street Worcester, MA 01605 phone: (508) 799-1220, email: flansburgjc@worcesterma.gov of any ambiguity, inconsistency, or error he may discover upon examination of the Contract Documents, the site or other local conditions. The submission of a bid will constitute a representation by the bidder that he has complied with every requirement of this Section 3 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the work of this contract.

3.4 A pre-bid conference will be held at the place and time set forth in the Invitation to Bid.

SECTION 4 - ADDENDA AND INTERPRETATION OF CONTRACT DOCUMENTS

4.1 All questions and requests for clarifications or interpretations of the meaning of the Contract Documents shall be in writing, E-Mail addressed to Jeremy C. Flansburg, Assistant Purchasing Director, City of Worcester, Purchasing Division, 455 Main Street, Worcester, MA 01605, phone: (508) 799-1220 or email: flansburgjc@worcesterma.gov and to be given consideration must be received at least five (5) business days prior to the date fixed for opening of bids.

4.2 Clarifications or such interpretations and any supplemental instructions or forms, if issued, will be issued in the form of written Addenda and when possible, not later than two (2) days before the date fixed for opening of bids. Addenda will upload to the City's Web site established for Project bids www.worcesterma. Each bidder shall be responsible for determining that he has received all Addenda issued, and failure of any bidder to receive any such Addendum shall not relieve such bidder from any obligation under its bid as submitted. Failure to acknowledge receipt of an Addendum on the Bid Form by the Bidder may be cause for rejection of the Bid.

4.3 All Addenda so issued shall become part of the Contract Documents.

4.4 Oral clarifications or interpretations will be of no legal effect. The Owner will not be responsible for, and no bidder may rely upon or use as the basis of a claim against the Owner or the Architect, any information, explanation or interpretation of the Contract Documents rendered in any fashion except as herein provided.

4.5 Last Day for Questions shall be 10:00 a.m. January 21, 2025

SECTION 5 - PRE QUALIFICATION BY DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE (DCAMM) (CHAPTER 149A PROJECTS)

5.1 **BIDS** on this contract must be accompanied by a copy of a Certificate of Eligibility issued by the Deputy Commissioner of the Massachusetts Division of

Capital Asset Management and Maintenance showing that the bidder has the classification and capacity rating to perform the work required. In order to be eligible to be awarded this contract, a bidder must be certified by the DCAMM for the total Project Cost, including all alternates elected (if applicable) to be taken by the Owner, and certified in the category by bidders TRADE.

5.2 Each trade bid must also be accompanied by a Sub-Bidder Update Statement. The Owner will furnish copies of the Update Statement form to bidders on request.

5.3 The Owner may at its discretion give the bidder notice of defects or omissions in the bidder's Update Statement and an opportunity to revise this statement. A contractor's bid shall not be rejected if there are mistakes or omissions of form in its Update Statement, provided the contractor promptly corrects those mistakes or omissions upon request by the Owner.

SECTION 6 - WAGE RATES

6.1 Minimum rates of wages for work performed under this contract will be as predetermined by the Commissioner of Labor and Industries of the Commonwealth of Massachusetts in accordance with the provisions of Sections 26 to 27C, inclusive, of Chapter 149 of the Massachusetts General Laws.

6.2 Section 27B of said Chapter 149 provides record-keeping requirements for contractors and subcontractors with respect to employees, hours, wages and other matters.

6.3 Bidders' attention is called to Section 148 of Chapter 149 of the Massachusetts General Laws, relating to the weekly payment of wages.

SECTION 7 - SALES TAX

7.1 Section 6(f) of Chapter 54H of the Massachusetts General Laws exempts from Massachusetts sales tax, building materials and supplies to be used in the project, and bidders shall not include in their bids any amount therefore. The number of the certificate granted by the Commissioner of Revenue for use in obtaining the exemption may be obtained from the City of Worcester.

SECTION 8 - PREPARATION AND SUBMISSION OF BIDS

8.1 Each bid shall be submitted upon the bid forms furnished by the Owner, copies of which are bound with the bid documents. The bid forms may be submitted without the balance of the Contract Documents. All blank spaces shall be filled in, in ink or typewritten, in words or figures. The bid prices for each item on the bid forms shall be stated in both words and figures. Where itemized lump sum or

unit prices are called for, the bidder shall provide all such prices. In the event of a discrepancy between prices written in words and prices written in figures, the written words shall govern. In the event of a discrepancy between the indicated sum of any column of figures and the correct sum thereof, the correct sum shall govern. The bid shall state the legal name of the bidder and shall be signed in ink by a person or persons legally authorized to bind the bidder to a contract. The name and title of the person or persons signing the bid shall be typed or printed below the signatures.

8.2 Each trade bid and the bid deposit (described below) shall be submitted to the Owner at the place stated in the Advertisement for Bids in a sealed envelope bearing on the outside the name of the bidder, his address and the title of the project for which the bid is submitted. If forwarded by mail, the sealed bid and the bid deposit shall be enclosed in an envelope with the notation "TRADE BID ENCLOSED" on the face and addressed as indicated in the Advertisement for Bids. A Certificate of Eligibility and an Update Statement in accordance with Section 5 shall if applicable, accompany each general bid.

8.3 Each sub-bid shall be submitted as specified in Paragraph 8.2 above, and, in addition, the notation "SUB-BID" and the name of the sub-trade for which the sub-bid is submitted shall be placed on the outside of the sealed envelope containing the sub-bid.

SECTION 9 - RECEIPT OF BIDS

9.1 All bidders are cautioned to allow ample time for transmittal of bids. Bidders are solely responsible for delivery to and receipt by the Owner of bids at the place stated in the Advertisement for Bids. Bids received after the specified time or at other than the specified location will not be accepted or recognized and will be returned to the Bidder unopened. The time of receipt will determine the acceptability of mailed bids, regardless of postmark.

9.2 Any bid may be withdrawn by the bidder or his duly authorized representative by written notice received by the Owner at the address for receipt of bids specified in the Advertisement for Bids prior to the time scheduled for the opening of such bids or authorized postponement thereof. No bid may be withdrawn for sixty (60) days, Saturdays, Sundays and legal holidays excluded, after the opening of general bids. No telephone or telegraphic bid, change in bid or withdrawal of bid will be received or recognized. A bid may be amended or modified only by withdrawing the bid and resubmitting another bid prior to the time for the opening of bids.

9.3 Bids will be opened and read publicly at the place and time stated in the Advertisement for Bids or the authorized postponement thereof. Bidders or their authorized representatives are invited to be present.

SECTION 10 - BID DEPOSIT

10.1 A bid deposit in the form of a bid bond, or cash, or a certified check must accompany each bid, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the City of Worcester. A bid bond shall be (a) in form satisfactory to the Owner, (b) with a Surety company qualified to do business (licensed) in the Commonwealth of Massachusetts and satisfactory to the Owner, and conditioned upon the faithful performance by the principal of the agreements contained in the bid. The bid deposit shall be in the amount of five (5) percent of the value of the bid.

SECTION 11 - TRADE-BID PROCEDURE

11.1 As stated in the Advertisement for Bids, the Owner has requested FILED SUB-BIDS on the following classes as listed on the invitation to bid.

11.2 Every sub-bidder duly filing a sub-bid with the Owner shall be bound thereby to every general bidder not excluded therein from the use thereof; and any variance from such sub-bid communicated to a general bidder shall be of no effect.

11.3 Each trade-bidder shall list in the trade-bid form the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the section of the specifications for that sub-trade requires such listings; provided that in the absence of a contrary provision in the specification, any sub-bidder may, without listing any bid price, list his own name for any such class of work or part thereof and perform that work with persons on his own payroll if such sub-bidder after sub-bid opening, shows to the satisfaction of the Owner that he does customarily perform such class of work or the part thereof with employees on his own payroll who are mechanics or laborers referred to in Section 26 of said Chapter 149, of the Massachusetts General Laws, and is qualified so to do.

11.4 **TRADE SUB-BIDS** on this contract must be accompanied by a copy of a Certificate of Eligibility issued by the Deputy Commissioner of the Massachusetts Division of Capital Asset Management and Maintenance showing that the bidder has the classification and capacity rating to perform the work required. In order to be eligible to be awarded this contract, each trade sub-bidder must be certified by the DCAMM for their total Project Cost, including all alternates elected (if applicable) to be taken by the Owner, and certified in their respective trade category.

11.5 Each filed sub-bid must also be accompanied by a Sub-Bidder Update Statement. The Owner will furnish copies of the Update Statement form to bidders on request. (Note: A sample copy of the Update Statement is located at the end of this Section.). Any trade sub-bid submitted without a currently valid Certificate

of Eligibility and Update Statement shall be invalid and will not be accepted by the Owner.

SECTION 12 - MINORITY AND WOMEN BUSINESS ENTERPRISE PROGRAM

12.1 The Owner has established goals for the participation of minority and women contractors and subcontractors on all City projects. **In furtherance thereof, the City of Worcester's Supplemental Equal Employment Opportunity Anti-Discrimination And Affirmative Action Program is included in the Bidding Documents, and all bidders shall comply with the requirements set forth therein.** Any bidder who has any questions about the forms and procedures should contact the Contract Compliance Office, City Hall, Room 201, Worcester, MA 01608, Telephone: (508) 799-1174.

SECTION 13 - RESPONSIBLE EMPLOYER ORDINANCE

13.1 The performance of the work derived from this bid is subject to the City's Responsible Employer Ordinance, Chapter 2, Section 35 of the Worcester Revised Ordinances (2008). Bidders are hereby instructed to review and familiarize themselves with the requirements thereof. The complete text of the ordinance is contained in the Supplementary General Conditions - Part I.

SAMPLE DCAMM SUB-BIDDER UPDATE STATEMENT

ON THE FOLLOWING PAGES

END OF SECTION

DIVISION OF CAPITAL ASSET MANAGEMENT & MAINTENANCE

PRIME UPDATE STATEMENTS ARE NOT PUBLIC RECORDS AND ARE NOT OPEN TO PUBLIC INSPECTION (M.G.L. C.149, §44D)

TO ALL BIDDERS AND AWARDING AUTHORITIES

A COMPLETED AND SIGNED PRIME CONTRACTOR UPDATE STATEMENT MUST BE SUBMITTED WITH EVERY PRIME BID FOR A CONTRACT PURSUANT TO M.G.L. c.149, §44A AND M.G.L. c. 149A. ANY PRIME BID SUBMITTED WITHOUT AN APPROPRIATE UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.

Caution: This form is to be used for submitting Prime Contract bids. It is not to be used for submitting Filed Sub-Bids or Trade Sub-Bids.

AWARDING AUTHORITIES

If the Awarding Authority determines that the bidder does not demonstrably possess the skill, ability and integrity necessary to perform the work on the project, it must reject the bid.

BIDDER'S AFFIDAVIT

I swear under the pains and penalties of perjury that I am duly authorized by the bidder named below to sign and submit this Prime Contractor Update Statement on behalf of the bidder named below, that I have read this Prime Contractor Update Statement, and that all of the information provided by the bidder in this Prime Contractor Update Statement is true, accurate, and complete as of the bid date.

Bid Date	Print Name of Prime Contractor
Project Number (or name if no number)	Business Address
Awarding Authority	Telephone Number

SIGNATURE⇨ _____

Bidder's Authorized Representative

INSTRUCTIONS

INSTRUCTIONS TO BIDDERS

- This form must be completed and submitted by all Prime contractors bidding on projects pursuant to M.G.L. c. 149, §44A and M.G.L. c. 149A.
- You must give complete and accurate answers to all questions and provide all of the information requested. MAKING A MATERIALLY FALSE STATEMENT IN THIS UPDATE STATEMENT IS GROUNDS FOR REJECTING YOUR BID AND FOR DEBARRING YOU FROM ALL PUBLIC CONTRACTING.
- **This Update Statement must include all requested information that was not previously reported on the Application used for your firm's most recently issued (not extended or amended) Prime Contractor Certificate of Eligibility. The Update Statement must cover the entire period since the date of your Application, NOT since the date of your Certification.**
- You must use this official form of Update Statement. Copies of this form may be obtained from the awarding authority and from the Division of Capital Asset Management and Maintenance Web Site: www.mass.gov/DCAMM.
- If additional space is needed, please copy the appropriate page of this Update Statement and attach it as an additional sheet.
- See the section entitled "Bidding Limits" in the *Instructions to Awarding Authorities* for important information concerning your bidding limits.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Bidder Qualifications

- It is the awarding authority's responsibility to determine who is the lowest eligible and responsible bidder. You must consider all of the information in the low bidder's Update Statement in making this determination. Remember: this information was not available to the Division of Capital Asset Management and Maintenance at the time of certification.
- The bidder's performance on the projects listed in Parts 1 and 2 must be part of your review. Contact the project references.
- AWARDING AUTHORITIES ARE STRONGLY ENCOURAGED TO REVIEW THE LOW BIDDER'S ENTIRE CERTIFICATION FILE AT THE DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE. Telephone (617) 727-9320 for an appointment.

Bidding Limits

Single Project Limit: The total amount of the bid, including all alternates, may not exceed the bidder's Single Project Limit.

Aggregate Work Limit: The annual value of the work to be performed on the contract for which the bid is submitted, when added to the annual cost to complete the bidder's other currently held contracts, may not exceed the bidder's Aggregate Work Limit. Use the following procedure to determine whether the low bidder is within its Aggregate Work Limit:

Step 1 Review Update Statement Question #2 to make sure that all requested information is provided and that the bidder has accurately calculated and totaled the annualized value of all incomplete work on its currently held contracts (column 9).

Step 2 Determine the annual dollar value of the work to be performed on your project. This is done as follows:

(i) If the project is to be completed in less than 12 months, the annual dollar value of the work is equal to the full amount of the bid.

(ii) If the project will take more than 12 months to complete, calculate the number of years given to complete the project by dividing the total number of months in the project schedule by 12 (calculate to 3 decimal places), then divide the amount of the bid by the calculated number of years to find the annual dollar value of the work.

Step 3 Add the annualized value of all of the bidder's incomplete contract work (the total of column 9 on page 5) to the annual dollar value of the work to be

performed on your project. **The total may not exceed the bidder's Aggregate Work Limit**.

Correction of Errors and Omissions in Update Statements

Matters of Form: An awarding authority shall not reject a contractor's bid because there are mistakes or omissions of form in the Update Statement submitted with the bid, provided the contractor promptly corrects those mistakes or omissions upon request of the awarding authority. [810 CMR 8.05(1)].

Correction of Other Defects: An awarding authority may, in its discretion, give a contractor notice of defects, other than mistakes or omissions of form, in the contractor's Update Statement, and an opportunity to correct such defects, provided the correction of such defects is not prejudicial to fair competition. An awarding authority may reject a corrected Update Statement if it contains unfavorable information about the contractor that was omitted from the Update Statement filed with the contractor's bid. [810 CMR 8.05(2)].

PART 1 - COMPLETED PROJECTS

LIST ALL PUBLIC AND PRIVATE *BUILDING* PROJECTS YOUR FIRM HAS COMPLETED SINCE THE DATE OF APPLICATION FOR YOUR MOST RECENTLY ISSUED (NOT EXTENDED OR AMENDED) DCAMM CERTIFICATE OF ELIGIBILITY. YOU MUST REPORT ALL REQUESTED INFORMATION NOT PREVIOUSLY REPORTED ON THAT DCAMM APPLICATION*.

PROJECT TITLE & LOCATION	WORK CATEGORY	CONTRACT PRICE	START DATE	DATE COMPLETED

Attach additional sheets if necessary

* If your firm has been terminated from a project prior to completion of the work or has failed or refused to complete its work under any contract, full details and an explanation must be provided. See Part 3 of this Update Statement.

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH COMPLETED PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _____

PART 2 - CURRENTLY HELD CONTRACTS

LIST ALL PUBLIC AND PRIVATE BUILDING AND NON-BUILDING *CONSTRUCTION* PROJECTS YOUR COMPANY HAS UNDER CONTRACT ON THIS DATE REGARDLESS OF WHEN OR WHETHER THE WORK COMMENCED.

1	2	3	4	5	6	7	8	9
PROJECT TITLE & LOCATION	WORK CATEGORY	START AND END DATES	ON SCHEDULE (yes / no)	CONTRACT PRICE	% NOT COMPLETE	$ VALUE OF WORK NOT COMPLETE (col. 5 X col. 6)	NO. OF YEARS REMAINING (see note below)	ANNUALIZED VALUE OF INCOMPLETE WORK (col. 7 ÷ col. 8) (divided by)

ANNUALIZED VALUE OF ALL INCOMPLETE CONTRACT WORK (Total of Column 9) $_____

Column 8
- If less than one year is left in the project schedule, write 1.
- If more than 12 months are left in the project schedule, divide the number of months left in the project schedule by 12 (calculate to three decimal places).

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH CURRENTLY HELD PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		
	OWNER:		
	DESIGNER:		
	GC:		

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _____

For **Parts 3 and 4**, if you answer YES to any question, please provide on a separate page a complete explanation. You must report all requested information not previously reported on your most recent DCAMM Application for Prime Certificate of Eligibility. Information must supplement all judicial and administrative proceedings involving bidder's firm, which were instituted or concluded (adversely or otherwise) since your firm's Application for your most recently issued (not extended or amended) Certificate of Eligibility. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.].

PART 3 – GENERAL PERFORMANCE

Part 3 of the Update Statement corresponds to Section 5 of the Prime Application. The numbering below refers back to the numbered questions in the application for your reference.

Prime Application Section 5 - General Performance

	YES	NO
5.A. Has your Company been terminated prior to completion of a Contract?	☐	☐
5.B. Has your Company failed or refused to perform or complete any of its Scope of Work under any Contract prior to substantial completion?	☐	☐
5.C. Has your Company and/or any principal, officer, or individual with a Financial Interest in your Company filed for bankruptcy?	☐	☐
5.D. Has a surety for your Company taken over or been asked to complete your Scope of Work under any Contract?	☐	☐
5.E. Has a payment or performance bond been invoked against your Company on any Contract?	☐	☐
5.F. Has any surety for your Company made payment under a payment bond to a vendor or supplier or other party on any Contract?	☐	☐
5.G. Has any subcontractor filed a demand for direct payment on any of your Contracts?	☐	☐
5.H. Has a lawsuit been filed by any of your subcontractors or suppliers to enforce a mechanic's lien in connection with any of your Contracts?	☐	☐
5.I. Has there been a death of any Company employee or other person in connection with (or as the result of) performing your Company's Scope of Work on any of your Contracts?	☐	☐
5.J. Has any Company employee or other person suffered an injury while performing any tasks within the Scope of Work on any of your Contracts resulting in his/her inability to return to work for a period in excess of one year?	☐	☐

PART 4 – LEGAL OR ADMINISTRATIVE PROCEEDINGS; COMPLIANCE WITH LAWS

Part 4 of the Update Statement corresponds to section 6 of the Prime Application. The numbering below refers back to the numbered questions in the application for your reference.

Prime Application Section 6 -Legal or Administrative Proceedings; Compliance with Laws

The term "administrative proceeding" as used in this Prime Contractor Update Statement includes (i) any action taken or proceeding brought by a governmental agency, department or officer to enforce any law, regulation, code, legal, or contractual requirement, except for those brought in state or federal courts, or (ii) any action taken by a governmental agency, department or officer imposing penalties, fines or other sanctions for failure to comply with any such legal or contractual requirement.

The term "anyone with a financial interest in your firm" as used in this Section "I", shall mean any person and/or entity with a 5% or greater ownership interest in the applicant's firm.

	YES	NO
6.A. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to the procurement or performance of any of your Contracts?	☐	☐
6.B. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal construction procurement laws?	☐	☐
6.C. Have any criminal charges involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to the procurement or performance of any of your Contracts (e.g., fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records or receipt of stolen property)?	☐	☐
6.D. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of state ethics laws (in Massachusetts: M.G.L. Chapter 268A)?	☐	☐

Section 6 - Legal or Administrative Proceedings; Compliance with Laws (continued)

	YES	NO
6.E. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal law regulating hours of labor, unemployment compensation, minimum wages, prevailing wages, overtime pay, equal pay, child labor or worker's compensation?	☐	☐
6.F. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of any state or federal law prohibiting discrimination in hiring and/or employment?	☐	☐
6.G. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled for violation of any state or federal law regulating labor relations, including collective bargaining agreements, employee welfare benefit plans, employee pension benefit plans, other ERISA and non-ERISA plans?	☐	☐
6.H. Have any proceedings by a local, state, or federal agency been brought, concluded, or settled relating to decertification, debarment or suspension of your Company and/or any principal or officer or individual with a Financial Interest in your Company from construction contracting?	☐	☐
6.I. Have any Judicial Actions or Administrative Proceedings involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled relating to a violation of state or federal environmental laws?	☐	☐
6.J. Has your Company been fined or sanctioned by OSHA and/or any other state or federal agency for violations of any laws or regulations related to occupational health or safety?	☐	☐
6.K. Has your Company ever (i) failed to meet applicable workforce and/or diversity program goals, benchmarks or other requirements, and/or (ii) been sanctioned, fined and/or penalized for non-compliance with workforce policies and/or diversity programs (e.g., for MBEs, WBEs, SDVOBEs and DBEs) and/or failure to maintain and/or submit required reports, such as certified payrolls.	☐	☐
6.L. Other than previously reported in the above questions, have any Judicial Actions or Administrative Proceedings or investigations involving your Company and/or a principal or officer or individual with a Financial Interest in your Company been brought, concluded, or settled by any local, state or federal agency relating to the procurement or performance of any construction contract?	☐	☐

PART 5 - SUPERVISORY PERSONNEL

List all supervisory personnel, such as project managers and superintendents, who will be assigned to the project if your firm is awarded the contract. **Attach the resume of each person listed below**.

NAME	TITLE OR FUNCTION

PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

Have there been any changes in your company's business organization (**including changes in ownership, mergers, or asset/stock sales**), financial condition or bonding capacity since the date your current Certificate of Eligibility was issued? ☐ Yes ☐ No

If YES, attach a separate page providing complete details.

PART 7 – LIST OF COMPLETED CONSTRUCTION PROJECTS SUBMITTED TO THE DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE.

Attach here a copy of the list of completed construction projects which was submitted with your firm's DCAMM Application for your most recently issued (not extended or amended) DCAMM Certificate of Eligibility. The Attachment must include a complete copy of the entire Projects Table – "Completed Projects" and the final page – "Certification" (Signature Page) containing the signature and date that the Completed Projects list was submitted to the Division of Capital Asset Management and Maintenance.

TRADE CONTRACTOR BID FORM

Company Name _____,

TO ALL TRADE CONTRACTOR BIDDERS EXCEPT THOSE EXCLUDED:

A. TRADE:_____,

Specified in Section (s): _____,

_____,

(*Bidder: Enter above the name of the trade for which you are bidding and list ALL the specification section or sections applicable to that trade as they are listed in the Table of Contents of the Specifications; for example, "Painting, Section 09 91 00;" "Glazing, Section 08 80 00;" "Electrical Work, all Division 26.*

The undersigned proposes to furnish all labor and materials are required for completing all the work of the trade identified above, for Addition and Renovations to DCU center, located in Worcester, Massachusetts, in accordance with the Contract Documents, including Drawings and Specifications.

The proposed Contract Price is

_____dollars ($_____)

Alternates: [*Enter a dollar value wither in the "add" or "subtract" line. If the Alternate will not change the proposed Contract Price, enter $0 or "NC" ("no change") in the "add" line*.]

B. For Alternate 1, _____,

ADD _____ dollars $_____)

SUBTRACT _____ dollars $_____)

ADDENDA: This trade contractor bid includes the following Addenda:

Number	Date	Number	Date

_____,

_____,

_____,

C. **IMPORTANT INFORMATION**: Because this is a CM at Risk Project **All Trade Contractors** must include their Bid price the cost of their providing payment and performance bonds in the full amount of their Bid, including all alternates. All Trade

Contractors awarded contracts on this Project are required by law to provide full payment and performance bonds at their own expense.

D. EXECUTION OF CONTRACT; BONDS; INSURANCE: The undersigned agrees, if selected as a Trade Contractor, to execute with the Construction Manager (hereafter sometimes referred to as the "CM at Risk" or the "Contractor"), a trade Contractor Agreement in accordance with the terms of this bid and applicable law within ten (10) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Construction Manager. If the undersigned further agrees to furnish a performance bond and payment bond in the full amount of the trade contract amount from a surety company licensed to do business in the commonwealth and whose name appears on the United States Treasury Department Circulation 570; provided that the bonds are subject to section (3) of section 44F of chapter 149 and (b) a Certificate of Insurance evidencing workers' compensation, public liability or property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the Construction manager as required by law.

To the extent provided by law, if the undersigned is bidding on the work of a sub-trade for which bidders have not been prequalified by the awarding authority, the undersigned agrees, if requested to do so by the Construction Manager, to furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority, and each in the sum of one hundred percent (100%) of the sub trade subcontract Price, the premiums for which shall be paid by the Construction Manager and be included in the Contract Price for the General Contract.

E. TRADE CONTRACTOR SUB-TRADE SUB-BIDDER LISTING: The names of all persons, firms, and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the Section of the Specifications for this sub-trade require a listing in this paragraph (including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specifications), and the bid price for each such class of work or part thereof as follows:

NAME	CLASS OF WORK	BID PRICE
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

_____ _____ _____

_____ _____ _____

(Do not give bid price for any class or part thereof furnished by undersigned.)

(The names of all sub-trade subcontractors to be used if awarded the trade contract and each sub-trade contract sum shall be identified above)

By submission of the Bid the Trade Contractor certifies that it has prequalified each of the sub-trade subcontractors listed above using criteria similar to the criteria for the prequalification of Trade Contractors.

By submission of this Bid the Trade Contractor certifies that the Trade Contractor certifies that the Trade Contractor will perform the complete trade work with employees on his own payroll, except for work customarily performed by the sub-trade subcontractors within the trade. Trade Contractor further certifies that this Bid provides the names of all sub-trade subcontractors to be used and each sub-trade contract sum.

F. The undersigned agrees that the above list of bids to the undersigned represents *bona fide* bids based on the plans, specifications and addenda, and that, if the undersigned is awarded the contract, the persons, firms, corporations listed above will be used for the work indicated at the amounts stated, if satisfactory to the Awarding Authority.

G. UNIT PRICES (*This Provision applies to Trade Contractor Sub-Bidders, for unit prices applicable to work of other trades enter N/A in the "Add and Deduct" column*.) Should certain additional classes of work be required or should the quantities of certain classes of work be increased or decreased from those on which this sub-bid is to be based, by order or approval of the Architect, the undersigned agrees that the Unit Prices set forth below will be the basis of payment to the subcontractor or credit to the awarding authority for such addition, increase, or decrease of the Work. The undersigned agrees that the Unit Prices given represent the exact amount per unit to be paid to the subcontractor (in the case of additions or increases) or to be refunded to the Awarding Authority (in the case of decreases), and that no additional adjustment will be requested or allowed for overhead, profit, insurance, compensation insurance, or other direct or indirect expenses of the subcontractor. The awarding authority shall have the right to reject any or all proposed Unit Prices at any time prior to the signing the Agreement. In which case the cost of extra work shall be as determined by one of the other methods set forth in the General Conditions.

SCHEDULE OF UNIT PRICES

TRADE CONTRACT

Unit Price Item No.	Spec Section	Description	Unit of Measure	Add and Deduct Amount
A.	03 54 16	Self-leveling – ¼"- ½" average thickness	2,500 SF	
B.	03 54 16	Self-leveling – ½" – ¾" average thickness	4,000 SF	
C.	03 54 16	Self-leveling – ¾"-1" average thickness	1,500 SF	
D.	26 51 00	Illuminated Exit Signs	Each	

H. The undersigned further agrees to be bound to the Construction Manager by the terms of the plans, drawings, specifications (including all General Conditions), and addenda, and to assume toward Construction Manager all the obligations and responsibilities that the Construction Manager, by those documents, assumes toward the Owner.

I. The undersigned offers the following information as evidence of his or her qualifications to perform the work as bid upon, according to all the requirements of the plans, drawings and specifications:

1. Have been in business under present business name _____years.

2. Ever failed to complete any work awarded? (If yes, briefly explain)

_____

3. List one or more recent buildings with names of general contractor and architect on which you served as subcontractor and performed work of similar character to the work required for this project:

BUILDING	ARCHITECT	GENERAL CONTRACTOR	AMOUNT OF CONTRACT

_____,

_____,

4.Bank Reference: _____,

Failure to meet trade contractor qualification requirements in the specification Sections listed in this Trade Contractor Bid Form, or failure to provide sufficient information in this Paragraph 1 to substantiate the required qualifications, may, at the sole discretion of the Awarding Authority, be deemed sufficient cause for rejection of any bid. The bidder expressly agrees that the judgment of the Awarding Authority on the matter of qualification is final.

J. CERTIFICATIONS

The undersigned hereby certifies that the Trade Contractor will perform the complete trade contract work with employees on its own payroll, except for work customarily performed by sub-trade subcontractors within the trade as listed above. Trade Contractor further certifies that this Bid provides the names of all sub-trade subcontractors to be used and each sub-trade contract sum.

The undersigned hereby certifies that all sub-trade subcontractors named in this bid form have been prequalified by the trade contractor using criteria similar to the contractors.

The undersigned further certifies that it shall comply with the prevailing wage law set forth in M.G.L. c. 149, §§26 & 27 and pay wages no less than those set forth in the wage rate tables for the Project. The undersigned further certifies that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that will comply fully with all laws and regulations applicable to awards of subcontracts subject to Chapter 149A of the General Laws.

The undersigned further certifies under penalties of perjury that this Bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in the subsection the word “person” shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned also certifies that he or she (or, if he or she is the authorized representative of the company, the company) is the only person interested in this Bid; that it is made without any connection with any other person making any other submission for the same work; that no person acting for, or employed by, the Commonwealth of Massachusetts or the City of Worcester is directly or indirectly

interested in the Bid or any subsequent proposal, or in any contract which may be made under it, or in expected profits to arise therefrom; that the undersigned Bidder has not influenced or attempted to influence any other person or corporation to file a Bid or any subsequent proposal or to refrain from doing so or to influence the terms of the Bid or any subsequent proposal of any other person or corporation; and that this submission is made in good faith without collusion or connection with any other person applying for the same work.

The undersigned certifies that if awarded this work shall comply with all federal and state laws, rules and regulations promoting fair employment practices or prohibiting employment discrimination and unfair labor practices and shall not discriminate in the hiring of any applicant for employment nor shall any qualified employee be demoted, discharged or otherwise subject to discrimination in the tenure, position, promotional opportunities, wages, benefits or terms and conditions of their employment because of race, color, national origin, ancestry, age, sex, religion, disability, handicap, sexual orientation or for exercising any rights afforded by law. The undersigned commits to purchasing supplies and services from certified minority and women owned businesses, small businesses or businesses owned by socially or economically disadvantaged persons or persons with disabilities.

The undersigned further certifies pursuant to M.G.L. c.149A, §8(g)(8) and M.G.L. 151A, §19A, I, that Bidder has filed all state and tax returns and paid all taxes as required by law and has complied with all state laws pertaining to contributions to the unemployment compensation fund and to payments in lieu of contributions.

The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation [promulgated there under. The undersigned further certifies under pain and penalties perjury that it is not presently debarred from doing public work under any applicable federal law.

K. The undersigned hereby agrees that this bid shall be valid for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the date designated for opening of the Bids.

L. ATTACHMENTS

AS LISTED IN THE INVITATION TO BID – Specification Section 001000

- **INFORMATIONAL SHEET (Form in Section 3.3)**
- **NON-COLLUSION AFFIDAVIT (Form in Section 3.3)**
- **AFFIDAVIT OF COMPLIANCE (Form in Section 3.3)**
- **AFFIDAVIT OF PREVAILING WAGE COMPLIANCE (Form in Section 3.3)**

- **COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE (Specification Section 009500)**
- **TAX PAYMENT CERTIFICATE (Form in Specification Section 008500)**

Acknowledgement of Addenda. By signing below, the interested Trade Contractor acknowledges receipt of the addenda listed by Trade Contractor Bid Form.

Authorized to sign: This form must be signed by an officer of the firm or an individual so authorized by an officer of the firm who has personal knowledge regarding the information contained herein.

SIGNED UNDER THE PAINS AND PENALTIES OF PERJURY:

Signature: _____,

Print Name: _____,

Title: _____,

Firm Name: _____,

Firm Address: _____,

_____,

Phone No: _____,

Date: _____,

Project Name: _____,

CONSTRUCTION MANAGER AT RISK CONTRACT

GENERAL CONDITIONS OF THE CONTRACT

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APPENDICES

APPENDIX A EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

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APPENDIX E COMMONLY USED FORMS

ARTICLE I - DEFINITION OF TERMS

The following words shall have the following meanings as used in this Contract:

Advertisement:

The Advertisement or Notice Inviting Bids or Proposals for the Work.

Approval (or Approved):

An approval in writing signed by the authorized signatory of the City of Worcester.

Architect:

The architect identified as the Designer in Article 1 of the Owner-CM Agreement.

As directed (As permitted, as required, as determined or words of like effect): The direction, permission, requirement or determination of the City of Worcester unless otherwise stated in the Contract Documents. Similarly, *approved*, *acceptable*, *satisfactory* or words of like import shall mean approved by or acceptable or satisfactory to the Designer and the City of Worcester, except as may be otherwise determined by the City of Worcester.

Building Code:

All applicable rules and regulations to which the City of Worcester is subject and which are contained or referenced in the code authorized by M.G.L. c. 143, s. 93 et seq., including all amendments thereto.

Certificate of Agency Use and Occupancy:

A certificate signed by the Designer and the City of Worcester pursuant to the requirements of Article VI of these General Conditions of the Contract, indicating that the City of Worcester has determined that (1) the Work has been completed in accordance with the Contract Documents, except for Punch List items, (2) certificates of inspection, testing and/or approval (including a certificate of occupancy under the Building Code), operating permits for any mechanical apparatus which may be required to permit full use and occupancy of the Work by its intended users (which in a Subcontractor's case may include the Contractor) have been delivered to the City of Worcester, (3) any applicable written warranties, operating instructions and related materials have been delivered to the City of Worcester, and (4) the Work may be used for its intended purpose without substantial inconvenience or interference.

Change Order:

(1) A written order not requiring the consent of the CM, signed by the Project Manager and designated as a Change Order, directing the CM to make changes in the Work within the general scope of the Contract, or (2) any written or oral order from the Project Manager that causes any change in the Work Provided that the CM has given the City of Worcester written

notice stating the date, circumstances, and source of the order and that the CM regards the order as a Change Order.

Construction Manager, Contractor, CM and General Contractor:

The person, corporation or other entity with whom the City of Worcester has executed the CM Agreement.

Construction Manager's Key Personnel:

The personnel listed in the Construction Manager's Proposal and Sections B.1, C.1, and C.2 of Fee Proposal Form GC of the Owner-CM Agreement, all of whom shall be dedicated to the Project on a full time basis, and which personnel shall include at a minimum the Project Executive, the Project Manager, the Superintendent (who shall be a properly licensed construction supervisor), and the Project Scheduler. Unless otherwise designated by the CM, the Project Executive shall have complete authority to act for the CM.

Contract:

The Contract formed by the Contract Documents.

Contract Documents:

The documents listed in Article 2 of the Owner-CM Agreement.

Contract Modification:

Any alteration of the Contract Documents accomplished by a written agreement properly executed by the parties to this Contract.

Contract Price:

The Contract Price constitutes full compensation to the CM for everything to be performed and furnished in connection with the Work and for all damages arising out of the performance of the Work for which the City of Worcester is responsible, and constitutes the maximum compensation regardless of any difficulty incurred by the CM in connection with the Work or in consequence of any suspension or discontinuance of the Work. See also definition of Guaranteed Maximum Price.

Designer:

The architect or engineer identified as the Designer in the Preliminary Statement of the Owner-CM Agreement, subject to the provisions of Article III, Section 1 of these General Conditions of the Contract.

Drawings:

The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including Plans, elevations, sections, details, schedules, and diagrams.

Engineer: The Designer, except that the term "Resident Engineer" shall have the meaning otherwise specified herein.

Final Acceptance:

The written determination by the City of Worcester that the Work has been 100% completed, except for the CM's indemnification obligations, warranty obligations, obligations to continue to maintain insurance coverage for the time periods provided in the Contract Documents, and any other obligations which are intended to survive Final Acceptance and/or the termination of the Contract.

Guaranteed Maximum Price:

Guaranteed maximum price", or "GMP", is the agreed total dollar amount for the construction management at risk services, including the cost of the work, the general conditions and the fees charged by the construction management at risk firm; also known as the Contract Price.

Laws:

All applicable statutes, regulations, ordinances, codes, laws, orders, decrees, approvals, certificates and requirements of governmental and quasi-governmental authorities.

Neutral:

An impartial third party not having an interest in the Owner, the Designer, the Program Manager, the CM or the Project.

Notice to Proceed (NTP):

The written notice provided by the City of Worcester to the CM which authorizes the CM to commence the Work as of a date specified therein, from which date the times specified in Article 4 of the Owner-CM Agreement is measured. The City of Worcester may issue more than one NTP, including but not limited to separate NTPs for Preconstruction and Construction Services, in which case the date from which the time for completion of construction is measured shall be as stated in the appropriate NTP.

Or equal (or words of like import):

Equal in the opinion of the City of Worcester determined pursuant to the provisions of M.G.L. c.30, s. 39M and the provisions of these General Conditions of the Contract.

Owner:

The Commonwealth of Massachusetts or political subdivision thereof, authority, or other instrumentality that will own the Work. This term may also be used interchangeably with the term "the City of Worcester."

Plan(s):

Drawing(s).

Product Data:

Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the CM or its Subcontractors and suppliers to illustrate materials or equipment for some portion of the Work. Product data shall also include any such information or instructions produced by the manufacturer or distributor of such materials or equipment and made readily available by said manufacturer or distributor.

Progress Schedule:

The progress schedule submitted by the CM Approved by the City of Worcester in accordance with the Contract Documents.

Project:

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by separate contractors.

Project Manager:

The City of Worcester's representative assigned to the Project.

Punch List:

A list of items determined by the City of Worcester to be minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work for its intended purpose.

Resident Engineer:

The on-Site representative of the City of Worcester.

Samples:

Samples are physical examples, that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

Schedule of Values:

The schedule Approved by the City of Worcester pursuant to Article VIII of these General Conditions of the Contract which allocates the Contract Price to the various portions of the Work and is used as a basis for payments to the CM.

Shop Drawings:

Drawings, diagrams, details, schedules, and other data specially prepared for the Work by the CM or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate a portion of the Work.

Site:

The land and, if any, building(s) or space within any such building(s) on which or in which the CM is to perform the Work.

Specifications:

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards, and workmanship for the Work and performance of related services.

Subcontractor:

Person or entity with whom the CM or a subcontractor contracts in order to perform the Work, except as otherwise specifically provided or required herein or by Law. “Subcontractor” when used also means “Trade Contractor” except when otherwise specified.

Substantial Completion:

"Substantial completion" shall occur when (1) the CM fully completes the Work or substantially completes the Work so that the value of the Work remaining to be done is, in the estimate of the City of Worcester, less than one percent of the adjusted contract price, or (2) the CM substantially completes the work and the City of Worcester takes possession for occupancy, whichever occurs first.

Superintendent:

The licensed construction supervisor who is an employee of the CM designated to be in full-time attendance at the Site throughout the prosecution and progress of the Work and who shall have complete authority to act for the CM.

Trade Contractor:

Subcontractors under Contract with the CM to perform the work of the trades listed in Section 1.1 of the Procedures for Award of Subcontracts at Appendix C, and selected under the process authorized in M.G.L. c. 149A and Section 1 of the aforementioned Procedures by the CM. Sometimes referred to as “Filed Subcontractor” or “Filed Subbidder.”

Work:

The Work consists of all the work identified in the Contract Documents. The Work comprises the completed construction required by the Contract Documents and includes all labor, tools, materials, supplies, equipment, permits, approvals, paperwork, calculations, submittals, and certificates necessary to develop, construct and complete the Work in accordance with all Laws, and all construction and other services required to be supervised, overseen, performed or furnished by CM or that the Contract Documents require the CM to cause to be supervised, overseen, performed or furnished. The CM shall provide and perform for the Contract Price all of the duties and obligations set forth in the Contract Documents.

All terms that this Contract defines may be used with or without initial capital letters. Other terms, abbreviations and references are defined as they appear herein. Words and abbreviations that are not defined in the Contract Documents, but which have recognized technical or trade meanings are used in accordance with those meanings. For additional definitions of terms, abbreviations and references refer to the *General Requirements, or Specifications.*

ARTICLE II
EXECUTION OF THE CONTRACT, SCOPE OF WORK, INTERPRETATION OF CONTRACT DOCUMENTS, DISTRIBUTION OF WORK, SUBCONTRACTS

1. Execution

The execution of the Owner – CM Agreement by the CM is a representation that the CM has visited the Site, has become familiar with local conditions under which the Work is to be performed and has correlated observations at the site with requirements of the Contract Documents.

2. Scope of Work

The Work consists of all the work identified in the Contract Documents. The Work comprises the completed construction required by the Contract Documents and includes all labor, tools, materials, supplies, equipment, permits, approvals, paperwork, calculations, submittals, and certificates necessary to develop, construct and complete the Work in accordance with all Laws, and all construction and other services required to be supervised, overseen, performed or furnished by CM or that the Contract Documents require the CM to cause to be supervised, overseen, performed or furnished. The CM shall provide and perform for the Contract Price all of the duties and obligations set forth in the Contract Documents.

3. Interpretation

A. The Plans and Specifications and other Contract Documents are to be considered together and are intended to be mutually complementary, so that any work shown on the Plans though not specified in the Specifications, and any work specified in the Specifications though not shown on the Plans, is to be executed by the CM as a part of this Contract. Should a conflict occur in or between or among any parts of the Contract Documents that are entitled to equal preference, the better quality or greater quantity shall govern, unless the City of Worcester directs otherwise. Figured dimensions shall take precedence over scaled dimensions.

B. All things that in the opinion of the City of Worcester may be reasonably inferred from the Plans, Specifications and other Contract Documents are to be executed by the CM. The Designer shall determine whether the detail Plans conform to the general Plans and Contract Documents, except as may be otherwise determined by the City of Worcester.

C. The tables of contents, titles, headings and marginal notes or sub-scripts contained herein are solely to facilitate references, are not intended to be construed as provisions of the Contract, and in no way affect the interpretation of the provisions to which they refer.

D. Where reference is made in the Contract Documents to publications, standards, or codes issued by associations or societies, such reference shall be interpreted to mean the current edition of such publications, standards, or codes, including revisions in effect on the date of the issuance of the RFP for the contract notwithstanding any reference to a particular

date. The foregoing sentence shall not apply to the dates, if any, specified with respect to insurance policy endorsement forms.

E. In case of any conflict among the Contract Documents, unless the context clearly otherwise requires, the Contract Documents shall be construed according to the following priorities:

First Priority:	Contract Modifications and Change Orders
Second Priority:	Owner-CM Agreement as amended
Third Priority:	General and Supplementary Conditions of the Contract as amended
Fourth Priority:	Drawings as amended -- Schedules take precedence over enlarged detail Drawings, and enlarged Detail Drawings take precedence over reduced scale Drawings; figured dimensions shall prevail over scale.
Fifth Priority:	Specifications as amended
Sixth Priority:	Request for Proposals as amended
Seventh Priority:	CM's Proposal as amended

F. The CM shall refer to all of the Drawings, and to all of the sections of the Specifications, and shall perform all work reasonably inferable therefrom as being necessary to produce the indicated results. Neither the City of Worcester nor the Designer assumes any liability arising out of jurisdictional issues raised or claims advanced by Subcontractors, trade organizations or other interested parties based on the arrangement or manner of subdivision of the content of the Specifications and Drawings. In the event of any claim arising out of any duplication, conflict, inconsistency or discrepancy within the Specifications or on the Drawings as to the allocation of the Work among the Subcontractors the CM shall be solely responsible for resolving the claim and shall be responsible for ensuring that all of the Work is completed, regardless of where it appears in the Specifications or on the Drawings.

4. Distribution of Work

Other than as required by M.G.L. c. 149A and any other applicable provisions of the Massachusetts General Laws and these Contract Documents, the CM shall be responsible for distributing the Work in the best interests of the Project.

5. Subcontracts

Procedures for the award of contracts by the CM for the furnishing of labor, materials and equipment in the performance of the Work ("Subcontracts") shall be as specified in the procedures attached hereto as Appendix "C". The CM shall make no substitution for any Subcontractor previously selected without the prior written approval of the City of Worcester. The term Subcontractor also means Trade Contractor except when otherwise specified. The CM shall maintain and periodically update and distribute to the City of Worcester, the Program Manager and the Designer a Project Directory listing the names, addresses and telephone numbers of the principal members of the staff of each Subcontractor. The principal contact and a back-up for each Subcontractor and each of their home telephone numbers, mobile telephone numbers and pager numbers, if available, shall be indicated in the Project Directory

so that such persons can be reached in emergency situations occurring beyond regular business hours.

All work shall be performed pursuant to written subcontracts. The CM shall use the Subcontract forms attached hereto in Appendix "D", for all Subcontractors. One form of Subcontract is to be used for all Trade Contractors selected for the trades listed in section 1.1 of the above referenced Procedures, and the other form is to be used for all Other Subcontractors. All subcontracts shall require the Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the CM by the terms of the Contract Documents, and to assume toward the CM all the obligations and responsibilities which the CM, by the Contract Documents, assumes toward the City of Worcester. Each Subcontract shall preserve and protect the rights of the City of Worcester under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights. The CM shall require each Subcontractor to enter into similar agreements with its Subcontractors. The CM shall provide to each proposed Subcontractor, prior to the execution of a Subcontract with such Subcontractor, copies of the Contract Documents to which the Subcontractor will be bound by this Section. Each Subcontractor shall provide copies of such Contract Documents to its Subcontractors.

Each Subcontract shall provide that in the event of termination of the Contract due to the default of the CM or for any other reason, the City of Worcester shall have the right (but shall have no obligation) to assume, and/or accept assignment of and further assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the CM under the Subcontract with such Subcontractor. In the event of such assumption or assignment by the City of Worcester, the Subcontractor shall have no claim against the City of Worcester or such third party for work performed by such Subcontractor or other matters arising prior to termination of the Contract, and the City of Worcester or such third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after such assumption or assignment.

No Subcontract, and nothing contained herein or in any Subcontract, shall be construed to create any contractual relationship between any Subcontractor and the City of Worcester.

6. Contract Price

The Contract Price constitutes full compensation to the CM for everything to be performed and furnished in connection with the Work and for all damages arising out of the performance of the Work for which the City of Worcester is responsible, and constitutes the maximum compensation regardless of any difficulty incurred by the CM in connection with the Work or in consequence of any suspension or discontinuance of the Work.

ARTICLE III
CONTROL OF WORK/ADMINISTRATION OF THE CONTRACT

1. Designer

Notwithstanding anything to the contrary expressed or implied in this Contract, any of the powers, rights, and duties of the Designer may be exercised by the City of Worcester, provided that the City of Worcester shall be under no obligation to do so. The City of Worcester may rely on the Designer for the performance and exercise of its rights and obligations hereunder and shall be presumed to so rely on the Designer in the absence of an explicit written assumption by the City of Worcester of any such rights and obligations, except that any Approval required to be obtained from the City of Worcester hereunder shall not be valid without the signature of the City of Worcester. The City of Worcester may explicitly overrule in writing any action, determination or decision of the Designer should the City of Worcester choose to do so, except to the extent that the same would violate applicable law. Subject to the foregoing, the Designer shall be responsible for the general administration of the Contract and shall perform the duties and exercise the rights herein conferred on the Designer. Except as otherwise specifically provided herein, the Designer shall decide all questions which may arise as to the conduct, quantity, quality, equality, acceptability, fitness, and rate of progress of the several kinds of work and materials to be performed and furnished under this Contract, and shall decide all questions which may arise as to the interpretation of the Plans and Specifications and as to the fulfillment of this Contract on the part of the CM. In the case of the death, resignation, inability or refusal of the Designer to act, or the termination of his or her or its employment, the City of Worcester may appoint another person to act as Designer for the purposes of this Contract. The City of Worcester shall give written notice to the CM of any such appointment.

2. Right of Access to Work

The City of Worcester, the User Agency and the Designer (and persons designated by them) may for any purpose enter upon the Work, the Site, and premises used by the CM, and the CM shall provide safe facilities therefor. Other contractors of the City of Worcester may also enter upon the same for the purposes which may be required by their contracts or work. Any differences or conflicts which may arise between the CM and other contractors of the City of Worcester with respect to their work shall be initially resolved by the Designer.

3. Inspection No Waiver

No inspection by the City of Worcester or the Designer or employees or agents of either of them, and no order, measurement, certificate, approval, payment order, payment, acceptance or any other action or inaction of any of them, shall operate as a waiver by the City of Worcester of any provision of this Contract.

ARTICLE IV
GENERAL PERFORMANCE OBLIGATIONS OF THE CM

The CM shall complete for the Contract Price all of the Work in a proper, thorough, and workmanlike manner in accordance with the Contract Documents. Without limiting the foregoing and without limiting the CM's obligations under any other provision of the Contract Documents, the CM shall for the Contract Price perform the following general obligations:

1. Review of Contract Documents and Field Conditions

A. Before commencing the Work, the CM shall carefully study the Contract Documents and carefully compare all Specifications, Plans, Drawings, figures, dimensions, lines, marks, scales, directions of the Designer, and any other information provided by the City of Worcester and shall at once report to the Designer any questions, errors, inconsistencies, or omissions.

B. Before commencing the Work, the CM shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the CM with the Contract Documents and shall at once report to the Designer any questions, errors, inconsistencies, or omissions.

2. Supervision and Construction Procedures;

Coordination; Cutting and Patching

A. The CM shall supervise and direct the Work, using the CM's best skill and attention. The CM shall be solely responsible for, and shall have control over, construction means, methods, techniques, sequences and procedures, and shall be responsible for coordinating all portions of the Work under the Contract.

B. The CM shall be responsible for the proper fitting of all Work and the coordination of the operations of all trades, Subcontractors, and materialmen engaged upon the Work. The CM shall guarantee to each of its Subcontractors all dimensions which they may require for the fitting of their work to all surrounding work.

C. All necessary cutting, coring, drilling, grouting, and patching required to fit together the several parts of the Work shall be coordinated by the CM.

D. The CM shall be responsible to the City of Worcester for the acts and omissions of the CM's employees, agents and Subcontractors of all tiers, and their agents and respective

contractors employees, and other persons performing portions of the Work or supplying materials therefor.

E. The CM shall be responsible for the inspection of portions of the Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

F. The CM shall employ a registered land surveyor to perform any engineering required for establishing grades, lines, levels, dimensions, layouts, and reference points for the trades. The CM shall be responsible for maintaining benchmarks and other survey marks and shall replace any benchmarks or survey marks that may have become disturbed or destroyed. The CM shall verify the materials shown on the Drawings before laying out the Work and shall be responsible for any error resulting from its failure to exercise this precaution.

G. Unless otherwise required by the Contract Documents, or directed in writing by the Designer or the City of Worcester, Work shall be performed during regular Working Hours which, unless prescribed otherwise by applicable law, shall be 7:00 a.m. to 5:00 p.m. However, if the CM desires to carry on the Work outside of regular working hours or on Saturdays, Sundays, or Massachusetts or federal holidays then the CM shall provide 48 hours notice to allow satisfactory arrangements to be made for inspecting Work in progress and shall bear the costs of such inspection. the City of Worcester shall bill the CM directly for such costs.

H. Work performed outside of regular Working Hours without the consent or knowledge of the Designer and/or the City of Worcester shall be subject to additional inspection and testing as directed by the Designer. The cost of this inspection and testing shall be borne by the CM whether the Work is found to be acceptable or not. The City of Worcester at its election shall be entitled either to issue a credit Change Order to cover such cost or to withhold such cost from any further payments due the CM and/or to receive a payment from the CM of the amount of such cost.

3. Key Personnel

The CM shall employ the Key Personnel as defined in Article I of the General Conditions unless otherwise agreed to by the City of Worcester. The Project Executive shall be the CM's senior person on Site and shall have full authority to accept communications to, make decisions for, and otherwise fully represent the CM in connection with all matters relevant to the Project. The CM's Project Manager(s) shall be responsible for one or more portions of the Work as assigned by the Project Executive. A Project Manager may be the designee of the Project Executive to exercise the Project Executive's responsibilities in the CM's Project Executive's absence. The Superintendent shall be properly licensed in accordance with the Building Code.

4. Labor

A. The CM shall employ only competent workers. The CM shall enforce and shall require all its Subcontractors to enforce strict discipline and good order among their respective employees and other persons carrying out the Work. The CM shall not permit employment

of unfit persons or persons not skilled in tasks assigned to them. Whenever the Designer or the City of Worcester shall notify the CM in writing that any worker is, in the Designer's opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such employee shall be discharged from the Work and shall not again be employed on the Project except with the consent of the City of Worcester.

B. The CM shall ensure that all its Subcontractors employ a sufficient number of workers to carry on the Work with all proper speed in accordance with Laws, the requirements of the Contract Documents, and the Progress Schedule.

C. The CM shall procure materials from such sources and shall manage its own forces and the forces of its Subcontractors in such a manner as will result in harmonious labor relations on the Project Site. The CM shall cause persons to be employed in the Work who will work in harmony with others so employed.

5. Notices and Permits

A. The CM at its sole cost shall take out and pay for all approvals, permits, user fees, certificates and licenses required by Laws, pay all charges and fees, and pay for (or cause the appropriate Subcontractor to pay for all utilities required for the proper execution of the Work.

B. The CM shall comply with all Laws and shall give all notices required thereby.

C. Except as otherwise specified in this Contract, it is not the CM's responsibility to ascertain that the Contract Documents are in accordance with applicable Laws. However, if the CM observes that portions of the Contract Documents are at variance with the requirements of Laws, the CM shall promptly notify the Designer and the City of Worcester in writing, and necessary changes shall be accomplished by an appropriate Contract Modification.

D. If the CM performs Work knowing it to be contrary to Laws without giving such notice to the Designer and the City of Worcester, the CM shall bear full responsibility for such Work and all costs attributable thereto, including, without limitation, corrections to the Work.

6. Lines, Marks, etc.

The CM shall furnish batter boards and stakes and shall cause to be placed and maintained thereon so as to be easily read, such lines, marks and directions relating to the Work as the Designer shall from time to time direct. The Designer shall establish base lines and benchmarks on the Drawings for the locations of the Work but all other lines and grades shall be determined by the CM.

7. Excavation

The CM shall prevent by sheeting and shoring or bracing, if necessary, any caving or bulging of the sides of any excavation made by the CM, leaving sheeting and shoring in place, or if any is removed, filling solid the spaces left thereby.

8. Corrections to the Work; Inspection No Bar to Subsequent Corrections

The inspection of the Work by the Designer, the City of Worcester or its consultants shall not relieve the CM of its responsibilities to fulfill the Contract obligations. Defective work may be rejected by the Designer, the City of Worcester or its consultants whether or not such work and/or materials have been previously overlooked or misjudged by the Designer, the City of Worcester or its consultants and accepted for payment. If the Work or any part thereof shall be found defective at any time before the Final Acceptance of the whole Work, the CM shall forthwith correct such defect in a manner satisfactory to the Designer, the City of Worcester or its consultants. If any material brought upon the Site for use in the Work, or selected for the same, shall be rejected by the Designer, the City of Worcester or its consultants as unsuitable or not in conformity with the Contract Documents, or as damaged by casualty or deteriorated due to improper storage at the Site or to any other factor, the CM shall forthwith remove such materials from the Site. The CM shall pay for the cost of making good all work or property of other contractors or of the Owner destroyed or damaged by such removal or replacement; repair any injury, defect, omission or mistake in the Work as soon as it is discovered, finish and immediately make good any defect, omission or mistake in the Work and complete and leave the Work in perfect condition.

9. Intentionally Omitted

10. Sanitary Facilities

The CM shall provide and maintain sanitary facilities for all persons employed on the Work, beginning with the first worker at the Site. Said facilities shall meet the following requirements unless otherwise specified in the Supplementary Contract Documents.

A. There shall be no fewer facilities than the number required by applicable Laws.

B. Facilities shall be kept in a clean sanitary condition at all times and shall be adequately screened to be inaccessible to flies.

11. Temporary Offices

A. Except as otherwise specified in the Contract Documents, the CM shall erect the following temporary offices near the Site as directed by the Designer and adequately furnish and maintain them in a clean, orderly condition:

(1) Refer to specification section 01 50 00 Temporary Facilities and Controls for additional information.

12. Contract Documents and Samples at the Site

A reasonable number of sets of Contract Documents will be furnished to the CM by the City of Worcester immediately after signing of the Contract, one of which shall be maintained at the Site for reference by authorized representatives of the City of Worcester. The CM shall maintain at the Site for the use and information of the City of Worcester one record copy of the Drawings, Specifications, Addenda, Change Orders, Approved Shop Drawings, Product Data, Samples, updated Progress Schedule, and all other submittals, all in good order and marked currently to record changes and selections made during construction. These shall be available to

the Designer and the City of Worcester and shall be delivered to the Designer for submittal to the City of Worcester upon completion of the Work. The Drawings, Specifications and other documents prepared by the Designer, and copies thereof furnished to the CM, are for use solely with respect to this Project. The CM shall not permit their release to other parties except as may be necessary in dealing with governmental authorities in the ordinary course of permitting and constructing the Project. Further, they are not to be used by the CM or any Subcontractor or Supplier on other projects without the specific written consent of the City of Worcester and the Designer.

13. Telephones

The CM shall provide and maintain separate individual telephone service and pay for all calls relating to the Work. Service and equipment shall meet the requirements, if any, of the Contract Documents and shall include provisions for incoming and outgoing calls: (1) in the CM's field office for the use of its authorized agents and (2) in the Resident Engineer's office for the use of the Designer and authorized agents of the City of Worcester.

14. Safety Laws, Regulations, and Practices

A. The CM shall comply with all health and safety Laws applicable to the Work. Without limitation:

(1) If the CM uses or stores toxic or hazardous substances it shall comply with M.G.L. c. 111F, s. 2, the "Right to Know" law and regulations promulgated by the Department of Public Health, 105 CMR 670, the Department of Environmental Protection, 310 CMR 33, and the Department of Labor and Workforce Development, 441 CMR 21; and shall post a Workplace Notice obtainable from the Department of Labor and Workforce Development.

(2) The CM shall comply with the Federal Resource Conservation and Recovery Act, the Federal Comprehensive Environmental Response, Compensation and Liability Act, M.G.L. c. 21C, M.G. L. c. 21E, and any other Laws affecting toxic or hazardous materials, solid, special or hazardous waste (collectively "Hazardous Materials Laws). Should the CM discover unforeseen materials subject to Hazardous Materials Laws at the Site, the CM shall immediately notify the City of Worcester of such discovery.

(3) The CM shall be responsible for the location of all utilities in connection with the Work. Without limiting the foregoing, the CM shall comply with Dig-Safe Laws. Dig-Safe is the Utility Underground Plant Damage Prevention System, 111 South Bedford Road, Burlington, MA 01803, 1-800-322-4844. The CM shall notify Dig-Safe of contemplated excavation, demolition, or explosive work in public or private ways, and in any utility company right of way or easement, by certified mail, with a copy to Department of Environmental Protection (DEP). This notice shall be given at least 72 hours prior to the work, but not more than sixty days before the work is to be done. Such notice shall state the name of the street or the route number of the way and shall include an accurate description of the location and nature of the proposed work. Dig-Safe is required to respond to the notice within 72 hours of receipt by designating the

location of pipes, mains, wires or conduits at the Site. The CM shall not commence work until Dig-Safe has responded. The work shall be performed in such manner and with reasonable precautions taken to avoid damage to utilities under the surface at the work location. The CM shall provide the Superintendent with current Dig-Safe regulations, and a copy of M.G.L. c. 82, s. 40. Any costs related to the services performed by Dig-Safe shall be borne by the CM.

(4) The CM shall comply with Public Law 92-596, "Occupational Safety and Health Act of 1970" (OSHA), with respect to all rules and regulations pertaining to construction, U.S. Code Title 29, sections 651 et seq. including Volume 36, numbers 75 and 105, of the Federal Register as amended, and as published by the U.S. Department of Labor.

(5) The CM shall comply with M.G.L. c. 149, s. 129A, relative to shoring and bracing of trenches.

B. The CM shall take reasonable precautions to prevent damage, injury or loss to persons or property. Nothing herein shall relieve Subcontractors of their responsibility for the safety of persons and property, and for compliance with all Laws applicable to the Work and their activities in connection therewith. Without limitation, the CM shall take all reasonable precautions for the safety of, and the prevention of injury or damage to (1) all agents and employees and contractors on the Work and all other persons who may be affected thereby including the general public, (2) all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the Site, under the care custody or control of the CM or any of its Subcontractors or any contractors directly or indirectly contracting through any of them, and (3) other property at the Site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of the Work. The CM shall promptly remedy all damage or loss to any such property caused in whole or in part by the CM, any Subcontractor, or anyone directly or indirectly contracted or employed by any of them or by anyone for whose acts any of them may be liable. Without limiting the foregoing, the CM shall:

(1) post and maintain adequate danger signs and other warnings against hazards;

(2) promulgate safety regulations and give appropriate notices to the City of Worcester and users of adjacent utilities and property;

(3) insure the adequate strength and safety of all scaffolding, staging and hoisting equipment, temporary shoring, bracing and tying;

(4) protect adjoining private or public property;

(5) provide barricades, temporary fences, and covered walkways required by prudent construction practices, Laws and/or the Contract Documents;

(6) furnish approved hard hats and other personal protective equipment, furnish approved first aid supplies, furnish the name of the first aid attendant, and maintain a posted list of emergency facilities;

(7) provide proper means of access to property where the existing access is cut off by the CM;

(8) maintain from the beginning of any darkness or twilight through the whole of every night sufficient lights on or near any obstruction so as to guard to protect travelers from injury from such obstruction;

(9) maintain adequate security at the Site so as not to expose the Work and surrounding property to vandalism or malicious mischief;

(10) provide adequate fire protection procedures during the use of cutting torches, welding equipment, plumbers' torches and other flame and spark producing apparatus; and

(11) take prompt action to correct any dangerous or hazardous conditions.

A. The CM shall not use or store explosives in the performance of the Work unless the CM first obtains the City of Worcester's prior written specific Approval. If the City of Worcester Approves the use or storage of explosives during the performance of the Work, the CM shall first comply with all Laws and obtain all permits, approvals, and certificates required in connection with the same and shall exercise best efforts, including but not limited to the employment and supervision of properly qualified personnel, to prevent damage, injuries, and accidents involving said explosives.

B. The CM shall not permit cutting or welding in or immediately adjacent to existing property of the Owner or of anyone else without the City of Worcester's prior Approval in each instance.

C. The CM shall submit a safety plan to the City of Worcester and designate by notice to the City of Worcester a full time responsible member of its organization at the Site whose duties shall include preventing accidents.

D. The CM shall submit to the City of Worcester without delay verbal and written reports of all accidents involving bodily injury or property damage arising in connection with the Work.

E. In any emergency affecting the safety of persons or property the CM shall immediately act in the exercise of reasonable judgment to prevent threatened damage, injury, or loss. The CM shall immediately notify the City of Worcester of such emergency.

15. Debris and Chemical Waste

A. The CM shall not permit the accumulation of interior or exterior debris. The CM shall keep the Work area clean at all times. Without limitation, garbage shall be removed daily.

B. The CM shall properly classify and remove debris and waste from the Site and transport and dispose of it, all in accordance with Laws, employing a qualified and properly licensed transporter, at any landfill, disposal or recycling facility licensed under applicable Laws, including without limitation, hazardous materials laws. The CM shall make all arrangements and give and obtain all notices, communications, documentation, permits, certificates, and approvals necessary for said disposal from the owner or officials in charge of such landfills, disposal or recycling facilities. The CM shall bear all fees and costs in connection with such classification, removal, transportation, disposal and storage. The CM shall not permit any storage of debris or waste except in accordance with Laws.

C. The CM shall not permit any open fire on the Site.

D. Chemical Waste: Chemical waste shall be stored in corrosion resistant containers, removed from the Site, and disposed of not less frequently than monthly unless more frequently required by Laws, including without limitation hazardous materials laws, or by the Contract Documents. Disposal of chemical waste shall be performed in accordance with requirements of the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP). Fueling and lubricating of vehicles and equipment shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants shall be disposed of in accordance with procedures meeting all applicable Laws. The CM shall immediately notify the Designer of any hazardous materials release large enough to require reporting under applicable Laws. The CM shall be responsible for immediately cleaning up in accordance with Laws any oil or hazardous materials releases resulting from its operations. Any costs incurred in cleaning up any such releases shall be borne by the CM.

16. Weather Protection (M.G.L. c. 149, s. 44G and 44F(1))

The CM shall provide "weather protection," which means temporary protection of that Work adversely affected by moisture, wind and cold. Weather protection shall be achieved by covering, enclosing and/or heating working areas such that a minimum temperature of 40 degrees Fahrenheit is maintained at the working surface during the months of November through March in order to permit construction to be carried on during such period in accordance with the Progress Schedule. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a resistance comparable to the specified permanent construction, the CM shall provide heat therein of not less than 55 degrees F. nor more than 75 degrees F. The foregoing provisions do not supersede any specific requirements for methods of construction, curing of materials and the like. Such weather protection shall be consistent with the Progress Schedule, shall permit the continuous progress of the Work necessary to maintain an orderly and efficient sequence of construction operations, shall include one thermometer for every 2,000 square feet of floor space or fraction thereof, shall be subject to the Approval of the City of Worcester, and shall meet such additional requirements as may be specified by the City of Worcester and by the Contract Documents.

17. Furnishings and Equipment

When, in the opinion of the Designer, any portion of the Work is in a reasonable condition to receive fittings, furniture, or other property of the Owner not covered by this Contract, the CM shall allow the City of Worcester to bring such fittings, furniture, and/or other property into such portions of the Work and shall provide all reasonable facilities and protection thereof. No such occupancy shall be construed as interfering with the provisions relating to time of completion, or as constituting an acceptance of the whole or any part of the Work. Any furniture or fittings so installed shall be placed in the Work at the risk of the City of Worcester except that the CM shall be liable for damages or losses to such furniture or fittings to the extent such damages or losses arise in whole or in part from the negligence or intentional misconduct of CM, Subcontractors, their agents and/or employees, or anyone for whose acts CM is responsible.

18. Intentionally Omitted

19. Sales Tax Exemption and Other Taxes

All building materials and supplies as well as the rental charges for construction vehicles, equipment and machinery rented exclusively for use on the Site, or while being used exclusively for the transportation of materials for the Work are entitled to an exemption from sales taxes under M.G.L. c. 64H, s. 6(f). The CM shall take all action required to obtain the benefit of such sales tax exemption. The CM shall bear the cost of any sales taxes that CM incurs in connection with the Work and the City of Worcester shall not reimburse the CM for any such taxes. The exemption number assigned to the CM as an exempt purchaser shall be provided to the CM by the City of Worcester upon the written request of the CM.

20. Final Cleaning

At the completion of the Work, the CM shall remove all waste materials, rubbish, tools, equipment, machinery and surplus materials, and professionally clean all sight-exposed surfaces so that the Work is clean and ready for occupancy. Subsequent to installation of User Agency furniture, telephones, and equipment, the CM shall provide such additional cleaning as may be necessary to remove any soil resulting from installation of such furniture, telephones and equipment.

21. Maintenance Data

Subject to such additional requirements as may be provided in the Contract Documents, the CM shall compile four complete and identical binders of operating and maintenance data for the entire Work. The CM shall submit record maintenance data to the Designer for approval, shall submit approved maintenance data to the City of Worcester, and shall instruct and train the User Agency's personnel in proper inspection and maintenance procedures.

22. Closeout Procedures

The CM shall take all actions and submit all items required for the issuance of the Certificate of Agency Use and Occupancy and Final Acceptance as specified in the Contract Documents.

23. Risk of Loss

The CM shall bear all risk of loss to the Work during the term of the Contract except for any portion of the Work as to which the Certificate of Agency Use and Occupancy has been issued pursuant to Article VI of these General Conditions of the Contract. Nothing herein shall limit the CM's responsibilities under Article IX or XV of these General Conditions of the Contract.

ARTICLE V - MATERIALS AND EQUIPMENT

1. Materials Generally

A. Unless otherwise specifically provided in the Contract Documents, the CM shall provide and pay for materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

The CM shall obtain prior written approval from the City of Worcester for permission to store materials or equipment to be incorporated in the Work, for which progress payments will be requested, at off-site locations. Any and all charges for storage, inspection and verification by the Designer and the City of Worcester, including insurance, shall be borne solely by the CM. Before approval, the City of Worcester may require, without limitation (i) evidence that the off-site location is properly secure, (ii) proper proof of insurance and proof of satisfactory contractual arrangements for transportation to the site, and (iii) a certificate from the CM stating:

(1) The name of the member of the CM or Subcontractor that leases or owns the warehouse or other storage facility;

(2) The location of such storage facility, including the storage space; i.e., the entire premises or certain areas of a warehouse giving the number of floors or portions thereof, and a certification that the CM has visited such location, verified the storage of such material or equipment therein or thereon (including confirmation that the materials or equipment are marked and segregated as provided below), and verified payment of all current storage charges;

(3) The date(s) on which the material or equipment is first stored at such facility; and

(4) A description of the materials or equipment stored, including quantities, types, manufacturers and other identification information, such as serial numbers.

The CM shall furnish to the City of Worcester, not less often than once per month, a current inventory of all materials or equipment being stored at any off-site location.

The CM shall mark each sealed carton or other item with the name of the Project and the City of Worcester, and all materials or equipment stored off-site shall be segregated to the extent required by the City of Worcester or the Designer.

Payment for materials or equipment stored off-site shall be at the reasonable discretion of the City of Worcester, taking into account the schedule requirements of the Work. Title to materials or equipment stored off-site shall be transferred at the time at which the City of Worcester pays for them, free of any lien or other interest of the Supplier or any other lien or encumbrance. Notwithstanding such transfer of title, the CM shall retain sole care, custody and control of, and shall have complete responsibility for the security and protection of, all

materials or equipment included in any Application for Payment which are stored at locations other than the site, and the CM assumes all risk of loss or damage to such materials or equipment, and the CM shall hold harmless the City of Worcester from and against all liabilities arising out of or resulting from loss or damage, from any cause, to such materials or equipment for which payment is requested, including liens, security interests or other claims of any kind by Suppliers or other third parties relating to such materials or equipment.

B. Materials and equipment to be installed as part of the Work (both or either of which are hereinafter referred to as "materials") shall be new, unused, of recent manufacture, assembled, and used in accordance with the best construction practices. The CM shall inform itself as to, and shall comply with, the provisions of M.G.L. c. 7, s. 23A, as amended, and shall abide by the same and all applicable rules, regulations and orders made thereunder in relation to the purchase of supplies and materials in the execution of the Work, including the provisions of M.G.L. c.7, s. 22, section 17 which provides that there be *"a preference in the purchase of supplies and materials, other considerations being equal, in favor, first, of supplies and materials manufactured and sold within the Commonwealth, and, second, of supplies and materials manufactured and sold elsewhere within the United States."*

2. Shop Drawings, Product Data, and Samples

A. The CM shall furnish to the Designer all samples of the materials to be used in the execution of the Work as required by the Contract Documents. The CM shall furnish to the Designer in a timely manner all coordination Drawings, shop details, Shop Drawings, and setting diagrams which may be necessary for acquiring and installing materials. These shall be reviewed as required by the Designer. A minimum of four (4) copies shall be submitted for final approval, one of which shall be returned to the CM, one to the Resident Engineer, one to the City of Worcester and one filed with the Designer. The inspection and approval by the Designer of Shop Drawings, etc. shall be general and shall in no way relieve the CM from responsibility for proper fitting, coordinating, construction, and construction sequencing. The CM shall furnish to the City of Worcester and the Designer such information and vouchers relative to the Work, the materials therefor, and the persons employed thereon, as the Designer shall from time to time request.

B. Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. The purpose of their submission is to demonstrate for those portions of the Work for which submittals are required the way the CM proposes to conform to the information given and the design concept expressed in the Contract Documents.

C. The CM shall review, approve, and submit to the Designer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the City of Worcester or of separate contractors. Submittals made by the CM which are not required by the Contract Documents or which do not comply with the Contract Documents

may be returned without action. The CM's attention is directed to the provisions of Section 4 of this Article V and to the Specifications.

D. The CM shall prepare and keep current for the Designer's approval a schedule of submittals which is coordinated with the Progress Schedule and allows the Designer reasonable time to review submittals.

E. The CM shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Designer. Such Work shall be in accordance with Approved submittals.

F. By submitting Shop Drawings, Product Data, Samples and similar submittals, the CM represents that the CM has determined and verified materials, field measurements, and field construction criteria related thereto and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

G. The CM shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Designer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the CM has specifically informed the Designer in writing of such deviation at the time of submittal and the City of Worcester has given explicit written approval to the specific deviation. The CM shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the Designer's or the City of Worcester's actions.

H. The CM shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Designer on previous submittals.

I. Informational submittals upon which the Designer is not expected to take responsive action may be so identified in the Contract Documents.

J. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, such certification must be stamped by a registered Massachusetts professional in the discipline required. The Designer shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

K. Materials furnished or used or employed under the Contract must be equal in quality to the samples furnished and be satisfactory to the Designer.

3. Tests

A. Any material to be used in the Work may be tested or inspected at any time by the Designer with an independent testing company with the prior Approval of the City of Worcester and may be rejected if it fails to comply with specified tests. the City of Worcester shall pay for all testing of specified material. If the CM requests permission to use a material that was not

specified, then the CM shall pay for such testing. The cost of testing of any materials that fail the testing criteria shall be borne by the CM

B. The CM shall notify the Designer and the City of Worcester of the proposed sources of materials in time to permit all required testing and inspection before the material is needed for incorporation into the Work. The CM shall have no claim arising from CM's failure to designate the proposed source or to order the material in time for adequate testing and inspection. Necessary arrangements shall be made to permit the Designer to make factory, shop or other inspection of materials or equipment ordered for the Work in process of manufacture or fabrication, or in storage elsewhere than the Site.

4. "Or Equal" Submissions

A. Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the words "or Approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if in the opinion of the Designer and the City of Worcester (a) it is at least equal in quality, durability, appearance, strength and design, (b) it performs at least equally the function imposed in the general design for the Work, and (c) it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the Specifications. Any changes in the work made necessary to accommodate products or materials substituted as an "or equal" shall be at the expense of the CM. "Approved equal" shall mean an item with respect to which the City of Worcester shall have issued a written statement to the CM to the effect that the item is, in the City of Worcester's opinion, equal within the meaning of this section to that prescribed in the Contract Documents.

B. The CM shall be responsible for providing the Designer with any information and test results that the Designer reasonably requires to determine whether or not a material is equal to a material named or described in the Contract Documents.

C. Whenever the CM submits a material for approval as a substitute for a material named or described in the Contract Documents, such submission shall be made at least one hundred twenty (120) days prior to the date the materials will be used in the Work. In no event shall the CM maintain a claim for delays based upon the Designer's review of such substituted materials if the CM has failed to comply with the one hundred twenty (120) day submission requirement.

5. Delivery and Storage of Materials; Inspection

A. Materials and equipment shall be progressively delivered to the Site so that there will be neither delay in the progress of the Work nor an undue accumulation of materials that are not to be used within a reasonable time and so that their security, quality, and fitness of the materials for the Work is preserved.

B. Materials stored off Site shall be insured and stored at the expense of the CM so as to guarantee the preservation of their security, quality and fitness for the Work. Without derogating from the CM's responsibilities in the previous sentence, when necessary to

avoid deterioration or damage, material (on or off Site) shall be placed on wooden platforms or other hard clean surfaces and not on the ground and shall be properly protected.

C. Expenses for inspection of material by the Designer and/or the City of Worcester personnel including travel, quarters, and subsistence shall be borne by the CM requesting the inspection of material stored outside the Commonwealth of Massachusetts as part of the Contract Price. The policy of the City of Worcester precludes the payment for material stored outside the boundaries of Massachusetts except in extremely limited circumstances with the express written consent of the City of Worcester. If the CM requests an inspection of material stored outside the Commonwealth of Massachusetts, the City of Worcester will initially pay for all expenses of inspecting the material incurred by the Designer and/or the City of Worcester's personnel including travel, quarters, and subsistence. the City of Worcester will then give CM an invoice for those costs and the CM shall submit a credit Change Order for the amount of those expenses.

D. Stored materials either at the Site or at some other location agreed upon in writing shall be so located as to facilitate prompt inspection and even though approved before storage, may again be inspected prior to their use in the Work.

E. All storage sites shall be restored to their original condition by the CM at the CM's expense.

F. The CM shall take charge of and be liable for any loss of or injury to the materials for its use delivered to or in the vicinity of the place where the Work is being done, whether furnished by the Owner or otherwise; the CM shall notify the Designer as soon as any such materials are so delivered, allow them to be examined by the Designer, and furnish workers to assist therewith.

6. Defective, Damaged, or Deteriorated Materials and Rejection Thereof

The Designer may reject materials if the Designer reasonably determines that such materials do not conform to the Contract Documents in any manner, including but not limited to materials that have become damaged or deteriorated from improper storage whether or not such materials have previously been accepted. The CM at its own expense shall remove rejected materials from the Work. No rejected material, the defects of which have been subsequently corrected, shall be used except with the written permission of the Designer. Should the CM fail to remove rejected material within a reasonable time, the City of Worcester may, in addition to any other available remedies, remove and/or replace the rejected material, and deduct the cost of such removal and/or replacement from any moneys due or to become due the CM. No extra time shall be allowed for completion of Work by reason of such rejection. The inspection of the Work shall not relieve the CM of any of its obligations herein prescribed, and any defective Work shall be corrected. Work not conforming to the Contract Documents may be rejected notwithstanding that such Work and materials have been previously overlooked or misjudged by the Designer and accepted for payment. If the Work or any part thereof shall be found defective at any time before Final Acceptance of the whole Work, the CM shall forthwith make good such defect in a manner satisfactory to the Designer. Nothing in the Contract shall be construed as vesting in the CM any property rights in the materials

used after they have been attached or affixed to the Work or the Site; but all such materials shall upon being so attached or affixed become a property of the Owner.

ARTICLE VI - PROSECUTION AND PROGRESS

1. Beginning, Progress Schedule, and Completion of Work

A. The Contract time shall commence upon the date specified and in accordance with any conditions in the Notice to Proceed.

B. Prior to the submission of the first progress payment, CM shall submit and the City of Worcester shall approve a progress schedule which complies with the requirements of specification section 013200 . Upon Approval by the City of Worcester, said schedule shall constitute the Progress Schedule. The CM shall comply with all requirements of said section 01310.

C. Time is of the essence of this Contract. The Work shall be completed within the time specified in the Owner-CM Agreement. Should the CM require additional time to complete the Work, the CM shall document the reasons therefor and submit a written request for an extension of time within 20 days of the occurrence of the event alleged to be the cause of the delay, as provided in this Article and in Article VII of these General Conditions of the Contract. Failure to submit said written request within the time required by the preceding sentence shall preclude the CM from subsequently claiming any time extension due to said delay.

D. If, in the opinion of the Designer or the City of Worcester, the CM fails to comply with the Progress Schedule, the City of Worcester may give the CM a written notice to that effect. whereupon (1) the CM shall, if the notice requires, discontinue all or any portion of the Work (which discontinuance shall neither terminate the Contract nor give the CM any claim for an increase in the Contract Price, damages, or an extension of any completion deadlines); or (2) at CM's sole cost increase the work force, equipment and plant, or any of them, employed on the whole or any part of the Work, to the extent required by such notice, and employ the same from day to day until the completion of the Work or such part thereof, or until the failure regarding the rate of progress, in the opinion of the Designer or the City of Worcester, shall have been sufficiently corrected.

E. If, in the opinion of the City of Worcester the CM fails to comply with the Progress Schedule, and whether or not the City of Worcester shall have given the CM a notice described in D above, the City of Worcester may (but shall not be required to) give the CM written notice of such failure and five days to cure the same. Unless the CM shall within that five days take all necessary steps to do so (including, if the City of Worcester requires, increasing its forces, equipment and plant) and continue to do so until in the opinion of the City of Worcester the failure is corrected, the City of Worcester may at the CM's expense and without terminating this Contract take exclusive or joint possession of all or a portion of the Site and employ and direct the labors of existing or such additional forces, equipment and plant as may in the Designer's or the City of Worcester's opinion be necessary to insure the completion of the Work or such part thereof within the time specified in the Contract Documents or at the earliest possible date thereafter. the City of Worcester may exercise its rights under this Article at any time and from time to time without waiving any of its

rights under this Contract, at law or in equity, including, without limitation, the right to deem this Contract terminated or to order the CM to discontinue the Work at any time thereafter. The CM shall continue to perform the remaining Work under this Contract even if the City of Worcester elects to have another contractor perform a portion of the Work under this Article.

F. The City of Worcester shall deduct the cost of any actions the City of Worcester takes under this Article from any amount then due or which might have become due to the CM under this Contract had the CM performed as required. On demand, the CM shall pay the City of Worcester any amount by which the cost of completing all or any portion of the Work exceeds the amount attributable to that Work under the Contract Documents. the City of Worcester's sole goal will be to complete the Work that it elects to complete within the time limits stated in the Contract or at the earliest possible date thereafter. Consequently, the City of Worcester shall have no obligation to obtain competitive bids or the lowest cost for completing the Work or any part thereof, except when it is required by law. the City of Worcester's election to complete all or part of the Work shall not release the CM from any liability for failure to complete the Work as the Contract Documents require, and shall not entitle the CM to a claim for an increase in the Contract Price or an extension of the time for completing the Work. If the cost that the City of Worcester incurs in completing all or any portion of the Work is less than the amount that the Contract Documents attribute to that Work, the City of Worcester will pay or credit the difference to the CM, less any other costs and expenses that the City of Worcester incurs, including the cost of supervision, and the Designer's and attorneys' fees and costs.

2. Failure to Complete Work on Time - Liquidated Damages

A. If liquidated damages are specified in the Owner - CM Agreement, the City of Worcester has determined that its damages as a result of CM's failure to complete the Work to the point at which it qualifies for the issuance of a Certificate of Agency Use and Occupancy will be difficult or impracticable to ascertain. Accordingly, if the Work is not completed to such point by the date specified in this Contract, the CM shall pay to the City of Worcester the sum designated as liquidated damages in the Contract for each and every calendar day that the CM is in default in completing the Work to such point. Such moneys shall be paid as liquidated damages, not as a penalty, to cover losses and expenses to the City of Worcester and/or the User Agency resulting solely from the fact that the Work is not completed on time.

B. Similarly, if the Contract states that by a specified date a designated portion of the Work shall be prosecuted to the point at which it qualifies for the issuance of a Certificate of Agency Use and Occupancy, and if such portion has not been prosecuted to such point by said date, the CM shall pay to the City of Worcester the sum designated in the Contract for each calendar day that the CM is in default in completing such portion of the Work to such point. Such moneys shall also be paid as liquidated damages not as a penalty, to cover

losses and expenses to the Owner resulting solely from the fact that the Work is not completed on time.

C. The City of Worcester may recover such liquidated damages by deducting the amount thereof from any moneys due or that might become due the CM, and if such moneys shall be insufficient to cover the liquidated damages, then the CM or the Surety shall pay to the City of Worcester the amount due.

D. Permitting the CM to continue and finish the Work or any portion of it after the time fixed in the Contract for its completion shall not be deemed as a waiver of any of the Owner's rights hereunder, at law or in equity.

E. Liquidated damages or a portion thereof may be waived by the City of Worcester if the CM submits evidence satisfactory to the City of Worcester that the delay was caused solely by conditions beyond the control of the CM and that the City of Worcester has not suffered any damages as a result of said delay.

F. Failure by the City of Worcester to specify a sum as liquidated damages in the Owner-CM Agreement, or the insertion of "N/A" or "none" in the space provided therein for liquidated damages, shall not be deemed a waiver of the City of Worcester's right to recover actual damages arising from the CM's failure to complete the Work on time.

3. Delays; Statutory Provisions (M.G.L. c. 30, s. 39O)

A. Notwithstanding any provision of this Contract to the contrary, except as otherwise provided by law as set forth in section B below, the CM shall not be entitled to increase the Contract Price or to receive damages on account of any hindrances or delays, avoidable or unavoidable; but if any delay is caused in the opinion of the City of Worcester, by the City of Worcester, the CM shall be entitled to an extension of time. The length of the extension shall be sufficient in the opinion of the City of Worcester for the CM to complete the Work. Although no delay shall increase the Contract Price, the City of Worcester may require that any change in the date by which the CM must complete all or any part of the Work be processed on a standard Change Order form.

B. If a suspension, delay, interruption or failure to act of the City of Worcester increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the CM with respect to such increase as the CM shall have against the City of Worcester by virtue of (a) and (b) of M.G.L. c. 30, s. 39O set forth below, but nothing in provisions (a) and (b) shall alter any other rights which the CM or the Subcontractor may have against each other. As used in the statutory language of (1) and (2) below, "contract" means this Contract, "general contractor" means the CM and "Awarding Authority" means the City of Worcester:

(1) "The Awarding Authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the Awarding Authority; provided, however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure

of the Awarding Authority to act within the time specified in this contract, the Awarding Authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the Awarding Authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(2) The general contractor must submit the amount of a claim under provision (a) to the Awarding Authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and except for costs due to a suspension order, the Awarding Authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the Awarding Authority in writing of the act or failure to act involved in the claim."

4. Use and Occupancy Prior to Final Acceptance

A. The CM agrees to the use and occupancy of the Project or any portion thereof before Final Acceptance of the Work by the City of Worcester.

B. The City of Worcester and the User Agency will cooperate with the CM with respect to the completion of the Work by taking such reasonable steps as may be possible to avoid interference with the CM's Work provided that they do not interfere with the proper functioning of the facility.

C. The CM shall not be responsible for wear and tear or damage resulting solely from temporary occupancy.

D. Use and occupancy of any part of the Work prior to Final Acceptance by the City of Worcester shall not relieve the CM from maintaining the required payment and performance bonds and insurance (to the extent that insurance is required to be maintained after Substantial Completion) required by this Contract.

5. Certificate of Agency Use and Occupancy

A. When the Work, or portion thereof which the City of Worcester agrees to accept separately has reached the state of Substantial Completion as shown on an Approved payment request, the CM shall develop, with the participation of the Designer and the City of Worcester, the Punch List identifying those items of unfinished or unacceptable Work that remain to be performed or corrected under the Contract.

B. Before the Work shall be deemed completed to the point where it is ready for the issuance of a Certificate of Agency Use and Occupancy, the CM shall:

(1) Provide CM's proposed Punch List containing a statement of the reason for each item listed thereon;

(2) Advise the City of Worcester of proposed changes in insurance in accordance with the provisions of this Contract, and provide to the City of Worcester evidence of CM's Completed Operations insurance coverage to the extent required by the Contract Documents;

(3) Execute and submit a notarized warranty on a form provided by the City of Worcester meeting the requirements of Article IX of these General Conditions of the Contract, to commence upon the date of the issuance of the Certificate of Agency Use and Occupancy for the Work or the designated portion thereof, unless otherwise provided in the Certificate of Agency Use and Occupancy;

(4) Submit signed special warranties and warranties of longer than one year as required by the Contract Documents;

(5) Submit signed maintenance agreements for all portions of the Work specified to receive maintenance after the issuance of the Certificate of Agency Use and Occupancy;

(6) Submit all preliminary record Drawings and documents and framed data in the forms required by the Contract Documents;

(7) Complete all items required to be completed by the Department of Public Safety and obtain a Certificate of Occupancy from the Department of Public Safety and similar releases which permit the User Agency and the City of Worcester full and unrestricted use of the areas claimed to be ready for occupancy;

(8) Deliver specified maintenance stocks of materials, required spare parts, and all special tools furnished by manufacturers to persons designated by the City of Worcester and obtain written receipts for same;

(9) Make final changes of lock cylinders or cores and advise the City of Worcester of the change of project security responsibility;

(10) Complete start-up of systems and instruct User Agency personnel on proper operation and routine maintenance of all systems and equipment; obtain and submit to Agency personnel that start-up and instruction have been completed;

(11) Remove all remaining temporary facilities that are no longer needed, surplus materials, and debris; (the CM shall not remove construction offices and trailers without the prior Approval of the City of Worcester);

(12) Submit final utility meter readings and similar information and advise the User Agency and the City of Worcester of the change of responsibility for utility charges and payments upon the issuance of the Certificate of Agency Use and Occupancy;

(13) Complete final clean-up of all Work, restoration of damaged finishes, and replacement of all damaged and broken glass not listed on the CM's Punch List.

(14) Complete such other items as may be called for in the Contract Documents, if any, or in the Specifications.

C. After completing the items specified in subsection B above, the CM shall make a written request for the Designer's inspection for a Certificate of Agency Use and Occupancy in accordance with the Contract Documents. The Designer shall review the submittals and the Work and shall either 1) sign a Certificate of Agency Use and Occupancy or 2) notify the CM of incomplete and/or incorrect Work that must be completed and corrected prior to the issuance of the Certificate of Agency Use and Occupancy. The Designer shall notify the CM of any additions to the Punch List. In connection with the execution of the Certificate of Agency Use and Occupancy the Designer shall assign dollar values to each item on the Punch List. Failure to include any incomplete or defective item on the Punch List shall not relieve the CM of the obligation to complete all Work in accordance with the Contract Documents.

6. Final Acceptance of the Work

A. Prerequisites for Final Acceptance. After the issuance of a Certificate of Agency Use and Occupancy for the entire Work, and after the CM has completed all of the Work required by this Contract, including Change Orders and Punch List Items, the CM shall submit the following completed items to the City of Worcester together with such additional items as may be specified in the Contract Documents:

(1) A completed Final Application for Payment showing a final accounting of all changes in the Work, on the form provided by the City of Worcester.

(2) Certification and satisfactory evidence that all taxes, fees, and similar obligations have been paid.

(3) Consent of the Surety to Final Payment executed by applicable bonding companies.

(4) Certified copy of the Punch List stating that the CM has completed or corrected every item listed.

(5) Evidence of CM's continuing Completed Operations Insurance coverage to the extent required by the Contract Documents.

(6) All final record Drawings and documents in the forms specified by the Contract Documents.

(7) A notarized certification that all purchases made under the tax exemption certificate were legitimate and entitled to exemption.

(8) Written certifications from the Department of Public Safety and the Designer to the effect that: a) the Work has been inspected for compliance with the Contract Documents and has satisfied the Department of Public Safety; b) all equipment and systems included in the Work have been tested in the presence of the Designer and are operational and satisfactory; c) the Work is completed and ready for final inspection.

(9) Such other items as may be required by the Contract Documents.

B. Re-inspection; Final Acceptance. After notification from the CM that all remaining contract exceptions, omissions and incompletions have been completed (with the exception of CM's continuing warranty, insurance, indemnification, and such other obligations as are intended by the terms of the Contract Documents to extend beyond the date of Final Acceptance), the City of Worcester and the Designer shall inspect the Work to verify the completion of the same. If the Work is satisfactory, the City of Worcester shall prepare a Certificate of Final Acceptance or shall notify CM of items which remain to be completed prior to Final Acceptance.

7. One-Year Warranty Repair List and Inspection

Approximately 30 days prior to the expiration of the comprehensive one-year warranty period, the CM shall schedule an appointment with the City of Worcester for a re-inspection of the Work with the City of Worcester, and shall thereafter inspect the work at the time scheduled. Based on this inspection and on prior inspections, the City of Worcester shall issue a "Warranty Repair List" of items to be corrected by the CM. The CM shall make the repairs and/or replacements listed within 30 days of the issuance of the Warranty Repair List unless otherwise agreed by the City of Worcester in writing.

ARTICLE VII - CHANGES IN THE WORK

1. Change Orders Generally

A. No changes in the Work, the Contract Price, the Substantial and Final Completion dates, or any other provision of an Approval by the City of Worcester of the Contract Documents shall be made in absence of a Change Order as defined in Article I of these General Conditions of the Contract, directing the CM to perform such changes. Any request for a change in the provisions of this Contract submitted by the CM must be made in writing and in accordance with the provisions of this Contract, including the procedures of the City of Worcester.

B. A request for a change in the provisions of this Contract may be submitted to the City of Worcester by the CM, Designer, Resident Engineer or User Agency. The request must be made in writing and in accordance with the provisions of this Contract, Laws, and the procedures of the City of Worcester. When the CM believes that an event or circumstance gives rise to an adjustment in the Contract Price and/or the Contract Time it shall submit a request for a change order in accordance with the forms and procedures required by the City of Worcester.

C. A written directive (sometimes called a Notice to Proceed or a Notice of Intent may be issued by the City of Worcester instructing the CM to make changes in the Work within the scope of the Contract, including but not limited to, changes in: (1) the Plans and Specifications; (2) the method or manner of performance of the Work; (3) the Owner-furnished facilities, equipment, materials, services or Site; (4) the schedule for performance of the Work.

D. The CM shall immediately perform any changes in the work that are ordered by the City of Worcester.

E. Whenever a Change Order or written directive will cause a change in the CM's cost, the CM or the City of Worcester may request an adjustment in the Contract Price. Such request shall be in writing and shall be submitted by the party making such claim to the other party before commencement of the pertinent work or as soon thereafter as possible.

F. The City of Worcester and the CM shall negotiate in good faith an agreement on an equitable adjustment in the Contract Price, and/or time if appropriate, before commencement of the pertinent work or as soon thereafter as is possible. In the absence of an agreement for an equitable adjustment, the City of Worcester shall unilaterally determine the costs attributable to the change and provide the CM with a written notice to that effect. The CM may appeal the decision of the City of Worcester within thirty days of receipt of said notice, to the commissioner of the City of Worcester or his designee, and the CM shall have the right to such further appeal as is provided in M.G.L. c.30, s. 39Q set forth in Section 4.D of this Article VII. However, if the CM shall exercise its rights to

appeal the decision of the City of Worcester as aforesaid, the CM shall be required to engage in the mandatory mediation procedures set forth in Section 5 of this Article VII.

G. During the negotiation of an equitable adjustment in the Contract Price, the CM shall, if requested, provide the City of Worcester with all cost, pricing data and any other information or documentation used by it in computing the amount of the equitable adjustment, and the CM shall certify that the pricing data used was accurate, complete, current and reasonable. If the City of Worcester subsequently determines that the data submitted by the CM was incomplete, incorrect, not current, or unreasonable, the City of Worcester may exclude such data from consideration under the equitable adjustment request.

H. Whenever the Construction Manager is entitled or believes it is entitled to a Change Order adjusting the Contract Price, the Construction Manager shall maintain separate accounts (by job order or other suitable accounting procedure) of all costs incurred and attributable to such work. The Construction Manager shall maintain a computerized accounting system, acceptable to the City of Worcester, in which current information as to the status of all such work is maintained. The Construction Manager shall maintain such contemporaneous records as are necessary to provide a clear distinction between the costs of all Change Order Work and proposed Change Order Work, and the costs of other Work.

I. Notwithstanding any provisions in the Contract Documents to the contrary, no additional General Conditions Cost shall be due for any Change Order or portion of a Change Order resulting from or attributable to:

(1) Increases in the cost of Allowance items;

(2) Substitutions of equipment or materials which are functionally similar to equipment or materials specified in the Contract Documents; or

(3) Sales and use taxes.

2. Methods of Computing Equitable Adjustments

A. Equitable adjustments in the Contract Price shall be determined according to one of the following methods, or a combination thereof, as determined by the City of Worcester:

(1) fixed price basis, provided that the fixed price shall be inclusive of items (a) through (e) below and shall be computed in accordance with those provisions;

(2) estimated lump sum basis to be adjusted in accordance with Contract unit prices or other agreed upon unit prices provided that the unit prices shall be inclusive of all costs related to such equitable adjustment;

(3) time and materials basis to be subsequently adjusted on the basis of actual costs (but subject to a predetermined "not to exceed limit") calculated as follows:

a) the direct cost (or credit) for labor at the minimum wage rates established for this Contract pursuant to M.G.L. c. 149, s 26-27H, and the direct cost for material and use of equipment;
b) plus (or minus) the cost of Workmen's Compensation Insurance, Liability Insurance, Federal Social Security and Massachusetts Unemployment Compensation, or as an alternative the CM may elect to use a flat 30% of the total labor rate computed in accordance with subsection (a) above,
c) plus an allowance equal to 20% of the amount of (a) above for General Conditions, overhead, superintendence, fee, and profit; (5% of the allowance shall be paid to the CM and the Subcontractor shall be paid 15% of the Allowance).
d) plus (or minus) the actual direct additional premium costs and expenses incurred as a result of collective bargaining agreements or other agreements between organized labor and employers, and plus (or minus) the actual direct premium cost of payment and performance bonds required of CM and Trade Subcontractors for this Contract.

B. If the net change is an addition to the Contract Price, it shall include the CM's overhead, superintendence and profit. On any change that involves a net credit, no allowance for overhead, superintendence and profits shall be included. For any change that does not include labor performed or materials installed in the project, there will be no markup for the CM's or Subcontractor's overhead, superintendence, and profit, even though there may be a net increase in the Contract Price. Charges for small tools known as "tools of the trade" are not to be computed in the amount of any change in the Contract Price.

C. Adjustments in Subcontractors made under the provisions of the Procedure for Award of Subcontracts shall not be considered Change Orders and shall not entitle the CM to any adjustments for overhead, profit, and superintendence, although the City of Worcester may require that such Contract adjustments be processed on standard Change Order and equitable adjustment forms.

3. Work Performed under Protest

The CM agrees to perform all Work as directed by the City of Worcester, and if the the City of Worcester determines that certain Work that the CM believes to be or to warrant a Change Order under this Article does not represent a change in the Work, the CM shall perform said Work. The CM shall be deemed to have concurred with the the City of Worcester's determination as aforesaid unless the

CM shall perform Work under protest in compliance with the following sub-sections (A) and (B) below:

A. If the CM claims compensation for a change in the Work that is not deemed by the the City of Worcester to be a change or to warrant additional compensation as claimed by the CM, the CM shall on or before the first working day following the commencement of any such work or the sustaining of any such damage submit to the City of Worcester a written statement of the nature of such work or claim. The CM shall not be entitled to additional compensation for any work performed or damage sustained for which written notice is not

given within the time limit specified in the preceding sentence, even though similar in character to work or damage with respect to which notice is timely given.

B. On or before the second working day after the commencement of such work or the sustaining of such damage, and daily thereafter, the CM shall file to the extent possible with the Resident Engineer, the Designer, and the City of Worcester, itemized statements of the details and costs of such work performed, or damage sustained. The CM shall use the City of Worcester Daily Time and Materials Report found in the City of Worcester Form 13 to record all labor and material used. If the CM shall fail to make such statements to the extent possible, then the CM shall not be entitled to additional compensation for any such work or damages.

4. False Claims, Statutory Provisions Regarding Changes

A. Criminal Penalties: The CM's attention is directed to M.G.L. c. 30, s. 39I which provides criminal penalties for unauthorized deviations from the Plans and Specifications, and to M.G.L. c. 30, s. 39J and M.G.L. c. 7, s. 42E-42I. The CM's attention is also directed to M.G.L. 266, s. 67B which provides criminal penalties for false claims by Contractor under this Contract:

"Whoever makes or presents to any employee, department, agency or public instrumentality of the commonwealth, or of any political subdivision thereof, any claim upon or against any department, agency, or public instrumentality of the commonwealth, or any political subdivision thereof, knowing such claim to be false, fictitious, or fraudulent, shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than five years, or in the house of correction for not more than two and one-half years, or both."

B. Differing Site Conditions (M.G.L. c. 30, s. 39N):

"If, during the progress of the work, the contractor or the Awarding Authority discovers that the actual subsurface or latent physical conditions encountered at the Site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing Site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."

C. Timely Decision By the City of Worcester(M.G.L. c. 30, s. 39P): "Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the Awarding Authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the Awarding Authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."

D. Change Order / Contract Interpretation Appeal Procedure (M.G.L. c. 30, s. 39Q): The following provisions apply to every contract awarded by any state agency as defined by M.G.L. c. 7, s. 39A for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section 39A:

(1) "(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(2) "(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefore and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his/her designee shall be final and conclusive unless an appeal is taken as provided below.

(3) "(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subsection, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one-day

period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, s/he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one-hundred-and-twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(4) "(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subsection shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subsection. The hearing officer's decision shall be final and conclusive and shall not be set aside except in cases of fraud."

5. Mandatory Mediation

In the case of every dispute where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is $50,000 or more and the CM appeals the decision of the chief executive officer of the City of Worcester or his designee described in Section 4.B above, the City of Worcester and the CM shall engage in good faith in a non-binding mediation process, which process shall be concluded within sixty days from the date that the CM files an appeal from said decision as provided in Section 4.B above. In the case of such disputes where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is $500,000 or more, the parties shall, if the mediation process fails, submit the dispute to a third-party Neutral or Dispute Review Board which shall within sixty days render a non-binding advisory opinion. Unless the parties have previously agreed in writing to a process for submitting disputes to mediation or a Dispute Review Board, the City of Worcester shall determine in its reasonable discretion the procedures to be followed and shall give the CM notice of the same in writing within 7 days of the date that the City of Worcester receives notice of the CM's appeal from the decision of the chief executive officer of the City of Worcester or his designee. The cost of the services of any mediator selected by one party to this Contract shall be borne by the party making the selection. The cost of the services of any mediator selected jointly by the parties to this Contract or jointly by mediators selected by the parties to this Contract shall be borne equally by the CM and the City of Worcester.

ARTICLE VIII - PAYMENT PROVISIONS

1. Schedule of Values

Before submission of the first request for payment under this Contract, the CM shall submit to the City of Worcester a schedule of values for its approval, which shall include all preconstruction activities as well as all construction activities and shall be in sufficient detail to reflect the various preconstruction activities and the major components of each construction trade (with relevant Subcontractors as well as MBE/WBEs noted), including quantities when requested, aggregating the GMP with detail for the Contingency and divided so as to facilitate payments for work under each section of the Specifications. The schedule shall be prepared in such form and supported by such data to substantiate its accuracy as the the City of Worcester may require. When Approved by the the City of Worcester, it shall constitute the Schedule of Values and shall be used only as a basis for the CM's requests for payments and credits, the first of which payments shall not be made until such Schedule of Values is approved by the City of Worcester.

2. Payment Liabilities of CM

A. The CM shall pay to the City of Worcester all expenses, losses and damages, as determined by the City of Worcester , incurred in consequence of any default, defect, omission or mistake of the CM or his employees or Subcontractors or the making good thereof.

B. If the Work (or a portion thereof) is not completed to Substantial Completion and the CM has not satisfied the requirements for the issuance of a Certificate of Agency Use and Occupancy in accordance with Article VI, Section 5 of these General Conditions, by the date specified in the Owner-CM Agreement, the CM shall pay to the Owner liquidated damages as provided in Article VI, Section 2 of these General Conditions of the Contract.

3. Retention of Moneys by the City of Worcester

A. The City of Worcester may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefor, to (1) the the City of Worcester 's expenditures for the CM's account, (2) to secure the City of Worcester's remedies against the CM for the CM's breach of its obligations under this Contract or the breach of any person performing any part of the Work and (3) the payment of any expenses, losses or damages incurred by the City of Worcester or any agency of the Commonwealth as a result of the failure of the CM to perform its obligations hereunder. the City of Worcester may retain, until all claims are settled, such moneys as the City of Worcester estimates to be the fair value of the City of Worcester's claims against the CM, and of all claims for labor performed or furnished and for materials used or employed in or in connection with the Work and for the rental of vehicles, appliances and equipment employed and for the employment of substitute contractors and labor in connection with the

Work filed in accordance with M.G.L. c. 30, s. 39A and s. 39F. the City of Worcester may make such settlements and apply thereto any moneys retained under this Contract.

B. The CM shall each week examine all claims so filed, and if the same are in any respect incorrect or do not correctly show the amount due from the CM to the claimant for such labor and materials, the CM shall forthwith file with the City of Worcester a separate written statement of all inaccuracies in each claim and of the correct amount due from the CM to each claimant therefor, and shall immediately file a statement of all payments thereafter made to such claimants. Each such statement shall be sworn to and contain a detailed breakdown required by M.G.L. c. 30 s. 39F(d) and (e). Unless such statements are so filed by the CM the amount shown by the claims filed shall at the option of the City of Worcester be conclusively deemed to be the accurate amount due from the CM therefor in all accounting with the City of Worcester. If the moneys retained under this Contract are insufficient to pay the sums found by the City of Worcester to be due under the claims for labor and materials filed as aforesaid, the City of Worcester may, at its discretion, pay the same, and the CM shall repay to the City of Worcester all sums paid out. the City of Worcester may also at its discretion use any moneys retained, due or to become due under this Contract, for the purpose of paying for both labor and materials used or employed in the Work for which claims have not been filed with the City of Worcester.

C. No moneys retained under the provisions of this Article shall be held to be statutory security for the payment of claims filed in accordance with the provisions of M.G.L. c. 149, s. 29, as amended, for which security is provided by bond.

4. Applications for Payment

A. The CM shall, once in each month on the day of the month corresponding to the day of the month specified in the Notice to Proceed referenced in Article 2 of the Owner - CM Agreement, on forms provided and in the manner prescribed by the Awarding Authority, submit to the Awarding Authority a statement showing the total amount of Work done to the time of such estimate and the value thereof as approved by the Resident Engineer and the Designer. It shall be the sole responsibility of the CM to deliver or cause to be delivered to the Resident Engineer (the "designee" as provided by M.G.L. c. 30, s. 39K), said periodic estimate in proper form, approved as provided above and arithmetically correct. All periodic estimates shall contain such certifications and other evidence supporting the CM's right to payment as the Awarding Authority may require, including without limitation, lien waivers and other evidence, on such forms as the Awarding Authority may require, establishing that title to the equipment or materials is unencumbered and has been transferred to the Owner. If there is no Resident Engineer assigned to the Contract, the Designer shall be the designee. If there is neither a Resident Engineer nor a Designer, the designee shall be a person designated by the Awarding Authority at the project field office or alternatively the home office of the Awarding Authority. The CM shall include in such periodic estimate only such materials as are incorporated in the Work, except as provided in section C below. The Awarding Authority shall retain five percent of such estimated value as part security for the completion of the Work and shall pay to the CM while carrying on the Work the balance not retained as aforesaid, subject to the Approval of the Awarding Authority after

deducting therefrom all previous payments and all sums to be kept under the provisions of this Contract.

B. Each periodic estimate shall constitute the CM's representation that (1) the payment then requested to be disbursed has been incurred by the CM on account of the Work and is justly due to Subcontractors or, to the CM in the case of other Work performed by the CM on account thereof, (2) the materials, supplies and equipment for which Application for Payment is being submitted have been installed or incorporated into the Work or have been stored at the Site or at such off Site storage locations as the Awarding Authority shall have Approved, (3) the materials, supplies and equipment are insured in accordance with the provisions of this Contract, (4) the materials, supplies and equipment are owned by the Owner and are not subject to any liens or encumbrances, (5) the Work which is the subject of such periodic estimate has been performed in accordance with the Contract Documents and (6) that all due and payable bills with respect to the Work have been paid to date or shall be paid from the proceeds of such periodic estimate. The CM's attention is directed to the criminal penalties for false claims referenced in section A above.

C. The CM may include in a periodic estimate the value of materials or equipment delivered at the Site (or at some location agreed to in writing) only upon delivery to the Awarding Authority of: (1) an acceptable transfer of title on the form provided by the Awarding Authority; (2) written certification by the CM (or applicable subcontractor) on the form provided by the Awarding Authority that the CM (or the Subcontractor which executed the transfer of title) is the lawful owner and that the materials or equipment are free from all encumbrances, accompanied by receipted invoices or other acceptable proof of prior payment for such materials; (3) a stored materials insurance binder that covers the materials for which payment is requested, that names the Owner as an insured party should the stored materials be subjected to any casualty, loss, or theft prior to their inclusion in the Work. The material(s) or equipment must, in the judgment of the Designer (1) meet the requirements of the Contract, including prior shop drawing, product data, and sample approval, (2) be ready for use, and (3) be properly stored by the CM and be adequately protected until incorporated into the Work. See also Article V.5.C of these General Conditions of the Contract concerning the cost of inspections.

D. The Awarding Authority may make changes in any periodic estimate submitted by the CM in accordance with M.G.L. c.30, s. 39K (see below) and the payment due shall be computed in accordance with the changes so made. The provisions of said section 39K shall govern payments on which the Awarding Authority has made changes.

E. No certificate for payment and no progress payment shall constitute acceptance of Work that is not in accordance with the Contract Documents.

F. The CM and all Subcontractors furnishing labor on this Contract agree to furnish certified payroll reports if requested to do so, at no additional expense to the Awarding Authority. The Awarding Authority may at all reasonable times audit such reports.

5. Periodic Payments (M.G.L. c. 30, s. 39K)

The Awarding Authority shall make payment to the CM in accordance with M.G.L. c. 30, s. 39K, which provides as follows:

"Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the Contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days(twenty-four days in the case of the commonwealth) after receipt of such period estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the change so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of

receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and column listing the amount paid to each filed subcontractor as of the date of the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149."

6. Payment of Subcontractors (M.G.L. c. 30, s. 39F)

The CM shall make payments to Subcontractors in accordance with M.G.L c.30, s. 39F which is quoted in this section below. For the purposes of this Contract, the word "forthwith" appearing in section (1)(a) of the quoted provision shall be deemed to mean "within five (5) business days."

"1 (a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general Contractor shall pay to each subcontractor the amount paid for the

labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the Plans and Specifications, the entire balance due under the subcontract less amounts retained by the City of Worcester as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the Awarding Authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the Awarding Authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(c) Each payment made by the Awarding Authority to the general contractor pursuant to subsections (a) and (b) of this section for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the Awarding Authority shall take reasonable steps to compel the general contractor to make each such payment to each subcontractor. If the Awarding Authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subsections (1) and (2) the Awarding Authority shall act upon the demand as provided in this section.

(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the Awarding Authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the Awarding Authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the Awarding Authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the Awarding Authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement to or sent by certified mail to the Awarding Authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.

(e) Within fifteen days after receipt of the demand by the Awarding Authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the Awarding Authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the Awarding Authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided that the Awarding Authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subsection (d). The Awarding Authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deduction from direct payments made as provided in parts (i) and (ii) of this subsection.

(f) The Awarding Authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subsection (5) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the Awarding Authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subsection (6) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the General contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the Awarding Authority to the general contractor to the extent of such payment.

(h) The Awarding Authority shall deduct from payments to a General contractor amounts which, together with the deposits in interest bearing accounts pursuant to subsection (6) are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subsection (1) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subsection (1), the subcontractor may demand direct payment by following the procedure in subsection (4) and the general contractor may file a sworn reply as provided in that same subsection. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment

shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the Awarding Authority shall proceed as provided in subsection (e), (f), (g) and (h)."

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the Awarding Authority, or which are on deposit pursuant to subsection (6) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) “subcontractor" as used in this section (I) for contracts awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and received a subcontract as a result of that filed sub-bid or who is approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in section (1) of section thirty-nine M of chapter thirty shall mean a person approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the demand for direct payment deposit as provided in subsection (6) by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subsection (6) by a petition in equity in the superior court against the Awarding Authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this section. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general Contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general

contractor are available for direct payment shall have a right to file a petition in court of equity against the Awarding Authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the Awarding Authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subsection (5) and in subsection (6).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the Awarding Authority as provided in part (iii) of subsection (5) and in subsection (6) any amount held under a trustee writ or pursuant to a restraining order or injunction."

7. Final Payment; Release of Claims by CM

Upon Final Acceptance of the Work the CM shall be entitled to payment of the balance of the Contract Price. Final payment shall be as provided in this Article above and in accordance with any process set forth in the Contract Documents. The CM agrees to execute a Certificate of Final Inspection, Release (with CM's own exceptions listed thereon) and Acceptance as a condition precedent to Final Payment. The acceptance by the CM of the Final Payment made as aforesaid, or the execution of the Certificate of Final Acceptance by the CM, shall constitute a release of the Owner, the City of Worcester, the Designer, and every member and agent of any of them, from all claims of and liability to the CM for anything done or furnished for or relating to the Work, or for any act or neglect of the Owner, the Designer, or of any person relating to or affecting the Work, except the claim against the Owner or the Designer for the remainder, if any there be, of the amounts set forth by the CM in the Certificate of Final Inspection, Release and Acceptance. Final Acceptance shall not relieve CM of the requirements of Articles IX, XIV, and XV of these General Conditions of the Contract, or of other provisions of this Contract, to the extent that the same are intended to survive Final Acceptance.

ARTICLE IX - GUARANTEES AND WARRANTIES

1. General Warranty

If at any time during the period of one (1) year from the date of the issuance of the Certificate of Agency Use and Occupancy by the City of Worcester or the date of Final Acceptance, whichever occurs first, any part of such Work shall in the reasonable opinion of the City of Worcester be defective or require replacing or repairing, or damage to other property of the Owner is caused by any defect in the Work, the City of Worcester shall notify the CM in writing to make the required repairs or replacements and repair such damage. If the CM shall neglect to commence such repairs or replacements to the satisfaction to the City of Worcester within ten (10) days from the date of the giving of such notice, then the City of Worcester may employ other persons to make the same. The CM agrees, upon demand, to pay to the City of Worcester all amounts which it expends for such repairs, replacements, and/or damages. During this one-year guarantee period any corrective work shall be performed under all the applicable terms of this Contract, and if Change Orders are issued in accordance with the terms of this Contract, the CM shall be entitled to compensation for special insurance, as required. This one-year guarantee shall not limit any express guaranty or warranty provided elsewhere in the Contract.

2. Special Guarantees and Warranties

A. The CM's obligation to correct Work as set forth in section 1 above is in addition to, and not in substitution of, such guarantees or warranties as may be required in the various sections of the Specifications.

B. Guarantees and warranties required in the various sections of the Specifications must be delivered to the Designer before final payment to the CM may be made, or in the case of guarantees and warranties which originate with a subcontractor 's section of the Work, before final payment for the amount of that subtrade or for the phase of Work to which the guarantee or warranty relates.

C. The failure to deliver a required guarantee or warranty shall constitute a failure to fully complete the Work in accordance with the Contract Documents.

ARTICLE X - MISCELLANEOUS LEGAL REQUIREMENTS

1. CM to be Informed

The CM shall inform itself of all existing and future Laws in any manner affecting those engaged or employed in the Work, or the materials used or employed in the Work, or in a any way affecting the conduct of the Work, and of all orders and decrees of bodies or tribunals having any applicable jurisdiction or authority over the Work.

2. Compliance with all Laws

The CM shall cause all persons employed in the performance of the Work to comply with, all existing and future Laws, including but not limited to those set forth below:

A. **Corporate Disclosures.** The CM, if a foreign corporation, shall comply with M.G.L. c. 181, s.3 and s. 5, and M.G.L. c. 30, s.39L.

B. **Veterans Preference.** In the employment of mechanics and apprentices, teamsters, chauffeurs, and laborers in the performance of Work in the Commonwealth, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment and who are veterans as defined M.G.L. c.4, s.7 (34), and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States.

C. **Prevailing Wages.** The CM shall comply with M.G.L. c. 149, s. 26- 27H. The prevailing wage schedule is found in Section 7 – CSI Division 000800 of the General Conditions, listing the prevailing minimum wage rates that must be paid to all workers employed in the Work. the City of Worcester is not responsible for any errors, omissions, or misprints in the said schedule. Such Schedule shall continue to be the minimum rate wages payable to workers employed in the Work throughout the term of this Contract, subject to the exceptions provided in M.G.L c.149, s. 26-27H. The CM shall not have any claim for extra compensation from the Owner if the actual wages paid to workers employed in the Work exceeds the rates listed on the schedule or as otherwise provided by law. The CM shall cause a copy of said Schedule to be kept in a conspicuous place at the Site during the term of the Contract. If reserve police officers are employed by the CM, they shall be paid the prevailing wage of regular police officers. (See M.G.L c.149, s.34B).

D. **Payroll Records and Statement of Compliance.** The CM shall comply and shall cause its Subcontractors to comply with Massachusetts General Law c. 149, s. 27B, which requires that a true and accurate record be kept of all persons employed on the a project for which the prevailing wage rates have been provided. The CM and all Subcontractors shall keep these records and preserve them for a period of three years from the date of completion of the Contract. Such records shall be open to inspection by any authorized representative of the Owner at any reasonable time, and as often as may be necessary. The CM shall, and

shall cause its Subcontractors to, submit weekly copies of their weekly payroll records to the City of Worcester. In addition, the CM and each Subcontractor shall furnish to the Executive Department of Labor within fifteen days after completion of its portion of the Work a signed statement in the form required by the City of Worcester.

E. **Vehicle operators.** If the Director of the Department of Labor and Workforce Development has established a Schedule of wage rates to be paid to the operators of trucks, vehicles or equipment for the Work, the CM shall be obligated to pay such operators at least the minimum wage rate contained on such Schedule. (See M.G.L. c.149, s.26-27H).

F. **Eight Hour Day.** The CM shall comply with M.G.L. c. 149, s. 30, 34 and 34A which provide that no laborer, workman, mechanic, foreman or inspector working within the Commonwealth in the employ of the CM, subcontractor or other person doing or contracting to do the whole or part of the Work shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of extraordinary emergency.

G. **Timely Payment of Wages.** The CM shall comply with, and shall cause its Subcontractors to comply with M.G.L. c. 149, s. 148 which requires the weekly or biweekly payment of employees within six days of the end of the pay period during which wages were earned if employed for five or six days of a calendar week, and within other periods of time under certain circumstances as set forth therein.

H. **Lodging, etc.** The CM shall comply with, and shall cause its Subcontractors to comply with, M.G.L. c. 149, s. 25 which provides that every employee under this Contract shall lodge, board and trade where and with whom he elects, and neither the CM nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board or trade at a particular place or with a particular person.

I. **Truck Rates.** The use by the CM of trucks or other motor vehicles hired from either common or contract motor carriers in the course of performance of this Contract is subject to such minimum rates and charges, and rules and regulations as may from time to time be promulgated by the Department of Public Utilities of the Commonwealth of Massachusetts or other agency of the State of Federal government which may be authorized by law to set rates or otherwise regulate the use of such vehicles. The CM expressly assumes the risk of any additional expense that may arise by reason of any change in such minimum rates and charges, and rules and regulations, and shall be entitled to no additional compensation or reimbursement by reason thereof.

J. **Anti-Boycott Covenant (Executive Order #130).** The CM warrants, represents and agrees that during the time this Contract is in effect, neither it or any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b) (3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by M.G.L. c. 151E, s. 2. If there shall be a breach in the warranty, representation or agreement contained in this section, then without limiting such other rights as it may have the Awarding Authority shall be entitled to rescind this contract.

As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the CM or by a person or persons or business entity or entities directly or indirectly owning at least 51% of the Ownership interests of the CM; or which directly or indirectly owns at least 51% of the Ownership interests of the CM.

K. **CM's Agreements with Suppliers-Anti-Boycott Provisions.** (1)The CM shall not purchase or rent any materials, equipment, machinery, vehicles, or supplies for or in connection with the Work from any person or entity who does not sign, under pains and penalties of perjury, a certificate that recites: "The undersigned warrants, represents and agrees that during the time its agreement with {insert CM's name} is in effect for materials, supplies or equipment to be used in connection with the {insert the name of the Awarding Authority} Project No. {insert project number}, neither the undersigned or any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b)(3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws. As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the undersigned or by a person or persons or business entity or entities directly or indirectly owning at least 51% of the ownership interests of the undersigned; or which directly or indirectly owns at least 51% of the ownership interests of the undersigned."

(1) The Awarding Authority shall not be obligated to pay the CM for the cost of any materials, supplies, or equipment purchased or rented from any individual or entity from whom the CM has not previously obtained and delivered to the Awarding Authority the certificate that the previous section requires. The CM will immediately terminate its contract with any supplier who breaches the warranty, representation and agreement contained in the previous section.

(2) The CM shall include in the CM's agreement with any person or entity from whom the CM intends to purchase or rent any materials, equipment, machinery, vehicles or supplies for or in connection with the Work, (a) a notice that this Contract obligates the CM to terminate the supply contract upon discovery of such breach of the sworn certificate delivered under subsection (1) and such termination shall be without liability to the CM or the Awarding Authority and (b) a provision which states: "The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of the undersigned vendor which pertain to the performance and requirements of this agreement to provide materials of any nature to the undersigned Contractor [CM} in connection with State Project No. (insert project number)."

L. Access to CM’s Records (Executive Order #195). The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and

other compilations of data of the CM which pertain to the performance and requirements of this Contract.

ARTICLE XI
CM'S ACCOUNTING METHOD REQUIREMENTS (M.G.L. c. 30, s. 39R)

1. Definitions

The words defined herein shall have the meaning stated below whenever they appear in this Article XI:

Contractor means the CM.

Contract means any Contract awarded, which is for an amount or estimated amount greater than one hundred thousand dollars.

Independent Certified Public Accountant means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with aspect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the City of Worcester.

Records means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

Audit, when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons, or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

2. Record Keeping

A. The Contractor shall make, and keep for at least six years after final payment, books, records, and accounts that in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.

B. Until the expiration of six years after final payment, the Inspector General, the City of Worcester, and the City of Worcester shall have the right to examine any books, documents, papers or records of the Contractor and Subcontractors that directly pertain to and involve transactions relating to the Contractor and Subcontractors. Any request for a change in the provisions of this Contract submitted by the CM must be made in writing

and in accordance with the provisions of this Contract, including the procedures of the City of Worcester.

C. The Contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the City of Worcester including the date of the change and reasons therefor and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes.

D. The Contractor represents that it has, prior to the execution of the Contract, filed a statement of management on internal accounting controls as set forth in Section 3 below.

E. The Contractor represents that it has, prior to the execution of the Contract, filed an audited financial statement for the most recent completed fiscal year as set forth in section 4 below and will continue to file such statement annually during the term of the Contract.

3. Statement of Management Controls

A. The Contractor shall file with the City of Worcester a statement of management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization,

(2) transactions are recorded as necessary to:

(a) to permit preparation of financial statements in conformity with generally accepted accounting principles, and

(b) to maintain accountability for assets.

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

B. The Contractor shall file with the City of Worcester a statement prepared and signed by an independent certified public accountant, stating that the accountant has examined the statement of management on internal accounting controls, and expressing an opinion as to:

(1) whether the representations of management in response to subsection 3 above are consistent with the results of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statement.

4. Annual Financial Statement

A. Every Contractor awarded a contract shall annually file with the City of Worcester during the term of the Contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report.

B. The office of Inspector General and the City of Worcester shall have the right to enforce the provisions of this Article. A Contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to M.G.L. c. 149, s. 44C.

5. Bid Pricing Materials

The Contractor shall save the written calculations, pricing information, and other data that the Contractor used to calculate the bid that induced the City of Worcester to enter into this Contract (the "Bid Pricing Materials") for at least six years after the City of Worcester makes final payment under this Contract.

ARTICLE XII - EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

This Contract includes all provisions of the City of Worcester's "Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program" appearing in Appendix A to these General Conditions of the Contract attached hereto and incorporated herein by reference.

ARTICLE XIII
GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES (EXECUTIVE ORDER 390)

This Contract includes all provisions of the City of Worcester's program relating to Goals for Participation by Minority Business Enterprises and Women Business Enterprises attached appearing in Appendix B to these General Conditions of the Contract attached hereto and incorporated herein by reference.

ARTICLE XIV - INSURANCE REQUIREMENTS

1. Insurance Generally

A. The CM shall take out and maintain the insurance coverages listed in this Article with respect to the operations as well as the completed operations of this Contract. This insurance shall be provided at the CM's expense and shall be in full force and effect for the full term of the Contract or for such longer period as this Article requires.

B. All policies shall be written on an occurrence basis and be issued by companies authorized to write that type of insurance under the laws of the Commonwealth and rated in Best's Insurance Guide (or any successor thereto or replacement thereof) as having a general policy holder rating of "A" or better and a financial rating of at least "9" or otherwise acceptable to the City of Worcester.

C. CM shall submit three originals of each certificate of insurance, acceptable to the City of Worcester, simultaneously with the execution of this Contract. Certificates shall show the City of Worcester and the Owner as an additional insured as to all policies of liability insurance and shall state that CM has paid all premiums and that none of the coverages shall be cancelled, terminated, or materially modified unless and until 30 days prior notice is given in writing to the City of Worcester. Contractor shall submit updated certificates prior to the expiration of any of the policies referenced in the certificates so that the City of Worcester shall at all times possess certificates indicating current coverage. Certificates shall indicate that the contractual liability coverage, and Contractor's Protective Liability coverage is in force. Certificates shall include specific acknowledgment that the following coverages are included in the policies:

- Contractual liability
- Contractor’s protective
- Owner as additional insured by form CG2010 (11/85 ed.) to the general liability
- Owner as additional insured to automobile liability, umbrella liability, and pollution liability
- General Liability is endorsed with CG2404, Waiver of Subrogation, in favor of the Owner
- Builder’s Risk or Installation Floater includes Owner, CM and subcontractors of any tier as named insureds. Builder’s Risk or Installation Floater is on an All Risk basis including earthquake and flood.

D. The CM shall file one certified copy of all policies with the City of Worcester within sixty days after Contract award. If the City of Worcester or the Owner is damaged by the CM's failure to maintain such insurance and to comply with the terms of this Article, then the CM shall be responsible for all costs and damages to the Owner attributable thereto.

E. Termination, cancellation, or material modification of any insurance required by this Contract, whether by the insurer or the insured, shall not be valid unless written notice

thereof is given to the City of Worcester at least thirty days prior to the effective date thereof, which shall be expressed in said notice

2. CM's Commercial General Liability

A. The CM shall provide the following minimum general liability coverage with respect to the operations performed by CM and any employee, subcontractor, or supplier, unless a higher coverage is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the additional coverage:

Bodily Injury	$1,000,000 each occurrence
Property Damage	$2,000,000 general aggregate, per project
Products & Completed Operations	$1,000,000 annual aggregate
Personal & Advertising Injury	$1,000,000 each occurrence
Medical Expenses	$10,000
Fire Damage Liability	$100,000

B. This policy shall include coverage relating to explosion, collapse, and underground property damage.

C. This policy shall include contractual liability coverage.

D. The completed operations coverage shall be maintained for a period of three (3) years after Substantial Completion.

E. If the Work includes work to be performed within 50 feet of a railroad, any exclusion for liability assumed under contract for work within 50 feet of a railroad shall be deleted.

F. This policy shall include endorsement CG2010 (10/85 edition), *Owner as Additional Insured* and CG2404 (11/85 edition) *Waiver of Subrogation in Favor of Owner.*

3. Vehicle Liability

A. The CM shall provide the following minimum coverage with respect to the operations of any employee, including coverage for owned, non-owned, and hired vehicles, unless a

higher coverage is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the additional coverage:

B. Combined Single Limit $1,000,000

C. The policy shall include a CA9948 Pollution Endorsement and shall name the Owner as an Additional Insured.

4. 4. Pollution Liability

The CM shall provide coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. the City of Worcester and the Owner shall be named as an additional insured and coverage must be on an occurrence basis. The amount of coverage shall be $1,000,000 per occurrence and $3,000,000 in the aggregate unless a higher amount is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the additional coverage.

5. Worker's Compensation

A. The CM shall provide the following coverage in accordance with M.G.L. c.149 §34A and c.152 as amended, unless a higher coverage is specified in Exhibit B to the Owner-CM Agreement, in which case the CM shall provide the higher coverage:

Worker's Compensation
Part One: Provide Statutory Minimum
Employer's Liability — $ 500,000 each accident
Part Two: $ 500,000 disease per employee
$500,000 disease policy aggregate

B. If specified in Exhibit A to the Owner-CM Agreement the policy must be endorsed to cover United States Longshoremen & Harborworkers Act (USLHW), Maritime Liability for $1,000,000/$1,000,000, or Federal Employer's Liability Act liability.

6. Builder's Risk/Installation Floater/Stored Materials

A. The CM shall provide coverage against loss or damage on all Work included in this Contract in an amount equal to the GMP. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood Zone), windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and CM's services

and expenses required as a result of such insured loss. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required below.

B. When Work will be completed on existing buildings owned by the Owner, the CM shall provide an installation floater, in the full amount of the Contract Price. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood Zone), windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's, Program Manager's and CM's services and expenses required as a result of such insured loss. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required below.

C. The CM shall maintain insurance on delivered and/or stored material designated to be incorporated in the Work against fire, theft or other hazards. Any loss or damage of whatever nature to such material while stored at some approved off Site location shall be forthwith replaced by the CM at no expense to the City of Worcester.

D. The policy or policies shall specifically state they are for the benefit of and payable to the City of Worcester, the CM, subcontractors and all persons furnishing labor or labor and materials for the Contract Work, as their interests may appear. The policy or policies shall list the City of Worcester, the CM, and Subcontractors of any tier as named insureds.

E. Coverage shall include any costs for work performed by the Designer or any consultant as the result of a loss experienced during the term of this Contract.

F. Coverage shall include temporary occupancy and waiver of subrogation.

7. Umbrella Coverage

The CM shall provide Umbrella Coverage in form at least as broad as primary coverages required by Sections 2, 3 and 5 of this Article in the following amount unless a higher amount is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the higher amount:

Umbrella Coverage	GMP Amount
Under $1,000,000	$ 2,000,000
$1,000,000 -- $5,000,000	$ 5,000,000
$5,000,001-- $10,000,000	$ 10,000,000
$10,000,001 and over	$ 25,000,000

8. Additional types of Insurance and Deductibles

The CM shall provide such other types of insurance as may be required by Exhibit A to the Owner-CM Agreement. If the policies required herein contain deductible amounts, the CM

shall be responsible for such deductible amounts, unless the City of Worcester specifically provides a written waiver to the CM.

ARTICLE XV - INDEMNIFICATION

1. Generally

To the fullest extent permitted by law, the CM shall indemnify, defend (with counsel subject to the supervision of the Attorney General of the Commonwealth of Massachusetts as required by M.G.L. c. 12, s. 3) and hold harmless the City of Worcester and their officers, agents, divisions, agencies, employees, representatives, successors and assigns from and against all claims, damages, losses and expenses, including but not limited to court costs and attorneys' fees, arising out of or resulting from the performance of the Work, including but not limited to those arising or resulting from:

- labor performed or furnished and/or materials used or employed in the performance of the Work;
- violations by CM, any Subcontractor, or by any person directly or indirectly employed or used by any of them in the performance of the Work or anyone for whose acts any of them may be liable (CM, subcontractor and all such persons herein collectively called "CM's Personnel") of any Laws;
- violations of any provision of this Contract by CM or its subcontractors, suppliers or any other person or firm providing labor and/or materials for the work.;
- injuries to any persons or damage to any property in connection with the Work; or
- any act, omission, or neglect of CM's Personnel.

The CM shall be obligated as provided above, regardless of whether or not such claims, damages, losses and/or expenses, are caused in whole or in part by the actions or inactions of a party indemnified hereunder. In any and all claims by CM's Personnel against parties indemnified hereunder, the CM's indemnification obligation set forth above shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CM or any subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Article XV.

2. Designer's Actions

The obligations of the CM under Section 1 above shall not extend to the liability of the Designer, its agents or employees, arising out of (i) the preparation or approval of maps, Drawings, opinions, reports, surveys Change Orders, designs or Specifications, or (ii) the giving of or the failure to give directions or instructions by the Designer, its agents to employees provided such giving or failure to give is the primary cause of the injury or damage.

3. Survival

The provisions of this Article XV are intended to survive Final Acceptance and/or any termination of this Contract.

ARTICLE XVI - PERFORMANCE AND PAYMENT BONDS

1. CM Bonds

A. The CM shall provide performance and payment (labor and materials) bonds in the form provided by the City of Worcester, executed by a surety licensed by the Commonwealth of Massachusetts Division of Insurance. Each such bond shall be in the amount of the GMP.

B. If at any time prior to final payment to the CM, the Surety:

- is adjudged bankrupt or has made a general assignment for the benefit of its creditors;
- has liquidated all assets and/or has made a general assignment for the benefit of its creditors;
- is placed in receivership;
- otherwise petitions a state or federal court for protection from its creditors; or
- allows its license to do business in Massachusetts to lapse or be revoked;
- then the CM shall, within 21 days of any such action listed above, provide the City of Worcester with new performance and payment bonds as described in Section A above. Such bonds shall be provided solely at the CM's expense.

2. Subcontractor Bonds

A. If the CM provided in its Guaranteed Maximum Price or other Proposal. that any or all subcontractors shall provide the CM with payment and performance bonds for the full amount of their respective Subcontracts, then the costs for said bonds shall be the responsibility of the CM. Irrespective of whether the CM requests payment and performance bonds from their respective Subcontractors, the CM understands that if the Subcontractor defaults or is terminated, the CM shall have full responsibility for all costs and expenses related to said default or termination.

B. If the CM provided in its General Bid that Subcontractors shall provide bonds, and subsequently waives the requirement, the CM shall give the City of Worcester a written certification that the CM understands that if the Subcontractor defaults or is terminated, the CM shall have full responsibility for all costs and expenses related to said default or termination.

ARTICLE XVII - TERMINATION OF CONTRACT

1. Termination for Cause

A. The City of Worcester may without prejudice to any other right or remedy deem this Contract terminated for cause if any of the following defaults shall occur and not be cured within three (3) days after the giving of written notice thereof by the City of Worcester to the CM and any surety that has given bonds in connection with this Contract:

(1) The CM has filed a petition, or a petition has been filed against the CM with its consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such a petition is filed against the CM without its consent and is not dismissed within sixty (60) days; or if the CM is generally not paying its debts as they become due; or if the CM becomes insolvent; or if the CM consents to the appointment of a receiver, trustee, liquidate, custodian or the like of the CM or of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days; or if the CM makes an assignment for the benefit of creditors;

(2) The CM refuses or fails, except in cases for which extension of time is provided under this Contract's express terms, to supply enough properly skilled workers or proper materials to perform its obligations under this Contract, or the City of Worcester has determined that the rate of progress required for the timely completion of the Work is not being met;

(3) The CM fails to make prompt payment to Subcontractors or for materials, equipment, or labor;

(4) All or a part of the Work has been abandoned;

(5) The CM has sublet or assigned all or any portion of the Work, the Contract, or claims thereunder, without the prior written consent of the Owner, except as expressly permitted in this Contract;

(6) The CM has failed to comply with Laws;

(7) The CM fails to maintain, or provide to the City of Worcester evidence of the insurance or bonds required by this Contract, or

(8) The CM has failed to perform the Work or any portion thereof as required by this Contract or has otherwise breached any material provision of this Contract.

B. The City of Worcester shall give the CM and any surety notice of such termination for cause, but the giving of notice of such termination shall not be a condition precedent or subsequent to the termination's effectiveness. In the event of such termination, and without limiting any other available remedies, the City of Worcester may, at its option:

(1) hold the CM and its sureties liable in damages for a breach of Contract;

(2) notify the CM to discontinue all work, or any part thereof, and the CM shall discontinue all work, or any part thereof, as the Owner may designate;

(3) complete the Work, or any part thereof, and charge the expense of completing the Work or part thereof, to the CM;

(4) require the surety or sureties to complete the Work and perform all of the CM's obligations under this Contract.

(5) take such other lawful action as is deemed by the City of Worcester to be in the best interest of the Commonwealth.

If the City of Worcester elects to complete all or any portion of the Work as specified in (3) above, it may take possession of all materials, equipment, tools, machinery, implements at or near the Site owned by the CM and finish the Work at the CM's expense by whatever means the City of Worcester may deem expedient; and the CM shall cooperate at its expense in the orderly transfer of the same to a new contractor or to the City of Worcester as directed by the City of Worcester. In such case the City of Worcester shall not make any further payments to the CM until the Work is completely finished. The Owner shall not be liable for any depreciation, loss or damage to said materials, machinery, implements or tools during said use and the CM shall be solely responsible for their removal from the Site after the Owner has no further use for them. Unless so removed within fifteen days after notice to the CM to do so, they may be sold at public auction, after publication of notice thereof at least twice in any newspaper published in the county where the Work is being performed, and the proceeds credited to the CM’s account; or they may, at the option of the City of Worcester, be stored at the CM’s expense subject to a lien for the storage charges.

C. Damages and expenses incurred under section B above shall include, but not be limited to, costs for the Designer's extra services required, in the opinion of the City of Worcester, to successfully inspect and administer the construction contract through final completion of the Work.

D. Expenses charged under section B above may be deducted and paid by the City of Worcester out of any moneys then due or to become due the CM under this Contract.

E. All sums damages, and expenses incurred by the Owner to complete the Work shall be charged to the CM. In case the damages and expenses charged are less than the sum that would have been payable under this Contract if the same had been completed by the CM, the CM shall be entitled to receive the difference. In case such expenses shall exceed the said sum, the CM shall pay the amount of the excess to the Owner.

2. Termination for Convenience

A. the City of Worcester may terminate this Contract for convenience even though the CM is not in default by giving notice to the CM specifying in said notice the date of termination.

B. In case of such termination without cause, the CM shall be paid: (1) all sums due and owing under this Contract through the date of termination, including any retainage withheld to the

date of termination, less any amount which the City of Worcester determines is necessary to correct or complete the Work performed to the date of termination; plus (2) a reasonable sum to cover the expenses which CM would not have incurred but for the early termination of the Contract, such as demobilization of the work force, restocking charges, termination fees payable to Subcontractors.

C. Lost profits shall not be payable. The payment provided in section B above shall be considered to fully compensate the CM for all claims and expenses and those of any consultants, Subcontractors, and suppliers, directly or indirectly attributable to the termination.

3. CM's Duties upon Termination for Convenience

Upon termination of this Contract for convenience as provided in Section 2 of this Article, the CM shall: (1) stop the Work; (2) stop placing orders and Subcontracts in connection with this Contract; (3) cancel all existing orders and Subcontracts; (4) surrender the Site to the City of Worcester in a safe condition; (5) transfer to the City of Worcester all materials, supplies, work in process, appliances, facilities, equipment and machinery of this Contract, and all plans, Drawings, Specifications and other information and documents used in connection with this Contract.

ARTICLE XVIII - MISCELLANEOUS PROVISIONS

1. No Assignment by CM

The CM shall not assign by power of attorney or otherwise, or sublet or subcontract, the Work or any part thereof, without the previous written consent of the City of Worcester and shall not, either legally or equitably, assign any of the moneys payable under this Contract, or CM's claims hereunder, unless with the like consent of the City of Worcester, whether said assignment is made before, at the time of, or after the execution of the Contract. The CM shall remain responsible for satisfactory performance of all Work sublet or assigned complying with all applicable requirements of the Contract. Consent of the City of Worcester shall not be deemed to constitute a representation or waiver of any right hereunder by the City of Worcester as to the qualifications or the responsibility of the CM or Subcontractor(s).

2. Non-Appropriation

The Commonwealth certifies that at the time of the execution of this Contract, sufficient appropriations exist and shall be encumbered to fund the Contract Price. Payments are subject to appropriation and shall be made only for work performed in accordance with the terms of this Contract. The CM shall not be obligated to perform, and shall not perform, work outside the scope of this Contract without an appropriate amendment to this Contract, and a sufficient appropriation(s) to support such additional work. The Commonwealth may immediately terminate or suspend this Contract in the event that the appropriation(s) funding this Contract is eliminated or reduced to an amount which will be insufficient to support anticipated future obligations under this Contract. Such termination shall be deemed a termination for convenience subject to the provisions of section 2 of Article XVII of this Contract.

3. Claims by Others Not Valid

No person other than the CM and the surety on any bond given pursuant to the terms of this Contract shall acquire any interest in this Contract or any claim against the City of Worcester hereunder, and no claim by any other person shall be valid except as provided in M.G.L. c. 30, s. 39F of the General Laws.

4. No Personal Liability of Public Officials

No public official, employee, or agent of the City of Worcester shall have any personal liability for the obligations of the City of Worcester set forth in this Contract.

5. Severability

The provisions of this Contract are severable, and if any of these provisions shall be held unconstitutional or unenforceable by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the other provisions of this Contract.

6. Choice of Laws

This Contract shall be governed by the laws of the Commonwealth of Massachusetts for all purposes, without regard to its laws on choice of law. All proceedings under this Contract or related to the Project shall be brought in the courts of the Commonwealth of Massachusetts.

7. Standard Forms

Unless directed otherwise in writing by the City of Worcester, CM shall use the standard forms in use by the Division of Capital Asset Management and Maintenance appearing in Appendix E to these General Conditions of the Contract.

8. No Waiver of Subsequent Breach

No waiver of any breach or obligation of this Contract shall constitute a waiver of any other or subsequent breach or obligation.

9. Remedies Cumulative

All remedies of the City of Worcester provided in this Contract shall be construed as cumulative and may be exercised simultaneously or in any order as determined by the City of Worcester in its sole discretion. the City of Worcester shall also be entitled as of right to specific performance and equitable relief including the right to an injunction against any breach of any of the provisions of this Contract

10. Notices

Notices to the CM shall be deemed given when hand delivered to the CM's temporary field office at or near the Site, or when deposited in the U.S. mail addressed to the CM at the CM's address specified in the Owner-CM Agreement, or when delivered by courier to either location. Unless otherwise specified in writing by the City of Worcester, notices and deliveries to the City of Worcester shall be effective only when delivered to the City of Worcester at the address specified in the Owner-CM Agreement and date-stamped at the reception desk or for which a receipt has been signed by the agent or employee designated by the City of Worcester to receive official notices.

END OF SECTION 002000

APPENDIX A

The following provisions form Article XII of the General Conditions of the Contract between the City of Worcester and the Construction Manager.

EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

1. Compliance Generally

For purpose of this Article, "minority" refers to Asians, Blacks, Western Hemisphere Hispanics, Native Americans, and Cape Verdeans; "Commission" refers to the Massachusetts Commission Against Discrimination. During the performance of this Contract, the Construction Manager and all of its Subcontractors (hereinafter collectively referred to as the Contractor) shall comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

2. Non-Discrimination and Affirmative Action

A. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, handicap, sexual orientation, or sex. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The Contractor shall comply with the provisions of M.G.L. c. 151B and all other applicable non-discrimination and equal opportunity laws.

B. The Contractor shall comply with the provisions of Executive Order No. 246 entitled Revoking and Superseding Executive Orders Numbers 143 and 150, with respect to affirmative action programs for handicapped individuals, which is herein incorporated by reference and made a part of this Contract.

C. In connection with the performance of the Work, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age, sexual orientation, or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, sexual orientation, or sex. The purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for future public construction projects.

D. If the Contractor shall use any subcontractor on any work performed under this Contract, the Contractor shall take affirmative steps to negotiate with qualified minority and women subcontractors. These affirmative steps shall cover both pre-bid and post-bid periods. It shall include notification to the State Office of Minority and Women Business Assistance or its designee, while bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids. In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this Contract relative to non-discrimination and affirmative action.

E. As part of its obligation of remedial action under this Article, the Contractor shall maintain on this project not less than the percent ratio set forth in Article 13 of the Owner – Construction Manager Agreement of minority employee worker hours to total worker hours in each job category including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in M.G. L. c. 149, s. 44F.

F. In the hiring of minority journeypersons, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the Commission, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the City of Worcester.

3. Liaison Committee, Reports and Records

A. At the option of the City of Worcester there may be established for the term of this Contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the Awarding Authority, and such other representatives as may be designated by the City of Worcester. The Contractor (or his agent, if any, designated by him as the on-Site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

B. The Contractor shall prepare projected staffing tables on a quarterly basis. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also when updated, to the Awarding Authority. The Contractor shall prepare weekly reports in a form approved by the Awarding Authority of hours worked in each trade by each employee, identified as minority or non-minority. Copies of these shall be provided at the end of each such week to the Awarding Authority and to the Liaison Committee.

C. Records of employment referral orders, prepared by the Contractor, shall be made available to the Awarding Authority on request.

D. A designee of the Awarding Authority shall each have right to access to the Site.

E. The Contractor shall comply with the provisions of M.G.L. c. 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made a part of this Contract.

F. The Contractor shall provide all information and reports required by the Awarding Authority on forms and in accordance with instructions issued by either of them and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the Awarding Authority to affect the employment of personnel. This provision shall apply only to information pertinent to the Owner 's supplementary affirmative action Contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Awarding Authority and shall set forth what efforts he has made to obtain the information.

4. Sanctions

A. Whenever the Awarding Authority believes the Contractor or any Subcontractor may not be operating in compliance with the terms of this Article, the City of Worcester shall directly, or through its designated agent, conduct an appropriate investigation, and may confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Article. If the City of Worcester finds the Contractor or any Subcontractor not in compliance, it may make a preliminary report on non-compliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the City of Worcester may make a final report of non-compliance, and recommend the imposition of one or more of the sanctions listed below. If, however, the City of Worcester believes the Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations, the Awarding Authority shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

(1) The recovery by the Awarding Authority from the Contractor of 1/100 of 1% of the Contract award price or $1,000 whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the Awarding Authority from the Contractor, to be assessed by the Contractor as a back charge against the subcontractor, of 1/10 of 1% of the sub-Contract Price, or $400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

(2) The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any subcontractor is able to demonstrate his compliance with the terms of the Contract;

(3) The termination, or cancellation, of the Contract, in whole or in part, unless the Contractor or any Subcontractor is able to demonstrate within a specified time his compliance with the terms of the contract;

(4) The denial to the Contractor or any subcontractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.

B. If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that it is in compliance with this Article, the Contractor may request the Awarding Authority to suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination, the Awarding Authority, shall either lift the sanctions or reimpose them.

C. Sanctions recommended by the Commission and enumerated under Section A above shall not be imposed by the Awarding Authority except after an adjudicatory proceeding, as that term is used in M.G.L. c. 30A, has been conducted. No investigation by the City of Worcester or its agent shall be initiated without prior notice to the Contractor.

D. Notwithstanding the provisions of 4A-4C above, if the Awarding Authority determines after investigation that the Contractor or any Subcontractor is not in compliance with the terms of this Article, it may suspend any payment or portion thereof due under the Contract until the contractor demonstrates to the satisfaction of the Awarding Authority compliance with the terms of this Article. This temporary suspension of payments by the Awarding Authority is separate from the sanctions set forth in Section 4A-4C of this Article above, which are determined by MCAD and recommend to the Awarding Authority. Payment may be suspended only after the Contractor and any other interested party shall have been given the opportunity to present evidence in support of its position at an informal hearing held by the Awarding Authority, and the Awarding Authority has concluded upon review of all the evidence that such penalty is justified. Payment shall not be suspended if the Awarding Authority finds that the Contractor made its best efforts to comply with this Article, or that some other justifiable reason exists for waiving the provisions of this Article in whole or in part.

APPENDIX B

The following provisions form Article XIII of the General Conditions of the Contract between the City of Worcester and the Construction Manager.

GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES

(EXECUTIVE ORDER 390, M.G.L. c. 7, s. 40N)

1. MBE and WBE Program

A. The MBE and WBE participation goals for this Contract are as set forth in the Request for Proposals for Construction Management Services and in the Owner-Construction Manager Agreement.

(1) Minority Business Enterprise participation goal is 10% of the GMP.

(2) The Women Business Enterprise participation goal is 15.0% of the GMP.

By submitting a proposal the CM agrees that if selected as the Construction Manager it will meet or exceed these participation goals. All CM's are advised that by submitting a proposal they certify that their proposal and services provided under the proposal will fully comply with all requirements of the RFP, including the MBE/WBE requirements.

B. The Construction Manager, all subcontractors, sub-subcontractors, and materials suppliers shall comply with all of the terms and conditions of this Article, which include the provisions pertaining to MBE/WBE participation set forth in the Owner – Construction Manager Agreement in order to meet the MBE/WBE participation goals established for this Contract.

C. A minority owned business shall be considered an MBE only if it has been certified as a minority business enterprise by the State Office of Minority and Women Business Assistance ("SOMWBA").

D. A woman owned business shall be considered a WBE only if it has been certified as a woman business enterprise by SOMWBA.

E. Certification as a disadvantaged business enterprise ("DBE"), certification as an MBE/WBE by any agency other than SOMWBA, or submission of an application to SOMWBA for certification as an MBE/WBE shall not confer MBE/WBE status on a firm for the purposes of this Contract.

2. Waiver Prior to RFP Submission

A. The City of Worcester reserves the right to reduce or waive the MBE or WBE participation goals established for this Contract upon written request made by a CM submitting a proposal to provide Construction Management Services within the time frame set forth in Section 2.B. below. Such written request must demonstrate to the satisfaction of the City of Worcester that it is not feasible for a non-MBE or non-WBE firm to meet the goals established for this Contract based upon any or all the following:

(1) Actual MBE/WBE availability.

(2) The geographic location of the project to the extent related to MBE/WBE availability.

(3) The scope of the work.

(4) The percentage of work available for subcontracting to MBE/WBEs.

(5) Other relevant factors, including a documented inability by the CM to identify MBE/WBE subcontractors sufficient to meet the MBE/WBE goals after having made a diligent, good faith effort to do so. All the foregoing documentation shall accompany the CMs request for a reduction or waiver of the MBE/WBE participation goals.

B. Requests to waive the MBE/WBE participation goals for this Contract must be addressed to both the owner's Project Manager for the Project and the city's Compliance Office and be received no later than fourteen (14) calendar days before the date set for the receipt of proposals.

C. The City of Worcester will not consider any request to reduce or waive the MBE/WBE participation goals for this contract that is received after thIS deadline. Any reduction or waiver of the MBE/WBE participation goals for this Contract will be made by written addendum mailed to all firms pre-qualified to submit proposals for the Project.

3. Trade Contractor Bids

Trade Contractors in the 18 categories of work as set forth in the Procedures for Award of Subcontracts are not required to submit a Schedule of MBE/WBE Participation with their bids. A Trade Contractor may, at its option, submit a Letter of Intent with its bid if it is a SOMWBA certified MBE/WBE. If a Trade Contractor intends to sub-subcontract work to a SOMWBA certified MBE/WBE, and the Trade Contractor wishes that sub-subcontract to be credited toward the participation goals for this Contract, the Trade Contractor should submit a Letter of Intent from that MBE/WBE with its Bid. A Trade Contractor can subcontract out any portion of its work to MBE/WBEs unless such work is designated as work specifically not to be sub-sub-contracted out.

4. MBE/WBE Participation Schedule

A. The Construction Manager shall submit the following documents to the city's Compliance Office as subcontractors are selected, and at each phase of the subcontractor selection process: i) A properly completed and updated Schedule for Participation by

Minority/Women Business Enterprises showing MBE/WBE participation in an amount equal to or exceeding the MBE/WBE participation goals for this contract; and ii) A properly completed Letter of Intent in the form provided by the City of Worcester for each MBE/WBE listed in the Schedule for Participation by Minority/Women Business Enterprises; and iii) A current SOMBWA certification letter for each MBE/WBE listed in the Schedule for Participation by Minority/Women Business Enterprises.

B. Each Letter of Intent shall identify and describe the work to be performed by the named MBE/WBE (the "MBE/WBE Work") with enough specificity to permit the City of Worcester to identify the particular items of contract work that the MBE/WBE will perform for MBE/WBE participation credit. The City of Worcester reserves the right to reject any Letter of Intent if the price to be paid for the MBE/WBE work does not bear a reasonable relationship to the value of such work under the contract as determined by the City of Worcester.

C. Within five (5) business days after receipt of the Schedule For Participation by Minority/Women Business Enterprises, Letters of Intent, and SOMWBA certification letters, the City of Worcester shall review and either approve or disapprove the Construction Manager's submissions. If the Construction Manager has not submitted an appropriate final Schedule For Participation by Minority/Women Business Enterprises and appropriate Letters of Intent and SOMWBA certification letters that has been approved by the City of Worcester establishing that the MBE/WBE participation goal for the project will be met, the Construction Manager may be considered ineligible for award of the construction phase contract and the City of Worcester may award the contract to the next most advantageous CM, subject to said CM's compliance with these conditions or the CONSTRUCTION MANAGER MAY BE CONSIDERED IN BREACH OF THE CONTRACT.

5. MBE/WBE Participation Credit

A. If the Construction Manager is itself an MBE or WBE, MBE or WBE participation credit shall be given in an amount equal to the entire Contract Price. If the Construction Manager is not an MBE or WBE, then MBE or WBE participation credit will be given for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

B. If the Construction Manager is a joint venture with one or more MBE/WBE joint venturers, MBE or WBE participation credit shall be given to the joint venture as follows:

(1) If the joint venture is certified by SOMBWA as an MBE or WBE, MBE or WBE participation credit shall be given in an amount equal to the portion of the Contract Price.

(2) If the joint venture is not certified as an MBE or WBE by SOMWBA, MBE or WBE participation credit shall be given to the joint venture for the value of the Work that is

performed by the MBE/WBE joint venturer(s), and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

C. If an MBE/WBE supplies but does not install equipment or materials, MBE or WBE participation credit shall be given only if the MBE/WBE supplier is regularly engaged in sales of equipment or supplies to the construction industry from an established place of business. MBE or WBE participation credit shall be given the full amount of the purchase order only if the MBE/WBE supplier manufactures the goods or substantially alters them before resale. In all other cases, MBE or WBE participation credit shall be given for 10% of the purchase order.

D. MBE participation credit shall be given for the work performed by MBEs only, and WBE participation credit shall be given for the work performed by WBEs only. MBE participation may not be substituted for WBE participation, nor may WBE participation be substituted for MBE participation.

6. MBE/WBE Subcontracts

Within thirty (30) days after the award of each subcontract, the Construction Manager shall furnish the city's Compliance Office with a signed copy of the subcontract and sub-subcontract for each MBE/WBE Subcontractor listed on the Construction Manager's Schedule of Participation and cause each of its Subcontractors to execute a sub-subcontract with each MBE/WBE sub-subcontractor and provide copies of the sub-subcontracts to the city's Compliance Office.

7. Performance of Contract Work by MBE/WBEs

A. The Construction Manager shall not perform with its own organization or subcontract or assign to any other firm work designated to be performed by any MBE/WBE in the Letters of Intent or Schedule for Participation of Minority/Women Business Enterprises without the prior Approval of the City of Worcester, nor shall any MBE or WBE assign or subcontract to any other firm, or permit any other firm to perform any of its MBE/WBE Work without the prior Approval of the City of Worcester. Any such unapproved assignment, subcontracting, sub-subcontracting, or performances of MBE/WBE Work by others is prohibited. The City of Worcester WILL not apply to the MBE/WBE participation goal(s) any sums attributable to such unapproved assignments, sub-contracts, sub-subcontracts, or performance of MBE/WBE work by others.

B. The Construction Manager shall be responsible for monitoring the performance of MBE/WBE Work to ensure that each scheduled MBE/WBE performs its own MBE/WBE Work with its own workforce.

C. The Construction Manager and each MBE/WBE shall provide the City of Worcester with all information and documentation that the City of Worcester determines is necessary to ascertain whether or not an MBE/WBE has performed its own MBE/WBE Work. At the discretion the City of Worcester, failure to submit such documentation to the City of

Worcester shall establish conclusively for the purpose of giving MBE/WBE participation credit under this Contract that such MBE/WBE did not perform such work.

8. Notification of Changes in MBE/WBE Work

A. If after approval of a Final Schedule for Participation of Minority/Women Business Enterprises and the commencement of construction work under the Contract the Construction Manager determines or has reason to believe that a scheduled MBE/WBE is unable or unwilling to perform its MBE/WBE Work, or that there has been or will be a change in any MBE/WMBE Work, or that the Construction Manager will be unable to meet the MBE/WBE participation goal(s) for this Contract for any reason, the Construction Manager shall immediately notify the City of Worcester in writing of such circumstances.

B. Any notice of a change in MBE/WBE Work pursuant to subparagraph "A" above shall include a revised Schedule for Participation by Minority/Women Business Enterprises, and additional or amended Letters of Intent and subcontracts.

9. Actions Required If There is a Reduction in MBE/WBE Participation

A. If for any reason other than a reduction in MBE/WBE Work resulting from a Change Order initiated by the City of Worcester, the Construction Manager believes that it shall be unable to meet the MBE/WBE participation goals for this the Construction Manager shall immediately undertake a diligent, good faith effort to make up the shortfall in MBE/WBE participation as follows:

(1) The Construction Manager shall identify all items of the Work remaining to be performed under the Contract that may be made available for subcontracting or sub-subcontracting to MBE/WBEs. The Construction Manager shall send a list of such items of work to the City of Worcester, together with a list of the remaining items of the Work that was not made available to MBE/WBEs and the reason for not making such work available for subcontracting or sub-subcontracting to MBE/WBEs.

(2) The Construction Manager shall send written notices soliciting proposals to perform the items of the Work that may be made available for subcontracting to MBE/WBEs to all MBE/WBEs qualified to perform such work. The Construction Manager shall advise the City of Worcester of (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the SOMWBA directory under the applicable trade category who was not solicited and the reasons therefor. The Construction Manager shall also advise the City of Worcester of the dates notices were mailed and provide a copy of the written notice(s) sent.

(3) The Construction Manager shall make reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted to the City of Worcester evidencing this effort.

(4) The Construction Manager shall make reasonable efforts to assist MBE/WBEs that need assistance in obtaining insurance, bonds, or lines of credit in order to perform work under the Contract, and shall provide the City of Worcester with evidence that such efforts were made.

(5) The Construction Manager shall provide the City of Worcesterwith a statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE that submitted a proposal.

(6) The Construction Manager shall take any additional measures reasonably requested by the City of Worcester to meet the MBE/WBE participation goal(s) established for this Contract, including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Construction Manager's interest in obtaining proposals from MBE/WBEs, and/or sending written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted to MBE/WBEs.

B. If the Construction Manager is unable to meet the MBE/WBE participation goals for this Contract because there is a change or reduction in MBE/WBE and after complying fully with each of the requirements of paragraph "A" above, and the Construction Manager is otherwise in full compliance with the terms of this Article, the City of Worcester may reduce the MBE/WBE participation goals for this Contract to the extent that such goals cannot be achieved.

10. Suspension of Payment and/or Performance for Noncompliance

A. If at any time during the performance of this Contract, the City of Worcester determines or has reason to believe that (1) there has been a change or reduction in any MBE/WBE Work which will result in the Construction Manager failing to meet the MBE/ WBE participation goal(s) for this Contract, other than a reduction in MBE/WBE Work resulting from a change in the Contract work ordered by the City of Worcester, and (2) the Construction Manager has failed to comply fully with all of the terms and conditions of paragraphs 1 through 9 above, the City of Worcester may:

(1) Suspend payment to the Construction Manager of an amount equal to the value of the work which was to have been performed by an MBE/WBE pursuant to the Construction Manager's Schedule for Participation by Minority/Women Business Enterprises but which was not so performed, in order to ensure that sufficient Contract funds will be available if liquidated damages are assessed pursuant to paragraph 11, and/or

(2) Suspend the Construction Manager's performance of this Contract in whole or in part.

B. The City of Worcester shall give the Construction Manager prompt written notice of any action taken pursuant to paragraph A above and shall give the Construction Manager and any other interested party, including any MBE/WBEs, an opportunity to present evidence

to the City of Worcester that the Construction Manager is in compliance with the requirements of this Article, or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The City of Worcester may invite SOMWBA and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken pursuant to this paragraph.

C. Upon a showing that the Construction Manager is in full compliance with the requirements of this Article, or that the Construction Manager has met or will meet the MBE/WBE participation goals for this Contract, the City of Worcester shall release any funds withheld pursuant to clause A(1) above, and lift any suspension of the Contractor's performance under clause A(2) above.

11. Liquidated Damages; Termination

A. If payment by the City of Worcester or performance by the Construction Manager is suspended by the City of Worcester as provided in paragraph 10 above, the City of Worcester shall have the following rights and remedies if the Construction Manager thereafter fails to take all action necessary to bring the Construction Manager into full compliance with the requirements of this Article, or if full compliance is no longer possible because the default of the Construction Manager is no longer susceptible to cure, if the Construction Manager fails to take such other action as may be required by the City of Worcester to meet the MBE/WBE participation goals set forth in this Contract:

(1) The City of Worcester may terminate this Contract, and/or

(2) The City of Worcester may retain from final payment to the Construction Manager, as liquidated damages, an amount equal to the difference between (x) the total of the MBE/WBE participation goals set forth in this Contract, and (y) the amount of MBE/WBE participation credit earned by the Construction Manager for MBE/WBE Work performed under this Contract as determined by the City of Worcester, the parties agreeing that the damages for failure to meet the MBE/WBE participation goals are difficult to determine and that the foregoing amount to be retained by the City of Worcester represents the parties' best estimate of such damages. Any liquidated damages will be assessed separately for MBE and WBE participation.

B. Before exercising its rights and remedies hereunder, the City of Worcester may, but the City of Worcester shall not be obligated to, give the Construction Manager and any other interested party another opportunity to present evidence to the City of Worcester that the Contractor is in compliance with the requirements of this Article or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The City of Worcester may invite SOMWBA and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken hereunder.

12. Reporting Requirements

The Construction Manager shall submit to the City of Worcester all information or documentation that is necessary in the judgment of the City of Worcester to ascertain whether or not the Construction Manager has complied with any of the provisions of this Article.

13. Awarding Authority's Right to Waive Provisions of this Article in Whole or In Part

City of Worcester reserves the right to waive any provision or requirement of this Article if the City of Worcester determines that such waiver is justified and in the public interest. No such waiver shall be effective unless in writing and signed by a representative of the city's Compliance Office or the office of its General Counsel. No other action or inaction by the City of Worcester shall be construed as a waiver of any provision of this Article.

APPENDIX C

Procedures for Award of Subcontracts

Pursuant to M.G.L. c.149A, as contained in Chapter 193 of the Acts of 2004, the City of Worcester is required to develop a process consistent with legal requirements for the selection of subcontractors for construction manager at risk projects. This process is described in these Procedures for Award of Subcontracts (the "Procedures"). The Procedures are divided into three parts. The first part describes the prequalification and procurement of "Trade Contractors", which, for the purposes of the Procedures, shall mean the subcontractors performing work in trade categories covered by Section 44F of Chapter 149. The second part describes the prequalification and procurement of all subcontractors that are not Trade Contractors. The third part addresses additional procurement matters.

For the purposes of the Procedures, the term Project shall mean the specific construction project to which the Procedures are being applied; the term CM shall mean the construction manager at risk selected by the City of Worcester to construct the Project; the term Designer shall mean the firm (and its subconsultants) selected by the City of Worcester to design; the term Project Manager shall refer to the City of Worcester staff serving as Project Manager on the project; and the term Applicant shall mean any firm that submits a response pursuant to the Procedures.

1. Trade Contractors

A. Applicability of Procedures

(1) Subcontracts Subject to Trade Contract Procedures. The procedures set forth in Sections B and C below shall govern the award of subcontracts by the CM for the furnishing of labor, materials, and equipment in the performance of the categories of work listed below whenever the estimated construction cost of such category of work exceeds $25,000:

(a) Roofing and Flashing
(b) Glass and Glazing
(c) Metal windows
(d) Painting
(e) Waterproofing, Damp-proofing and Caulking
(f) Plumbing
(g) Miscellaneous and Ornamental Iron
(h) Heating, Ventilating, and Air Conditioning
(i) Lathing and Plastering
(j) Electrical work
(k) Acoustical Tile
(l) Elevators
(m) Marble
(n) Masonry work
(o) Tile
(p) Terrazzo
(q) Resilient Floors

Any other categories of work selected by the City of Worcester for designation as Trade Contract work.

The subcontractors performing these trades are referred to throughout the Contract Documents as "Trade Contractor(s)." Contracts for work in these categories of work where the estimated cost of such work exceeds $25,000 are referred to as "trade contracts."

B. Qualification of Trade Contractors

(1) Prequalification Committee. DCAM shall establish a prequalification committee ("the Prequalification Committee") consisting of four members. The members shall include two employees of the city's Department of Public Facilities (DPF) with management roles in the construction of large buildings, a representative of the Designer, and a representative of the CM. The Chief of DPF shall designate the Chairperson of the Prequalification Committee. An alternate may be appointed for each member of the Prequalification Committee to serve on occasions when the regular member cannot be available. Both the representative of the Designer and CM serving on the Prequalification Committee, and the alternates representing the Designer and CM shall be subject to the City of Worcester's approval. The Prequalification Committee shall conduct the prequalification of trade contractors as set forth in Sections B and C of the Procedures. The CM will aid the Prequalification Committee in the exercise of its responsibilities under the Procedures, including assistance from CM staff.
Three members of the Prequalification Committee shall constitute a quorum for the purposes of conducting the Prequalification Committee's official business. The Chief or his designee may join any meeting of the Prequalification Committee as a voting member to achieve a quorum, if in the Chief's judgment the action scheduled for such meeting cannot be postponed without adverse consequences to the Project.

(2) Request for Qualifications. The City of Worcester shall issue a request for qualifications ("RFQ") for each category of work listed in Section A.1 if such work is required on the Project. The RFQ shall be placed on the Comm-PASS web site; advertised in a newspaper of general circulation in the area of the Project and in the Central Register established under Massachusetts General Laws, Chapter 9, Section 20, and in such additional media as DCAM and the Prequalification Committee may deem appropriate at least fourteen (14) calendar days before the deadline for Applicants to submit a response to the RFQ by submission of a Statement of Qualifications ("SOQ"). All interested Trade Contractors shall be eligible to respond to the RFQ and participate in the prequalification process. The CM firm may submit its qualifications to bid on trade contract work provided that the CM customarily performs the work for which it submits its qualifications and does so with employees on its own payroll, and provided that the CM meets all the requirements of the selection process. The RFQ shall be prepared by the City of Worcester in a form consistent with the requirements of M.G.L. c. 149A and in consultation with the Prequalification Committee and the CM. The RFQ shall contain a form or forms (individually or collectively, the City of Worcester "Statement of Qualifications" or "SOQ") requiring the information necessary for the Prequalification Committee to determine if the Applicant is qualified to perform the category of work for which it seeks prequalification on the Project. City of Worcester's

Standard form RFQ and SOQ will be provided by the City of Worcester and must be utilized as the RFQ and SOQ for the Project. The RFQ shall include, at a minimum:

(a) the date, time, and place for submission,
(b) relevant information about the project and the bidding process,
(c) the specific criteria for trade contractor prequalification and selection,
(d) a statement indicating that the RFQ will be used to prequalify trade contractors that will be invited to submit a bid,
(e) that the responders' names are to be posted, but that there shall be no public opening of responses.

(3) Prequalification Criteria. The Prequalification Committee shall evaluate the information submitted by each Applicant on it's the City of Worcester Statement of Qualifications, the results of reference checks performed by the City of Worcester and/or the CM, and any other information required or obtained by the Prequalification Committee. The following subsections enumerate the legally required categories to be used by the Prequalification Committee in evaluating the Applicants, the subcategories of information within each category, and the specific point allocation required for prequalification within each category. Applicants must achieve an overall score of 70 or greater and must also achieve the minimum required points within each category to be deemed prequalified. Applicants that do not achieve both the minimum scores within each category and do not achieve an overall score of 70 or above shall not be deemed prequalified.

(a) Management Experience (50 points, minimum of 25 required for approval)

(i) Business owners - The name, title, years with firm of the owner(s) of the business (1 Point)
(ii) Management personnel - The names, title, education and construction experience, years with firm, and list of projects completed by all management personnel. (25 Points)
(iii) Similar project experience - The project name(s), description, description of scope, original trade contract sum, final trade contract sum with explanation, and date completed of similar projects. (10 Points)
(iv) Terminations – A list of any projects on which the trade contractor was terminated or failed to complete the work. (3 Points)
(v) Lawsuits – A list of commercial lawsuits in which the trade contractor is a defendant or defendant-in-counterclaim regarding construction contracts within the last 3 years. The lawsuits shall not include any actions that primarily involve personal injury or workers' compensation claims, or where the sole cause of action involves the trade contractor's exercise of its rights for direct payment under the law. (3 Points)
(vi) Safety record – The three-year history of the trade contractor's workers' compensation experience modifier. (8 Points)

(b) References (30 points; minimum of 15 required for approval)

(i) Client references - for all projects listed in clause (iii) of Management experience above, including the project name, client's name, address, telephone and fax number, and contact person. (24 Points)
(ii) Credit references - .A minimum of five credit references, including telephone and fax number of contact person from key suppliers, vendors and banks. (3 Points)
(iii) Public project record – A list of all completed public building construction projects as defined in section 44A of chapter 149 during the past three years with client's name, address, telephone and fax number and contact person. (3 Points)

(c) Capacity to Complete Projects – (20 points; minimum of 10 required for approval)

(i) Annual revenue for prior three fiscal years. There shall be no requirement for submission of financial statements. (10 Points)
(ii) Revenue under contract for next three fiscal years. (10 Points)

(d) Commitment Letter – (mandatory no points assigned) Mandatory commitment letters from surety companies or authorized agents stating that payment and performance bonds at 110% of the estimated trade contract value will be provided to the applicant if it is the successful bidder. The surety company providing the commitment letter must be licensed to do business in the Commonwealth and appear on the United States Treasury Department Circular 570.

(e) Certificate of Eligibility – (mandatory, no points assigned) All SOQs submitted after January 1, 2006, must include a DCAM issued certificate of eligibility listing the Applicant as currently certified as a subcontractor in the scope of work for which the Applicant is submitting its SOQ.

(f) Update Statement – (mandatory, no points assigned)

All SOQs submitted after January 1, 2006, must include a fully completed and current Update Statement prepared by the Applicant.

Applicants that are certified by the Massachusetts State Office of Minority and Women Business Enterprise ("SOMWBA") as either a Minority Business Enterprise, a Women Business Enterprise or a Minority/Women Business Enterprise and provide documentation of current SOMWBA certification with their SOQ will have an additional 5 points added to their overall score.

If the Applicant is a joint venture, the Applicant must submit a copy of the joint venture agreement, signed by each member, and the joint venture agreement must clearly identify, for each member of the joint venture, such member's proportionate share or interest in the financial or other benefits, risks or liabilities of the venture ("joint venture interest"). One

member of the joint venture must have a joint venture interest greater than fifty (50) percent ("the Lead Venturer"). The requirements for prequalification in B.3 a-f above shall be met by each member of the joint venture; and the bonding requirements of B.3 d above shall be met by the Lead Venturer or by the joint venture as an entity. A joint venture prequalified by the Prequalification Committee must obtain a Certificate of Eligibility from the City of Worcester prior to the time bids are filed and must submit the Joint Venture's Certificate of Eligibility with its bid.

Joint ventures must be submitted for consideration by the Prequalification Committee. Following the deadline for submission of SOQs for a specific category of work, joint ventures for that category of work which were not submitted to the Prequalification Committee may not bid on that category of work, except that two firms both of whom were independently prequalified by the Prequalification Committee for that category of work, may form a joint venture to bid that category of work without further consideration by the Prequalification Committee provided the Joint Venture has been the City of Worcester Certified prior to submitting its bid and submits the Joint Venture's Certificate of Eligibility with its bid.

(4) Deliberations of the Prequalification Committee. The Prequalification Committee shall consider each SOQ submitted based on the criteria set forth in Section B.3 above. The Prequalification Committee shall require that all mandatory submissions are submitted by the Applicant and apply a numerical scoring system, with both the minimum point scores for each category, and a score of 70 out of a possible 100 overall points, required to be prequalified. The Prequalification Committee shall prepare a written record of the evaluation of each Applicant.

The scoring system shall provide for the assigning of scores as follows. The Prequalification Committee shall first consider whether the Applicant has met the requirements of Subsections d, e and f, bonding commitment letter, certificate of eligibility and update statement. If the Applicant has satisfied those criterion, it shall be awarded up to 100 points using the criteria listed above. Applicants that do not meet the requirements of Subsections d, e, f, and sign the RFQ, shall not be presented to the Prequalification Committee for consideration.

Any Applicant that fails to achieve either an overall score of at least 70 or that fails to achieve the minimum required points within each category shall be deemed not to be prequalified for the category of work for which the Applicant sought prequalification. If it is determined at any time during the evaluation process, that an Applicant has willfully supplied materially false or misleading information in its application or otherwise, the Applicant may be eliminated from further consideration for prequalification for the Project and, in the discretion of the Commissioner, for any other projects requiring prequalification under these Procedures.

The decision of the Prequalification Committee shall be final and not subject to appeal except on the grounds of fraud or collusion. An Applicant firm's prequalification score

shall be made available to that Applicant firm only and only upon request. An Applicant firm's score shall not be a public record as defined in M.G.L. c. 4, §7 and shall not be open to pubic inspection to the fullest extent possible under the law.

A list of the Applicants that have been determined by the Prequalification Committee to be prequalified and therefore eligible to bid shall be posted at the offices of the of the City of Worcester listing the firms by trade categories. Applicants shall also be notified of the Prequalification Committee's determination on prequalification by mail at the address furnished by each Applicant.

The Prequalification Committee reserves the right to reopen the prequalification process for any category of work before it has completed its evaluation of firms that previously submitted City of Worcester's SOQs and/or to hold multiple rounds of prequalification for any given category of work. In either case, any Applicant that has submitted a complete City of Worcester SOQ shall not be required to submit another one, although any Applicant not prequalified may elect to amend its SOQ prior to the latest deadline for submitting information for the trade contract for which the Applicant seeks to be prequalified.

No person or firm suspended or debarred pursuant to Massachusetts General Laws Chapter 29, Section 29F, or Chapter 149, Section 44C, or disqualified pursuant to Chapter 7, Section 38D, or which has been debarred by the Federal Government shall be determined to be qualified to compete for a trade contract or any other contract or subcontract to be issued on the Project. If any Applicant determined to be qualified to perform one or more trade contracts is subsequently suspended or debarred pursuant to such laws, the qualification of such Applicant shall be rescinded and such Applicant shall be notified of such action and eliminated from the list of prequalified bidders.

(5) Determinations to Remain in Effect. The Prequalification Committee's determinations as to which Applicants are prequalified shall remain in effect, subject to the following provisions of this Section B.5, for the duration of the Project. Upon receipt at any time of additional information deemed material and significant by the Prequalification Committee regarding a previously prequalified Applicant's qualifications or responsibility, including, but not limited to, compliance with any minimum prequalification requirements, the Prequalification Committee may determine, in consultation with the City of Worcester and the CM, that the Applicant is not qualified to perform the applicable trade contract(s) for the Project. In such event, the Prequalification Committee shall notify the Applicant of its determination, and inform the Applicant of any information on which the Prequalification Committee's determination is based that was not furnished by the Applicant.

C. Bidding

(1) Requests for Bids. A request for bids ("RFB") will be issued for each trade contract subject to Sections 2 and 3 of these Procedures. The RFB will only be issued to the

Trade Contractors appearing on the list of prequalified Applicants for the applicable trade contract determined pursuant to Section B above. The RFB shall include at least the following attachments:

(a) the date, time and place for submission of responses to the RFB. All Trade Contractor bids for DCAM projects will be submitted and opened at the DPF at 50 Officer Manny Familia Way, Worcester, MA 01605,
(b) fully detailed drawings and specifications by class of work in accordance with section (a) of Subsection 1 of Section 44F of Chapter 149 of the Massachusetts General Laws (i.e., separate specification sections for the trades listed in Section A.1 above) which shall provide for full competition for each item of material to be furnished under the contract as set forth under subsection (b) of M.G.L. c.30, §39M,
(c) drawings and specifications that provide for full competition for each item of material to be furnished under the contract as set forth under Subsection (b) of Section 39M of Chapter 30 of the Massachusetts General Laws,
(d) a detailed definition of the Trade Contractor's scope of work, including alternates and unit price items, if any, within that scope of work,
(e) a project schedule indicating the planned sequence and duration of each trade contractor's work,
(f) list of the Trade Contractors prequalified for the work covered by the RFB,
(g) a Trade Contractor bid form, in a format provided by the City of Worcester, that shall require, without limitation, a listing of price, addenda, alternates and unit price items, if any, for the trade work; certification that the trade contractor will perform the complete trade work with employees on his own payroll, except for work customarily performed by sub-trade subcontractors within the trade; and the names of all sub-trade subcontractors to be used if awarded the trade contract and each sub-trade contract sum; to the extent applicable, an identification by the Trade Contractor that it is a MBE or WBE or a list of the MBEs and/or WBEs proposed to be used by the Trade Contractor,
(h) an affidavit that must be executed by all bidders confirming that all sub-trade subcontractors named on the bid form have been prequalified by the Trade Contractor using criteria like the criteria for the prequalification of Trade Contractors,
(i) an affidavit of tax compliance that must be executed by all bidders,
(j) an affidavit of prevailing wage compliance pursuant to M.G.L. c. 149, §§ 26 and 27 that must be executed by all bidders,
(k) a noncollusion affidavit that must be executed by all bidders,
(l) a requirement that a bidder post a 5% bid bond from a surety company licensed to do business in the Commonwealth and whose names appears on U.S. Treasury Department Circular 570; but the bid bond shall be returned to the bidder if the bidder is not selected as the Trade Contractor,
(m) a budget for the project, and the budget amount for the trade contract scope of work as provided in the project guaranteed maximum price, if available, or as provided in the most recent budget for the project,

(n) a requirement that a bidder submit a current Certificate of Eligibility issued by the City of Worcester to the Trade Contractor showing that the Trade Contractor is certified for the trade category for which the bid is submitted,
(o) a requirement that a bidder submit a completed Update Statement with its bid,
(p) a Trade Contractor agreement form as set forth in M.G.L. c. 149A, §8 (k).

The prequalified Trade Contractors shall submit bids in compliance with the requirements of the Request for Bids (RFB) package.

(2) Bid Opening, Award, Rejection and Negotiation of Bids. Bids shall be opened publicly by the City of Worcester. Bids for each trade shall be a) accepted only from firms appearing on the list of prequalified firms described in Section B.4 for such trade; b) submitted as set forth in the RFB, and c) opened publicly. Any bid which does not include the bid bond or affidavits required pursuant to law or any response in which the information requested is incomplete, conditional, or obscure or which contains any additions not required in the request for bids package shall be rejected. The trade contract for each trade shall be awarded to the lowest prequalified bidder except that the City of Worcester reserves the right to reject the bids of any and all Trade Contractors if: a Trade Contractor is not eligible to submit a bid; if the bid does not represent the bid of a person competent to perform the work specified; or if less than three such bids were received and the prices are not reasonable for acceptance without further negotiation or competition. In addition, if fewer than three responsive bids are received for any trade category and the lowest bid exceeds the estimated cost for the work, the CM shall attempt to negotiate an acceptable price with the lowest prequalified bidder. If the negotiations are unsuccessful, the construction manager shall terminate negotiations with the lowest prequalified bidder and shall initiate negotiations with the trade contractor who was the second lowest prequalified bidder. If the CM is unsuccessful in negotiating an acceptable price with the lowest prequalified bidder and second lowest prequalified bidder, the construction manager, on behalf of and with the consent of the public agency, shall solicit additional bids utilizing the procedures for selection of subcontractors who are not trade contractors, set out below and in M.G.L. c. 149A, § 8 (j).

(3) Trade Contract Execution. Each trade contractor selected to perform work on the Project shall return an executed trade contract including the required performance and payment bonds and insurance certificate to the CM within 10 business days of receipt of the trade contract from the CM. The trade contract shall be the trade contract agreement required by law and in a form provided by the City of Worcester.

2. Other Subcontracts

A. Applicability of Procedures

(1) Subcontracts Subject to Procedures For Other Subcontracts. The process set forth in these Sections 4 and 5 of the Procedures shall apply to the procurement of subcontracts

and subcontractors that are not subject to the provisions of Sections 2 and 3 above, specifically subcontractors that are not Trade Contractors, and where the subcontract scope of work has an estimated value that is equal to or exceeds $25,000.

B. Prequalification and Procurement

(1) Subcontracts in With An Estimate Cost equal to or greater than $25,000. For Subcontracts that are not trade contracts with an estimated cost equal to or greater than $25,000, the CM shall submit to the City of Worcester for its approval the qualifications which it believes a subcontractor must have to perform the work of the subcontract and a list of a minimum of three (3) subcontracting firms, and preferably at least five (5) subcontracting firms, which the CM believes meet the qualifications. The CM shall submit information in a form and content satisfactory to the City of Worcester concerning the qualifications and responsibility of the proposed subcontractors and, when relevant, how the selection will further the CM's compliance with its Project MBE and WBE participation goals. The CM firm may submit its qualifications to bid on subcontract work provided that the CM customarily performs the work for which it submits its qualifications and does so with employees on its own payroll, and provided that the CM meets all the requirements of the selection process. The City of Worcester may eliminate firms from the list of firms submitted by the CM, and the City of Worcester may add firms to the list submitted by the CM. The CM must add the firms requested by the City of Worcester to the list if the firms are acceptable to the CM. If the firms the City of Worcester requested be added are not acceptable to the CM based upon qualifications, ability or for any other reason the CM must advise the City of Worcester of its objections and the basis for the objections in writing. If the City of Worcester determines that the CM's objections to the City of Worcester requested firm(s) are valid then the requested firms will not be added to the list otherwise the firm(s) requested by the City of Worcester will be added. The CM will invite all subcontractors on the approved list to submit bids for the subcontract work, using forms and procedures approved by the City of Worcester. The bids shall be based on detailed bidding information developed by the CM for the subcontract work. The CM will submit to the City of Worcester a list of bids submitted for each subcontract and with the list will indicate the bidder it recommends be selected to be awarded a subcontract. The CM shall along with its submission provide a written explanation as to the reasons for its selection and recommendation. The CM's recommendation will be based on relevant factors including, but not limited to, price, quality of work, and MBE and/or WBE participation. City of Worcester's approval is required before a subcontract can be awarded by the CM to a subcontractor, which approval shall not be unreasonably withheld provided the selection will not have an adverse effect on meeting project goals including, but not limited to, price, quality of work and/or MBE/WBE participation. In no event will the selection of a subcontractor affect the GMP agreed to by the CM. The CM may, with the approval of the City of Worcester, reject the proposals for a subcontract and either resolicit that scope of work or negotiate with one or more of the firms that submitted the rejected proposals. Such rejection may be based on the

proposal being too high compared to the amount carried in the GMP for that scope of work or upon any other basis approved by the City of Worcester.

(2) Subcontracts With An Estimated Cost Less Than $25,000. Subcontracts with an estimated cost less than $25,000, and subcontracts for the supply of materials or equipment not including performance of labor in construction at the Project site, regardless of the estimated cost, may be awarded by the CM using any method selected by the CM with the approval of the City of Worcester.

3. Other Procurement Provisions

A. Emergencies

In case of an emergency, the City of Worcester or the CM, with the prior approval of the City of Worcester, may award a contract for such work as is necessary to preserve or protect the health or safety of persons or property on the basis of such competitive bids or proposals as it can reasonably obtain in time to respond to the emergency and without public advertisement or opening of bids or proposals; or the CM may perform such work with its own forces.

B. Termination of Contracts

Termination of Trade Contracts and Other Subcontracts. If a trade contract, or other subcontract, is terminated in whole or in part by the CM after the subcontractor commences work but prior to completion of the work covered by such trade contract or other subcontract on account of breach or default by the trade contractor or other subcontractor, or for other reasons in the public interest approved by the City of Worcester, the CM may engage a replacement subcontractor using any method selected by the CM and approved by the City of Worcester, or may perform the affected work with its own forces, as necessary to preserve, protect, or complete the work without following these procedures and without public advertisement or opening of bids or proposals. The termination of a trade or other subcontractor prior to completion of its work shall not be the basis for an increase in the GMP.

C. Miscellaneous Provisions

(1) Procurement Records. The Prequalification Committee and the CM shall ensure that the City of Worcester has a complete set of the following records:

(a) All RFQs issued pursuant to Section 2 of these Procedures, including all addenda.
(b) All City of Worcester's SOQs and other information furnished to or otherwise obtained by the Prequalification Committee and the CM concerning qualification of each Applicant responding to an RFQ including any references or scoring obtained or generated in connection with the SOQs.
(c) All RFBs issued by the CM to prequalified Trade Contractors pursuant to Section 3 of these Procedures.

(d) All bids received from such Trade Contractors in response to such RFBs.
(e) All solicitations for bids or proposals issued by the CM to firms other than Trade Contractors.
(f) All bids and proposals received by the CM from such firms in response to such solicitations.
(g) All contracts awarded pursuant to these procedures.
(h) All other written documents required pursuant to the terms of these Procedures.
(i) All other documents referring or relating to the evaluation of qualifications, proposals or bids, including but not limited to, all notes (to the extent included in Project files), memoranda, correspondence and meeting minutes, whether formal or informal, in either electronic media or hard copy.

The City of Worcester shall retain copies of such records for a period of six (6) years from the date of final payment under the contract to which such records relate. The Secretary of Administration and Finance and the Inspector General of the Commonwealth shall have access to all such records at any time upon reasonable notice.

(2) Severability. If any provision of these Procedures shall be determined to be invalid or unenforceable, the remaining provisions of the Procedures shall remain in full force and effect.
(3) Time. The periods of time within which any party is required to act under the terms of these procedures when described in terms of "days" shall, unless otherwise specified, mean calendar days (and not business days), except that if the last day of any such time period falls on a Saturday, Sunday, or legal holiday in Massachusetts, the period of time during which the required action must be taken will be extended to the next following business day.

APPENDIX D

- Form for Subcontract between Construction Manager and Trade Contractor
- Form for Subcontract between Construction Manager and Subcontractor

COMMONWEALTH OF MASSACHUSETTS
FORM FOR SUBCONTRACT BETWEEN CONSTRUCTION MANAGER AND TRADE CONTRACTOR AS SET FORTH IN THE CONTRACT DOCUMENTS

THIS AGREEMENT made this _____day of _____20_____, by and between

_____

a corporation organized and existing under the law of _____,
a partnership consisting of _____,
an individual doing business as _____,
hereinafter called the "Construction Manager or CM" and _____

_____,
a corporation organized and existing under the laws of _____,
a partnership consisting of _____,
an individual doing business _____,
hereinafter called the "Trade Contractor",

WITNESSETH that the CM and the Trade Contractor for the considerations hereafter named, agree as follows:

1. The Trade Contractor agrees to furnish all labor and materials required for the completion of all work specified in Section No. _____,

   of the Specifications for _____,
   (Name of Sub-trade)
   and the Plans referred to therein and addenda No. _____, _____, _____and _____for the _____,
   (complete title of project and project no. taken from the title page of the Specifications)
   all as prepared by _____,
   (Name of Designer or Engineer)

for the sum of _____,

($_____)

and the CM agrees to pay the Trade Contractor said sum for said work. This price includes the following alternates (and other items set forth in the sub-bid):

Alternate No(s) _____, _____, _____,

_____, _____, _____, _____.

(a) The Trade Contractor agrees to be bound to the CM by the terms of the hereinbefore described Plans, Specifications (including all general conditions stated herein) and addenda Nos._____, _____, and _____, and to assume to the CM all the obligations and responsibilities that the CM by those documents assumes to the _____hereinafter called the "Awarding Authority," except to the extent that provisions contained herein are by their terms or by law applicable only to the CM.

(b) The CM agrees to be bound to the Trade Contractor by the terms of the herein and before described documents and to assume to the Trade Contractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the CM, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority. The Trade Contractor shall preserve and protect the rights of the City of Worcester under the Contract Documents with respect to the Work to be performed by the Trade Contractor so that the subcontracting thereof will not prejudice such rights, and shall be subject to the Record Retention requirements as set forth in the Contract Documents.

2. The CM agrees to begin, prosecute and complete the entire work specified by the Awarding Authority in an orderly manner so that the Trade Contractor will be able to begin, prosecute and complete the work described in this subcontract; and, in consideration thereof, upon notice from the CM, either oral or in writing, the Trade Contractor agrees to begin, prosecute and complete the work described in this Subcontract in an orderly manner and with due consideration to the date or time specified by the Awarding Authority for the completion of the entire work.

3. The Trade Contractor agrees to furnish to the CM within a reasonable time after the execution of this subcontract, evidence of workmen's compensation insurance as required by law and evidence of public liability and property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the CM.

4. The CM agrees that no claim for services rendered or materials furnished by the CM to the Trade Contractor shall be valid unless written notice thereof is given by the CM to the Trade Contractor during the first ten (10) days of the calendar month following that in which the claim originated.

5. The Trade Contractor agrees that it shall enter into similar agreements, as this, with its Subcontractors, except to the extent that provisions contained herein are by their terms or by law applicable only to the CM and/or Contractor.

6. The CM agrees that it has provided to the Trade Contractor, prior to the execution of this Subcontract, copies of the Contract Documents to which the Trade Contractor will be bound by this Subcontract. The Trade Contractor agrees that it shall similarly make copies of such Contract Documents available to its Subcontractors.

7. In the event of termination of the Contract due to the default of the CM or for any other reason, the City of Worcester shall have the right (but shall have no obligation) to assume, and/or accept assignment of and further assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the CM under the Subcontract with such Trade Contractor. In the event of such assumption or assignment by the City of Worcester, the Trade Contractor shall have no claim against the City of Worcester or such third party for work performed by such Trade Contractor or other matters arising prior to termination of the Contract, and the DCAM or such third party, as the case may be, shall be liable only for obligations to the Trade Contractor arising after such assumption or assignment.

8. Nothing contained herein, shall be construed to create any contractual relationship between the Trade Contractor and the City of Worcester.

9. This agreement is contingent upon the execution of a Contract for Construction Management Services between the CM and the Awarding Authority for the complete work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above-written.

SEAL ATTEST

_____ _____
(Name of Trade Contractor)

By: _____

SEAL ATTEST

_____ _____
(Name of CM)

By: _____

_____
(City and State)

THIS FORM MAY BE REPRODUCED

COMMONWEALTH OF MASSACHUSETTS
FORM FOR SUBCONTRACT BETWEEN CONSTRUCTION MANAGER AND SUBCONTRACTOR OTHER THAN TRADE CONTRACTOR AS SET FORTH IN THE CONTRACT DOCUMENTS

THIS AGREEMENT made this _____day of _____20_____, by and between

_____

a corporation organized and existing under the law of _____,

a partnership consisting of _____,

an individual doing business as _____,

hereinafter called the "Construction Manager or CM" and _____

_____,

a corporation organized and existing under the laws of _____,

a partnership consisting of _____,

an individual doing business _____,

hereinafter called the "Subcontractor",

WITNESSETH that the CM and the Subcontractor for the considerations hereafter named, agree as follows:

1. The Subcontractor agrees to furnish all labor and materials required for the completion of all work as follows:_____,

   (attach additional sheets as necessary)

   according to the Specifications and Plans referred to therein and addenda No. _____, _____, _____and _____for the _____

   _____,

   (complete title of project and project no. taken from the title page of the Specifications)

   all as prepared by _____,

   (Name of Designer or Engineer)

for the sum of _____,

($_____)

and the CM agrees to pay the Subcontractor said sum for said work. This price includes the following alternates (and other items set forth in the sub-bid):

Alternate No(s) _____, _____, _____,

_____, _____, _____, _____.

(a) The Subcontractor agrees to be bound to the CM by the terms of the hereinbefore described Plans, Specifications (including all general conditions stated herein) and addenda Nos.___ _____, _____, and _____, and to assume to the CM all the obligations and responsibilities that the CM by those documents assumes to the _ _____hereinafter called the "Awarding Authority," except to the extent that provisions contained herein are by their terms or by law applicable only to the CM.

(b) The CM agrees to be bound to the Subcontractor by the terms of the herein and before described documents and to assume to the Subcontractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the CM, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority. The Subcontractor shall preserve and protect the rights of the City of Worcester under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall be subject to the Record Retention requirements as set forth in the Contract Documents.

2. The CM agrees to begin, prosecute and complete the entire work specified by the Awarding Authority in an orderly manner so that the Subcontractor will be able to begin, prosecute and complete the work described in this subcontract; and, in consideration thereof, upon notice from the CM, either oral or in writing, the Subcontractor agrees to begin, prosecute and complete the work described in this Subcontract in an orderly manner and with due consideration to the date or time specified by the Awarding Authority for the completion of the entire work.

3. The Subcontractor agrees to furnish to the CM within a reasonable time after the execution of this subcontract, evidence of workmen's compensation insurance as required by law and evidence of public liability and property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the CM.

4. The CM agrees that no claim for services rendered or materials furnished by the CM to the Subcontractor shall be valid unless written notice thereof is given by the CM to the Subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.

5. The Subcontractor agrees that it shall enter into similar agreements, as this, with its Subcontractors, except to the extent that provisions contained herein are by their terms or by law applicable only to the CM and/or Contractor.

6. The CM agrees that it has provided to the Subcontractor, prior to the execution of this Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Subcontract. The Subcontractor agrees that it shall similarly make copies of such Contract Documents available to its Subcontractors.

7. In the event of termination of the Contract due to the default of the CM or for any other reason, the City of Worcester shall have the right (but shall have no obligation) to assume, and/or accept assignment of and further assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the CM under the Subcontract with such Subcontractor. In the event of such assumption or assignment by the City of Worcester, the Subcontractor shall have no claim against the City of Worcester or such third party for work performed by such Subcontractor or other matters arising prior to termination of the Contract, and the DCAM or such third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after such assumption or assignment.

8. Nothing contained herein, shall be construed to create any contractual relationship between the Subcontractor and the City of Worcester.

9. This agreement is contingent upon the execution of a Contract for Construction Management Services between the CM and the Awarding Authority for the complete work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above-written.

SEAL ATTEST

_____ _____
(Name of Subcontractor)

By: _____

SEAL ATTEST

_____ _____
(Name of CM)

By: _____

_____
(City and State)

THIS FORM MAY BE REPRODUCED

APPENDIX E

COMMONLY USED FORMS

- Procedure for Payment to Contractors (CM)
- Payment Voucher Input Form
- Requisition for Payment (CM) (DCAM Form S1b) and Instructions
- Instructions Regarding Change Orders and Contract Modifications (DCAM Form 13)
- Daily Time and Material Report for Change Orders
- Request and Agreement for a Change in the Plans, Specifications and/or Contract (DCAM Form 5)
- Notice of Intent
- Contractor's Weekly Workforce Report
- Minorities/Women in Contractor's Weekly Workforce Report
- Weekly Payroll Report Form and Statement of Compliance
- Quarterly Projected Workforce Table
- Certification of Payment by Contractor to MBE/WBE and Instructions
- Certificate of Completion by Minority/Women Business Enterprise
- Form for Transfer of Title (Work Not Incorporated, DCAM Form 16)
- Certificate of Agency Use and Occupancy -E-1
- Certificate of Final Inspection, Release and Acceptance - E-2

SECTION 9. CSI DIVISION - 0 - CM@RISK SUPPLEMENTARY GENERAL CONDITIONS

CITY OF WORCESTER

SUPPLEMENTARY GENERAL CONDITIONS

STATUTORY PROVISIONS FOR MASSACHUSETTS

PUBLIC CONSTRUCTION CONTRACTS

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3.3 **Construction Managers's Accounting Method Requirements**, M.G.L. Chapter 30, Section 39R

3.4 **Construction Managers's Accounting Method Requirements**, M.G.L. Chapter 30, Section 39R

3.5 **Construction Managers's Accounting Method Requirements**, M.G.L. Chapter 30, Section 39R

3.6 **Construction Managers's Accounting Method Requirements**, M.G.L. Chapter 30, Section 39R

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CITY OF WORCESTER

SUPPLEMENTARY GENERAL CONDITIONS

STATUTORY PROVISIONS FOR MASSACHUSETTS

PUBLIC CONSTRUCTION CONTRACTS

The following provisions are required by or are intended to be consistent with requirements of Massachusetts's statutes governing public construction contracts in the Commonwealth of Massachusetts (hereinafter referred to as the "Commonwealth"). Any other provisions required by statute to be included herein shall be deemed to be so included. In addition, the parties recognize that other rights, duties, and obligations with respect to public construction contracts are provided for by statute, notwithstanding the fact that they are not provided for in the Contract Documents. In case of conflict between the provisions of these Supplementary General Conditions and other provisions in the Contract Documents, the provisions of these Supplementary General Conditions shall govern. In case of conflict between the provisions of these Supplementary General Conditions and the provisions of any applicable statute, the statutory provisions shall govern. Where the term "Awarding Authority" appears in the following sections, it shall be taken as meaning the Owner.

ARTICLE 1 - PAYMENT, CONTRACT ADMINISTRATION, etc.

1.1 "Or Equal" Clause: (Statutory reference: M.G.L. Chapter 30, Section 39M(b)). This Section 1.1 applies to every contract for the construction, reconstruction or repair of any public work or for the purchase of any material by the Commonwealth, any political subdivision thereof, or any county, city, town, district or housing authority (above certain dollar limits, as stated in the statute), and to contracts awarded pursuant to M.G.L. Chapter 149, Sections 44A through 44H. The said Sections 44A through 44H apply to every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a department, agency, board, commission, authority, or other instrumentality or the Commonwealth or political subdivision thereof, or two or more subdivisions thereof, but not including the Massachusetts Bay Transportation Authority, estimated to cost more than a dollar amount set forth in M.G.L. Chapter 149, Section 44A.

1.1.1 Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the words "or approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if, in the opinion of the Architect:

(1) It is at least equal in quality, durability, appearance, strength, and design;

(2) It performs at least equally the function imposed in the general design for the work;

(3) It conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the specifications.

1.1.2 Any structural or mechanical changes made necessary to accommodate substituted equipment under this section shall be at the expense of the Contractor or Subcontractor

responsible for the work item. See other sections of General and Supplementary Conditions for procedures to be used in determining compliance with the standards of this section.

1.2 Delays: (Statutory reference: Chapter 30, Section 39O). This Section 1.2 applies to every contract subject to M.G.L. Chapter 30, Section 39M and to every contract subject to Chapter 149, Sections 44A through 44H.

1.2.1 Except as otherwise provided by law and by this Section 1.2, the Contractor shall not be entitled to damages on account of any hindrances or delays, avoidable or unavoidable; but if such delay be occasioned by the Awarding Authority, the Contractor may be entitled to an extension of time only, in which to complete the work, to be determined by the Architect.

(1) The Awarding Authority may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the Awarding Authority; provided, however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the Awarding Authority to act within a time as may be otherwise specified in this contract and without the fault or negligence of the Contractor, the Awarding Authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit or overhead to the Contractor on such increase; and provided further, that the Awarding Authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(2) The Contractor must submit the amount of a claim under provision (a) to the Awarding Authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract, and except for costs due to a suspension order, the Awarding Authority shall not approve any costs in the claim incurred more than twenty days before the Contractor notified the Awarding Authority in writing of the act or failure to act involved in the claim.

(a) In the event a suspension, delay, interruption or failure to act of the Awarding Authority increases the cost of performance of any Subcontractor, that Subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the Contractor against the Awarding Authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the Contractor or the Subcontractor may have against each other.

1.3 Deviations: (Statutory reference: M.G.L. Chapter 30, Section 39I). This Section 1.3 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the Commonwealth or any political subdivision thereof.

1.3.1 The Contractor shall perform all the work required by this contract in conformity with the Drawings and Specifications contained herein. No willful and substantial deviation from said Drawings and specifications shall be made unless authorized in writing by the Awarding Authority or by the Engineer or Architect in charge of the work who is duly authorized by the Awarding Authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract, such deviation from the Drawings or Specifications may be authorized by a written order of the Awarding Authority or such Engineer or Architect so authorized to approve such deviation. Within thirty (30) days thereafter, such written order shall be confirmed by a certificate of the Awarding Authority stating: (1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefore (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is the same cost and quality, or that an equitable adjustment has been agreed upon between the Awarding Authority and the Contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the Awarding Authority.

1.3.2 Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

1.4 Finality of Decisions by Awarding Authority or Architect: (Statutory reference: M.G.L. Chapter 30, Section 39J). This Section 1.4 applies to every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the Commonwealth or by any county, city, district, board, commission, or other public body, when the amount of the contract exceeds the amount stated in M.G.L. Chapter 30, Section 39J.

1.4.1 Notwithstanding any contrary provision of this contract, no decision by the Awarding Authority or by the Architect on a dispute, whether of fact or of law, arising under said contract shall be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily, is unsupported by substantial evidence, or is based upon error of law.

1.5 Differing Site Conditions: (Statutory reference: M.G.L. Chapter 30, Section 39N). This Section 1.5 applies to every contract subject to M.G.L. Chapter 30, Section 39M and to every contract subject to M.G.L. Chapter 149, Sections 44A through 44H.

1.5.1 If, during the progress of the work, the Contractor or the Awarding Authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the Drawings or indicated in the Contract Documents, either the Contractor or the Awarding Authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible

after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the Awarding Authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the Drawings or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Drawings and Contract Documents and are such a nature as to cause an increase or decrease in the cost of the work, the Awarding Authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

1.6 Timely Decision by Awarding Authority: (Statutory reference: M.G.L. Chapter 30, Section 39P). This Section 1.6 applies to every contract subject to M.G.L. Chapter 30, Section 39M, and to every contract subject to M.G.L. Chapter 149, Sections 44A through 44H.

1.6.1 In every case in which this contract requires the Awarding Authority, any Official, its Architect or Engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, the decision shall be made promptly and, in any event, no later than thirty (30) days after the written submission for decision; but if such decision requires extended investigation and study, the Awarding Authority, the Official, Architect or Engineer shall, within thirty (30) days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty (30) day period and the date by which the decision will be made.

1.7 Certificate of Appropriation: (Statutory reference: M.G.L. Chapter 44, Section 31C). This Section 1.7 applies to contracts for construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public work by any city or town costing more than the amount set forth in M.G.L. Chapter 44, Section 31C.

1.7.1 This Contract shall not be deemed to have been made until the auditor or accountant or other officer of the city or town having similar duties has certified thereon that an appropriation in the amount of this contract is available therefore and that an officer of the city, town, or Awarding Authority has been authorized to execute said contract and approve all requisitions and change orders. No order to the Contractor for a change in or addition to the work, whether in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the Contractor is willing to perform without any increase in the contract price, shall be deemed to be given until the auditor or accountant, or other officer of the Awarding Authority having similar duties, has certified thereon that an appropriation in the amount of such order is available therefore; but such certificate shall not be taken as an admission by the Awarding Authority of its liability to pay for such work. The certificate of the auditor or accountant or other officer of the Awarding Authority having similar duties, that an appropriation in the amount of this contract or in the amount of such order is available shall bar any defense by the Awarding Authority on the ground of insufficient appropriation.

1.8 Method of Payment: (Statutory reference: M.G.L. Chapter 30, Section 39K). This Section 1.8 applies to every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the Commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than two thousand dollars ($2,000).

1.8.1 Within fifteen (15) days after receipt from the Contractor, at the place designated by the Awarding Authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the Contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the Contractor has title or to which a Subcontractor has title and has authorized the Contractor to transfer title to the Awarding Authority, less (1) a retention based on its estimate of the full value of its claims against the Contractor and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Section 1.10 of these Supplementary General Conditions, and less (3) a retention not exceeding five (5) percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five (65) days after (a) the Contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the Awarding Authority, less than one percent of the original contract price, or (b) the Contractor substantially completes the work and the Awarding Authority takes possession for occupancy, whichever occurs first, the Awarding Authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the Contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Section 1.10 of these Supplementary General Conditions, or based on the record payments by the Contractor to the Subcontractors under this contract if such record of payment indicates that the Contractor has not paid Subcontractors as provided in Section 1.10. If the Awarding Authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three (3) percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen (15) days after receipt of such periodic estimate from the Contractor, at the place designated by the awarding authority if such a place is so designated. The Contractor agrees to pay to each Subcontractor a portion of any such interest paid in accordance with the amount due each Subcontractor.

1.8.2 The Awarding Authority may make changes in any periodic estimate submitted by the Contractor, and the payment due on said periodic estimate shall be computed in accordance with the change so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment

computed in accordance with the changes made, as provided herein; provided, that the Awarding Authority may, within seven (7) days after receipt, return to the Contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter.

1.8.3 All periodic estimates shall be submitted to the Awarding Authority, or to its designee as set forth in writing to the Contractor, and the date of receipt by the Awarding Authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each subtrade and each sub-subtrade, listed in the sub-bid form as required by the specifications, and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the Awarding Authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

1.8.4 A certificate of the Architect to the effect that the Contractor has fully or substantially completed the work shall, subject to the provisions of Section 1.4 of these Supplementary General Conditions, be conclusive for the purposes of this Section 1.8.

1.8.5 Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a completed and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination on the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149.

1.9 Method of Payment: (Statutory reference: M.G.L. Chapter 30, Section 39G). This Section 1.9 applies to every contract for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways; including bridges and other highway structures, sewers and water mains, airports and other public works entered into with the Commonwealth, or any agency or political subdivision thereof.

1.9.1 Upon substantial completion of the work required by a contract with the Commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the Awarding Authority its certification that the work has been substantially completed. Within twenty-one (21) days thereafter, the Awarding Authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The Awarding Authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the Awarding Authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one (21) day period, the contractor's certification shall take effect as the Awarding Authority's declaration that the work has been substantially completed.

1.9.2 Within sixty-five (65) days after the effective date of a declaration of substantial completion, the Awarding Authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quality and price of the work done and all but one (1) per cent retainage on that work, including the quantity, price and all but one (1) percent retainage for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The Awarding Authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payments filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to Section 1.10, but no contract subject to said Section 1.10 shall contain any other provision authorizing the Awarding Authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

1.9.3 If the Awarding Authority fails to prepare and send to the contractor any substantial completion estimate required by section 1.9.2, on or before the date herein above set forth, the Awarding Authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate, at the rate of three (3) percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the Awarding Authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefore, whichever occurs first. The Awarding Authority shall include the amount of such interest in the substantial completion estimate.

1.9.4 Within fifteen (15) days after the effective date of the declaration of substantial completion, the Awarding Authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five (45) days after the receipt of such list or before the then

contract completion date, whichever is later. If the contractor fails to complete such work within such time, the Awarding Authority may, subsequent to seven (7) day's written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

1.9.5 Within thirty (30) days after receipt by the Awarding Authority of a notice from the contractor stating that all of the work required by the contract has been completed, the Awarding Authority shall prepare and forthwith send to the contractor for acceptance, a final estimate for the quantity and price of the work done and all retainage on that work less the payments made to date, unless the Awarding Authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the Awarding Authority fails to prepare and sends to the contractor the final estimate within thirty (30) days after receipt of notice of completion, the Awarding Authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth (30th) day after such completion until the date on which the Awarding Authority sends the final estimate to the contractor for acceptance or the date of payment therefore, whichever occurs first, provided that the Awarding Authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided.

1.9.6 The Awarding Authority shall pay the amount due pursuant to any periodic substantial completion or final estimate within thirty-five (35) days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth (35) day to the date of payment. In the case of periodic payments, the Awarding Authority may deduct from its payment a retention based on its estimate of the fair value of its claim against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of Section 1.10, and a retention to secure satisfactory performance of the contractual work not exceeding five (5) percent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under Section 1.10; provided, that a five percent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

1.9.7 No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the Awarding Authority to approve a quantity and amount of, all or part of any work item or extra work item.

1.9.8 Substantial completion, for the purpose of this Section 1.9, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one (1) percent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.

1.10 Direct Payment: (Statutory reference: M.G.L. Chapter 30, Section 39F). This Section 1.10 applies to every contract awarded pursuant to M.G.L. Chapter 149, Sections 44A through 44H, and (with the exception of Subsection 1.10.9) to every contract awarded pursuant to M.G.L. Chapter 30, Section 39M.

1.10.1 Forthwith after the Contractor receives payment on account of a periodic estimate, the Contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that Subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

1.10.2 Not later than the sixty-fifth day after each Subcontractor substantially completes the work in accordance with the Drawings and Specifications, the entire balance due under the subcontract, less amounts retained by the Awarding Authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the Subcontractor; and the Awarding Authority shall pay that amount to the Contractor. The Contractor shall forthwith pay to the Subcontractor the full amount received from the Awarding Authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

1.10.3 Each payment made by the Awarding Authority to the Contractor pursuant to Subsections 1.10.1 and 1.10.2 of this Section 1.10 for the labor performed and the materials furnished by a Subcontractor shall be made to the Contractor for the account of that Subcontractor; and the Awarding Authority shall take reasonable steps to compel the Contractor to make each such payment to each such Subcontractor. If the Awarding Authority has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the Contractor or which is to be included in a payment to the Contractor for payment to the Subcontractor as provided in Subsections 1.10.1 and 1.10.2, the Awarding Authority shall act upon the demand as provided in this Section 1.10.

1.10.4 If, within seventy (70) days after the Subcontractor has substantially completed the subcontract work, the Subcontractor has not received from the Contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount retained by the Awarding Authority as to the estimated cost of completing the incomplete and unsatisfactory items of work, the Subcontractor may demand direct payment of that balance from the Awarding Authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the Awarding Authority, and a copy shall be delivered to or sent by certified mail to the Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the Subcontractor has substantially completed the subcontract work. Within ten (10) days after the Subcontractor has delivered or so mailed the demand to the Awarding Authority and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be a sworn statement delivered to or sent by

certified mail to the Awarding Authority, and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the Subcontractor.

1.10.5 Within fifteen (15) days after receipt of the demand by the Awarding Authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the Awarding Authority shall make direct payment to the Subcontractor of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor, less any amount (I) retained by the Awarding Authority as the estimated cost of completing the incomplete or unsatisfactory items of work,(ii) specified in any court proceedings barring such payment, or (iii) disputed by the Contractor in the sworn reply; provided that the Awarding Authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by Subsection 1.10.4. The Awarding Authority shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deduction from direct payments made as provided in parts (I) and (ii) of this Subsection.

1.10.6 The Awarding Authority shall forthwith deposit the amounts deducted from a direct payment as provided in part (iii) of Subsection 1.10.5 in an interest-bearing joint account in the names of the Contractor and the Subcontractor in a bank in Massachusetts selected by the Awarding Authority or agreed upon by the Contractor and the Subcontractor and shall notify the Contractor and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the Subcontractor or as determined by decree of a court of competent jurisdiction.

1.10.7 All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to Subsection 1.10.6 shall be made out of amounts payable to the Contractor at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts which later become payable to the Contractor and in the order or receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the Contractor to the extent of such payment.

1.10.8 The Awarding Authority shall deduct from payments to a Contractor amounts, which together with the deposits in interest-bearing accounts pursuant to Subsection 1.10.6, are sufficient to satisfy all unpaid balances of demands for direct payments received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.

1.10.9 If the Subcontractor does not receive payment as provided in Subsection 1.10.1 or if the Contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the Subcontractor and the Subcontractor does not receive

payment for same when due less the deductions provided for in Subsection 1.10.1, the Subcontractor may demand direct payment by following the procedure in Subsection 1.10.4 and the Contractor may file a sworn reply as provided in that same Subsection. A demand made after the first day of the month following that for which the Subcontractor performed or furnished the labor and materials for which the Subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the Contractor. Thereafter the Awarding Authority shall proceed as provided in Subsections 1.10.5, 1.10.6, 1.10.7 and 1.10.8.

1.10.10 Any assignment by a Subcontractor of the rights under this Section to a Surety company furnishing a bond under the provisions of M.G.L. Chapter 149, Section 29 shall be invalid. The assignment and subrogatierior court against the Awarding Authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this section. M.G.L. Chapter 231, Sections 59 and 59B shall apply to such petitions. The Court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to Sections 59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal there from as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such price in equity in the superior court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in Subsection 1.10.6 by a petition in equity in the superior court against the Awarding Authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this section. M.G.L. Chapter 231, Sections 59 and 59B shall apply to such petitions. The Court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to Sections 59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal there from as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a Subcontractor filing a demand for direct payment for which no funds due the Contractor are available for direct payment shall have a right to file a petition in a court of equity against the Awarding Authority claiming a demand for direct payment is premature, and such Subcontractor

must file the petition before the Awarding Authority has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of Subsection 1.10.5 and in Subsection 1.10.6.

1.10.11 "Subcontractor" as used in this Section 1.10 (I) for contracts awarded as provided in M.G.L. Chapter 149, Sections 44A-44H, inclusive, shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the Contractor, and (ii) for contracts awarded as provided in M.G.L. Chapter 30, Section 39M(a), shall mean a person approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor.

1.10.12 A Contractor or a Subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in Subsection 1.10.6 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in Subsection 1.10.6 by a petition in equity in the superior court against the Awarding Authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this section. M.G.L. Chapter 231, Sections 59 and 59B shall apply to such petitions. The Court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to Sections 59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal there from as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a Subcontractor filing a demand for direct payment for which no funds due the Contractor are available for direct payment shall have a right to file a petition in a court of equity against the Awarding Authority claiming a demand for direct payment is premature, and such Subcontractor must file the petition before the Awarding Authority has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of Subsection 1.10.5 and in Subsection 1.10.6.

1.10.13 In any petition to collect any claim for which a Subcontractor has filed a demand for direct payment the court shall, upon motion of the Contractor, reduce by the amount of any deposit of a disputed amount by the Awarding Authority as provided in part (iii) of Subsection 1.10.5 and in subsection 1.10.6 any amount held under a trustee writ or pursuant to a restraining order or injunction.

1.11 Discharge or Release of Bonds (Statutory reference: M.G.L. Chapter 30, Section 40). This Section 1.11 applies to every contract awarded for the construction or repair of public buildings or other public works.

1.11.1 Bonds given to the Commonwealth, any county, city, town or political subdivision to secure the performance of contracts for the construction or repair of public buildings or other public works may be discharged or released by the Awarding Authority, upon such terms as it deems expedient, after the expiration of one (1) year from the time of completion, subject to Section 39 K, of the work contracted to be done; provided that no claim filed under said bond is pending, and provided further, that no such bonds shall be discharged or released prior to the expiration of all special guarantees provided for in the contract unless new bonds in substitution therefore specifically relating to the unexpired guarantees shall be taken.

ARTICLE 2 - WAGES AND EMPLOYMENT PRACTICES

2.1 Preference To Veterans and Citizens In Public Works; Rate of Wages: (Statutory reference: M.G.L. Chapter 149, Section 26) This Section 2.1 applies to every contract or subcontract for the construction of public works by the Commonwealth or by a county, town or district.

2.1.1 In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment, who are veterans as defined in M.G.L. Chapter 4, Section 7, Clause 43, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect. Each county, town or district in the construction of public works, or persons contracting or subcontracting for such works, shall give preference to veterans and citizens who are residents of such county, town or district.

2.1.2 The rate per hour of the wages paid to said mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works shall not be less than the rate or rates of wages to be determined by the Commissioner of Labor and Industries as hereinafter provided; provided that the wages paid to laborers employed on said works shall not be less than those paid to laborers in the municipal service of the town or towns where said works are being constructed; provided further, that where the same public work is to be constructed in two (2) or more towns, the wages paid to laborers shall not be less than those paid to laborers in the municipal town paying the highest rate; provided further, that if, in any of the towns where the works are to be constructed, a wage rate or wage rates have been established in certain trades and occupations by collective agreements or understandings between organized labor and employers, the rate or rates to be paid on said works shall not be less than the rates so established; provided further, that in towns where no such rate or rates have been established, the wages paid to mechanics, teamsters, chauffeurs and laborers on public works shall not

be less than the wages paid to the employees in the same trades and occupations by private employers engaged in the construction industry. This section shall also apply to regular employees of the Commonwealth or a county, town or district, when such employees are employed in the construction, addition to or alteration of public buildings for which special appropriations of more than one thousand ($1,000.00) dollars are provided. Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

2.2 List of Jobs; Classifications; Determination of Rate of Wages; Schedule: (Statutory reference: M.G.L. Chapter 149, Section 27). This Section 2.2. applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

2.2.1 The Commissioner of Labor and Industries shall prepare, for the use of such public officials or public bodies whose duty it shall be to cause public works to be constructed, a list of the several jobs usually performed on various types of public works upon which mechanics and apprentices, teamsters, chauffeurs and laborers are employed. The Commissioner shall classify said jobs, and he may revise such classifications from time to time, as he may deem advisable. Prior to awarding a contract for the construction of public works, said public official or public body shall submit to the Commissioner a list of the jobs upon which mechanics and apprentices, teamsters, chauffeurs and laborers are to be employed, and shall request the Commissioner to determine the rate of wages to be paid on each job. The Commissioner, subject to the provisions of Section 2.1 of these Supplementary General Conditions, shall proceed forthwith to determine the same, and shall furnish said official or public body with a schedule of such rate or rates of wages as soon as said determination shall have been made. In advertising or calling for bids for said works, the Awarding Authority or public body shall incorporate said schedule in the advertisement or call for bids by an appropriate reference thereto, and shall furnish a copy of said schedule without cost, to any person requesting the same. Said schedule shall be made a part of the contract for said works and shall continue to be the minimum rate or rates of wages for said employees during the life of the contract. Any person engaged in the construction of said works shall cause a legible copy of said schedule to be kept posted in a conspicuous place at the site of said works during the life of the contract. The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in the previous section, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction. Note: The Awarding Authority does not guarantee the accuracy of any schedule of wage rates furnished to the Contractor hereunder, and the Contractor shall be responsible for ascertaining the prevailing wages in the area where the work will be performed.

2.3 Employment Records To Be Kept By Contractor, Subcontractors; Statement of Compliance: (Statutory reference: M.G.L. Chapter 149, Section 27B). This Section 2.3 applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

2.3.1 Every Contractor, Subcontractor or public body engaged in said public works to which Section 2.3 of these Supplementary General Conditions applies shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee and shall furnish to the Commissioner of Labor and Industries, upon his request, a copy of said record, signed by the employer of his authorized agent under the penalties of perjury. Such records shall be open to inspection by any authorized representative of the Department of Labor and Industries at any reasonable time, and as often as may be necessary.

2.3.2 Each such Contractor, Subcontractor or public body shall preserve its payroll records for a period of three (3) years from the date of completion of the contract.

2.3.3 Each such Contractor, Subcontractor or public body shall furnish to the Commissioner of Labor and Industries within fifteen (15) days after completion of its portion of the work a statement, executed by the Contractor, Subcontractor, or public body who supervises the payment of wages, in the following form.

STATEMENT OF COMPLIANCE

I_____,
(Name of Signatory Party) (Title)

Do hereby state:

That I pay or supervise the payment of the persons employed by,

_____,
(Contractor, Subcontractor or Public Body)

On the_____ and that all mechanics
(Building or Project)

And apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of Sections 26 and 27 of Chapter 149 of the General Laws.

Signature _____

Title _____

The above-mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the Contractor for such inspections.

2.4 Wages Paid to Operators of Trucks and Other Equipment: (Statutory reference: M.G.L. Chapter 149, Section 27F). This Section 2.4 applies to every contract for the construction of public works by the Commonwealth, or by a county, city, town or district.

2.4.1 Prescribed rates of wages, as determined by the Commissioner of Labor and Industries, shall be paid to the operators of all trucks, vehicles or equipment employed on the Project. Said rates of wages shall be requested of said Commissioner by the Awarding Authority and shall be furnished by the Commissioner in a schedule containing the classification of jobs, and the rate of wage to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employers and employees, the amount of such payments shall be paid directly to said operators.

2.5 Reserve Police Officers: (Statutory reference: M.G.L. Chapter 149, Section 34B). This Section 2.5 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the Commonwealth or any political subdivision thereof.

2.5.1 The contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wages paid to regular police officers in such city or town.

2.6 Eight-Hour Day, etc.: (Statutory reference: M.G.L. Chapter 149, Sections 30, 34, and 34A). This Section 2.6 applies only to contracts, which are subject to the provisions of the aforesaid Sections of the Massachusetts General Laws.

2.6.1 No laborer, worker, mechanic, foreman or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight (8) hours in any one (1) day or more than forty-eight (48) hours in any one (1) week, or more than six (6) days in any one (1) week, except in cases of extraordinary emergency.

2.7 Lodging, etc.: (Statutory reference: M.G.L. Chapter 149, Section 25). This section 2.7 applies to every contract for the doing of public work with the Commonwealth, a county, city or town, or with a department, board, commission, or officer acting therefore.

2.7.1 Every employee under this contract shall lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board or trade at a particular place or with a particular person.

2.8 Access to Contractor's Records: (Executive Order No. 195). This Section 2.8 applies to every contract for the purchase of services or materials by any agency, bureau, board, commission, institution, or department of the Commonwealth or a municipal contract funded, in whole or in part, by the Commonwealth.

2.8.1 The Governor or his Designee, the Secretary of Administration and Finance, and the State Auditor or his Designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of data of the Contractor which pertain to the performance and requirements of this contract.

2.9 Worker's Compensation Insurance: (Statutory reference: M.G.L. Chapter 149, Section 34). This Section 2.9 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the Commonwealth or any political subdivision thereof.

2.9.1 The Contractor shall, before commencing performance of the contract, provide by insurance for the payment of and the furnishing of other benefits under M.G.L. Chapter 152 to all persons to be employed under the contract, and the Contractor shall continue such insurance in full force and effect during the term of the contract. Sufficient proof of compliance with this Section 2.9 must be furnished at the time of execution of this contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to other party and to the Awarding Authority at least fifteen (15) days prior to the intended effective date thereof, which date shall be expressed in said notice.

ARTICLE 3 - CONTRACTOR'S ACCOUNTING METHOD REQUIREMENTS

3.1 (Statutory reference: M.G.L. Chapter 30, Section 39R). This Article 3 applies to "Contracts" and "Contractors", as defined in Subsection 3.1.1 and 3.1.2, below.

3.1.1 "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to Section 39M of Chapter 30, Sections 44A-44J inclusive, of Chapter 149, and Sections 30B-30P, inclusive, of Chapter 7.

3.1.2 "Contract" means any contract awarded or executed pursuant to Sections 30B-30P, inclusive, of Chapter 7, and any contract awarded or executed pursuant to Section 39M of Chapter 30, or Sections 44A-44H, inclusive, of Chapter 149, which is for an amount or estimated amount that exceeds the dollar amount set forth in M.G.L. Chapter 30, Section 39R.

3.1.3 "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

3.1.4 "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall

not be confined to the relationships existing in connection with the filing of reports with the Awarding Authority.

3.1.5 "Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a CERTIFIED opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

3.1.6 "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he/she has made and sets his/her opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed, the reasons therefore shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the auditing financial statement is a true and complete statement of the financial condition of the Contractor.

3.1.7 "Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

3.1.8 Accounting terms, unless-otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

3.2 Subsection 3.1.2 hereof notwithstanding, every agreement or contract awarded or executed pursuant to Sections 30B-30P, inclusive, of Chapter 7, and pursuant to Section 39M of Chapter 30 or to Sections 44A-44H, inclusive, of Chapter 149, shall provide that:

3.2.1 The Contractor shall make, and keep for at least six (6) years after final payment, books, records, and accounts, which in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.

3.2.2 Until the expiration of six (6) years after final payment, the Awarding Authority, office of inspector general, and the Deputy Commissioner of Capital Planning and Operations shall have the right to examine any books, documents, papers or records of the Contractor or his/her Subcontractors that directly pertain to, and involve transactions relating to, the Contractor or his/her Subcontractors.

3.2.3 If the agreement is a contract as defined herein, the Contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the Awarding Authority, including in his/her description the date of the change and reasons therefore, and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes.

3.2.4 If the agreement is a contract as defined herein, the Contractor has filed a statement of management on internal accounting controls as set forth in Section 3.3 below prior to the execution of the contract.

3.2.5 If the agreement is a contract as defined herein, the Contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in Section 3.5 below.

3.3 Every Contractor awarded a contract shall file with the Awarding Authority a statement of management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:

3.3.1 Transactions are executed in accordance with management's general and specific authorization;

3.3.2 Transactions are recorded as necessary;

(1) To permit preparation of financial statements in conformity with generally accepted accounting principles, and

(2) To maintain accountability for assets;

3.3.3 Access to assets is permitted only in accordance with management's general or specific authorization;

3.3.4 The recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

3.4 Every Contractor awarded a contract shall also file with the Awarding Authority a statement prepared and signed by an independent certified public accountant, stating that he/she has examined the statement of management on internal accounting controls, and expressing an opinion as to:

3.4.1 Whether the representations of management in response to this section and Section 3.2 above are consistent with the result of management's evaluation of the system of internal accounting controls; and

3.4.2 Whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts, which would be material when measured in relation to the applicant's financial statements.

3.5 Every Contractor awarded a contract by the Commonwealth or by any political subdivision thereof shall annually file with the Awarding Authority during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report.

ARTICLE 4 - MISCELLANEOUS

4.1 Weather Protection: This Section 4.1 applies to every contract subject to M.G.L. Chapter 149, Section 44A.

4.1.1 The Contractor shall install weather protection and provide adequate heat in the protected area from November 1 to March 31, as required by M.G.L. Chapter 149, Section 44F(1).

4.2 Form for Sub-contract: This Section 4.2 applies to every contract subject to M.G.L. Chapter 149, Section 44A.

4.2.1 The Contractor when sub-contracting with sub-bidders filed pursuant to M.G.L. Chapter 149, Section 44F shall use the form for sub-contract in Chapter 149, Section 44F(4)(c).

4.3 Foreign Corporations: This Section 4.3 applies to every contract with the Commonwealth, a county, city, town, district, board, commission, or other public body for the construction, reconstruction, alteration, remodeling, repair, or demolition of any public building or other public works.

4.3.1 The Contractor, if a foreign corporation, shall comply with M.G.L. Chapter 181, Sections 3 and 5, and Chapter 30, Section 39L.

4.4 Shoring: (Statutory reference: M.G.L. Chapter 149, Section 129A). This Section 4.4 applies to every construction project carried on by any city, town, county, or other subdivision of the Commonwealth in which a trench is to be dug to a depth of six and one-half (6 ½) feet which will be open less than forty-eight (48) hours, and except for digging of graves.

4.4.1 Trenches shall be shored and braced in conformity with rules and regulations relating thereto, adopted and enforced by the Department of Labor and Industries.

4.5 Certification of Compliance with Tax Laws: (Statutory reference: M.G.L. Chapter 62C, Section 49A). This Section 4.5 applies to contracts for goods or services furnished by any department, board, commission, division, authority, district or other agency of the Commonwealth or any subdivision of the Commonwealth, including a city, town or district.

4.5.1 By executing this contract, the Contractor certifies, under penalties of perjury, that to the best of his information, knowledge and belief he has complied with all laws of the Commonwealth relating to taxes.

4.6 Verification of Construction Debris Disposal: Worcester Revised Ordinances, Chapter 8, Section 7. This section shall apply to every contract entered into by the City of Worcester for the demolition, renovation, rehabilitation, or alteration of a building or structure.

4.6.1 In furtherance of the requirements set forth in M.G.L. Chapter 40, Section 54, and Section 114.1.3 of the Massachusetts State Building Code, the Code Director shall require any person who obtains a permit for the demolition, renovation, rehabilitation, or alteration of a building or structure to provide verification that the debris resulting from such activities was disposed of at the licensed solid waste facility named in conjunction with the permit application.

4.6.2 The verification required under Section 4.6, above, shall consist of the following:

(1) A dated receipt, signed by the owner/operator of the licensed solid waste disposal facility where the debris was deposited.

(2) The receipt shall contain a description of the debris disposed of, and its weight, or volume.

(3) The permit holder shall also provide the Code Director with an affidavit that the receipt submitted is true and accurate to the best of the permit holder's knowledge.

(4) If the permit holder cannot dispose of the debris at the location indicated, it shall be the permit holder's obligation to obtain an amendment to the permit reflecting the new disposal location. The Code Director shall be so notified, and the permit amended, prior to the disposal of the debris at the new disposal location.

4.6.3 Section 4.6 shall not apply to the construction of a new building or structure.

4.7 Responsible Employer Ordinance: (Worcester Revised Ordinances, Chapter 2, Section 35) This paragraph 4.7 shall apply to every contract entered into by the City of Worcester for the construction, reconstruction, installation, demolition, maintenance or repair of any building , where the contract amount is more than one hundred thousand dollars ($100,000).

4.7.1 The city council hereby finds and determines that taxpayer money is most efficiently and productively spent by awarding construction contracts to firms that include and enforce provisions requiring compliance with state laws governing the payment of prevailing wages, the provision of workers compensation coverage, and the proper classification of individuals as employees and not as independent contractors, as well as provisions concerning health insurance coverage and state-certified apprenticeship programs. The city council hereby further finds and determines that it is appropriate for it to exercise its entrepreneurial discretion by requiring firms that are awarded such contracts to comply with this ordinance because failure to comply is injurious to the life, health, and happiness of individuals employed by such firms and is deleterious to the quality of life in the city where most of such individuals reside.

4.7.2 Every contract awarded by the city under G.L. c.149 and G.L. 149A where the amount of the contract is more than one-hundred thousand dollars, and any subcontract awarded in connection with any such general contract where the amount of such subcontract is more than twenty-five thousand dollars, shall be deemed to incorporate by reference the provisions of sub-parts 4.7.3 (1) through (8) together with the provisions of subsections 4.3.4 and 4.3.5 of this section. Any person, company or corporation shall acknowledge, in writing, receipt of said requirements with their bid or proposal.

4.7.3 All bidders or proposers and all subcontractors and trade contractors, including subcontractors that are not subject to G.L. c.149, Section 44F, under the bidder for projects subject to G.L. c.149, Section 44A(2), and proposers under G.L. c. 149A, shall as a condition for bidding or subcontracting verify under oath and in writing at the time of bidding or subcontracting verify under oath and in writing at the time of budding or submittal in response to and RFP or in any event prior to entering into a subcontract at

any tier, that they comply with the following conditions for bidding or subcontracting and, for the duration of the project, shall comply with the following obligations:

(1) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must comply with the obligations established under G.L. c. 149 to pay the appropriate lawful prevailing wage rates to their employees.

(2) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must at a the time of bidding maintain or participate in a bona fide apprentice training program as defined by G.L. c.23, Sections 11H and 11I for each apprenticable trade or occupation represented in their workforce that is approved by the Division of Apprentice Standards of the Department of Labor and Workforce Development, regardless of whether or not the program qualifies as an employee welfare benefit plan under ERISA, and must register all apprentices with the Division and abide by the apprentice to journeyman ratio for each trade prescribed therein in the performance of any work on the project. This provision does not require the program to be an ERISA plan; the program need only have been approved by the Division of Apprentice Standards. All general bidders or proposers and all trade contractors and sub-bidders at every tier must submit with its bid or proposal an original, stamped Sponsor Verification letter from the Commonwealth of Massachusetts, Department of Labor and Workforce Development – Division Apprentice Standards, issued within the past 90 days, evidencing that at the time of submitting a bid or proposal, the bidder or proposer is currently an Approved Sponsor of Apprentices. Any bid or proposal submitted without the above documentation shall be rejected; ***(Compliance with the Apprentice Training Provision is currently suspended)***

(3) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must maintain appropriate industrial accident insurance coverage for all the employees on the project in accordance with G.L. c. 152;

(4) The bidder or proposer and all trade contractors and subcontractors under the bidder must properly classify employees as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance coverage, unemployment taxes, social security taxes and income tax withholding. (G.L. c.149, Section 148B on employee classification);

(5) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must at the time of bidding certify that, at the time employees begin work at the worksite, all employees will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration, and shall ensure that all employees working at the worksite possess such qualifications at all times throughout the duration of their work on the project and furnish documentation of successful completion of the course;

(6) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must be in compliance with the health and hospitalization requirements of the Massachusetts Health Care Reform law established by Chapter 58 of the Acts

of 2006, as amended, and regulations promulgated under that statute by the Commonwealth Health Insurance Connector Authority.

(7) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must make arrangements to ensure that each employee of every contractor entering or leaving the project individually completes the appropriate entries in a daily sign-in/out log. The sign-in/out log shall include: the location of the project; current date; printed employee name; signed employee name; and the time of each entry or exiting. The log shall contain a prominent notice that employees are entitled under state law to receive the prevailing wage rate for their work on the project. Such sign-in/out logs shall be provided to the City on a daily basis.

(8) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer, prior to bidding or, if not subject to bidding requirements, prior to performing any work on the project, shall sign under oath and provide to the City a certification that they are not debarred or otherwise prevented from bidding for or performing work on a public project in the Commonwealth of Massachusetts or in the City.

4.7.4 A proposal or bid submitted by any general bidder or by any trade contractor or subcontractor under the general bidder or proposer that does not comply with any of the foregoing conditions for bidding shall be rejected, and no subcontract for work outside the scope of G.L. c.149, Section 44F shall be awarded to a subcontractor that does not comply with the foregoing conditions.

4.7.5 All bidders or proposers and all trade contractors and subcontractors under the bidder or proposer who are awarded or who otherwise obtain contracts on the projects subject to G.L. c.149, Section 44A(2) orc.149A, shall comply with each of the obligations set forth in this Section 4.7 for the entire duration of their work on the project, and an officer of each bidder or subcontractor under the bidder shall certify under oath and in writing on a weekly basis that they are in compliance with such obligations.

4.7.6 Any proposer, bidder, trade contractor or subcontractor under the bidder or proposer who fails to comply with any one of the obligations set forth in this Section 4.7 for any period of time shall be, at the sole discretion of the City, subject to one or more of the following sanctions:

(1) cessation of work on the project until compliance is obtained;

(2) withholding of payment due under any contract or subcontract until compliance is obtained;

(3) permanent removal from any further work on the project;

(4) liquidated damages payable to the City in the amount of 5% of the dollar value of the contract.

4.7.7 In addition to the sanctions outlined in subsection 4.7.6 above, a proposer, general bidder or contractor shall be equally liable for the violations of its subcontractor with the exception of violations arising from work performed pursuant to subcontracts that are subject to G.L. c.149, Section 44F. Any contractor or subcontractor that has been

determined by the City or by any court or agency to have violated any of the obligations set forth in this Section 4.7 shall be barred from performing any work on any future projects for six months for a first violation, three years for a second violation and permanently for a third violation.

4.8 Regulation of Construction Noise: (Worcester Revised Ordinances, Chapter 8, Section 34). This section 4.8 shall apply to anyone operating powered construction equipment or delivering construction equipment and/or supplies at any construction site or project within the city of Worcester.

4.8.1 It shall be unlawful for any person, firm, corporation, partnership, or other entity to warm up or operate powered construction equipment or to build, erect, construct, demolish, alter, repair, excavate or engage in hoisting, grading, site work, including tree and brush removal, dredging or pneumatic hammering, or to deliver construction equipment and/or supplies to the site on any building, road, tower, parking lot, machine, pipe, sewer, sidewalk, or any other construction project (hereafter collectively the "construction project"), except between the hours of 7:00 a.m. and 9:00 p.m. on weekdays and Saturday, and between the hours 9:00 a.m. and 7:00 p.m. on Sundays except for "emergency work" which is performed in the interest of public safety or welfare and for which a permit has been issued by the commissioner of Code Enforcement (the Commissioner).

4.8.2 Emergency work permits may be issued in:

(1) Cases or urgent necessity and for the interests of health, safety and convenience of the public. The Commissioner shall consider whether the reasons given for the urgent necessity are valid and reasonable, and whether the health, safety and convenience of the public will be protected or better served by granting the permit requested and whether the manner and amount of loss or inconvenience to the party in interest imposes a significant hardship; or,

(2) Cases where because the location and nature of the work the noise caused by said work will not be heard by anyone not working on the project. The Commissioner shall consider whether supplying machinery and/or materials to the construction project site will cause unreasonable noise along the routes to the construction project site, and whether such activity will impact residential neighborhoods, and shall not grant any emergency work permit unless unreasonable noise in residential areas will be prevented.

(3) Emergency work permits may be issued to the general contractor on a blanket basis that applies to all of the contractors working on the job, or may be issued to specific contractors on the construction project, at the discretion of the Commissioner. Emergency work permits may be issued for not more than one week at a time, and may be renewed for additional one-week periods at the discretion of the Commissioner.

(4) Prior to issuing or reissuing said emergency work permit the Commissioner shall review the work being conducted and all attendant circumstances, and shall

prescribe whatever limitations possible to minimize the generation of noise, and to minimize the impact of noise on the neighbors to the construction project.

(5) Emergency repair work performed by the Department of Public Works and/or any public utility is exempt from this section.

(6) The fee for each such Emergency work permits issued under this section shall be set in accordance with Chapter2, § 24 of these ordinances.

(7) On any project for the construction, construction, installation, demolition, maintenance or repair of any building, or public work, to be funded in whole or in part by city funds, or funds which, in accordance with a federal or state grant, program, or otherwise, the city expends or administers, or any such project to which the city is a signatory to the contract therefore, the provisions of this section shall apply and the same shall be referenced in every invitation to bid for such project and, the following sections shall be contained in every resulting contract there from:

(a) "It shall be a material breach of this contract if the contractor and each subcontractor on shall not at all times adhere to the provisions of § 34 of chapter eight of the Revised Ordinances of the city, by limiting their on-site, noise producing construction and related work to the hours specified by the Ordinance.

(b) A waiver from the above requirements may, in certain circumstances, be granted in accordance with subsections (b), (c) and (d) of § 34 of chapter eight of the Revised Ordinances of the city."

(8) The Commissioner of the Department of Code Enforcement shall have the authority to adopt any rules and regulations he or she deems necessary to implement this section.

(9) Nothing in this section shall be deemed to prevent an individual from performing work on his or her own property, so long as the work is being done by the owner of the property or by direct relatives of the owner, and said work is not being done for profit.

(10) This ordinance may be enforced by any Building Inspector and/or Health and Code Inspector assigned by the Commissioner of the Departments of Public Health and Code Enforcement and the Police Department.

(11) Any violation of this ordinance by any person, firm, corporation, partnership, or other entity, shall be individually punished with a fine of $100.00. Each day upon which a violation of this ordinance occurs shall be considered a separate violation. Employers shall be deemed the violator for violations committed by their employees.

END OF SECTION 003000

IMPORTANT NOTICE TO BIDDERS

** **RESPONSIBLE EMPLOYER ORDINANCE**

and

MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION

BIDDERS MUST COMPLETE FORMS EOO-101 AND REO-101, WHICH ARE PART OF THE BID SUBMISSION

GENERAL BIDDERS, PROPOSERS, TRADE CONTRACTORS, FILED SUBCONTRACTORS, AND NON-FILED SUBCONTRACTORS, AT EVERY TIER, MUST PROVIDE EVIDENCE OF COMPLIANCE WITH THE CITY OF WORCESTER'S RESPONSIBLE EMPLOYER ORDINANCE ("REO") (See, Supplementary General Conditions, Section 4.7).

PLEASE SEE THE FOLLOWING PAGES FOR FURTHER REO REQUIREMENTS.

ALSO INCLUDED IN THIS SECTION IS A COPY OF THE AGREEMENT BETWEEN THE CITY AND THE MASSACHUSETTS COMMISSION AGAINST DISCRIMINATION THAT GOVERN THE ACTIVITIES ADDRESSED BY THE M/WBE BUSINESS ENTERPRISE AND WORKER UTILIZATION PROGRAM AND ITS ASSOCIATED FORMS CONTAINED HEREIN.

Direct any questions about these forms and procedures to:

certifiedpayrollrecords@worcesterma.gov or
purchasing@worcesterma.gov
Joshua Kasuba
KasubaJ@worcesterma.gov
City Hall – Room 201
455 Main Street
Worcester, MA 01608
(508) 799-1220

** This requirement applies to general bids over $150,000 and all subcontractors at every tier exclusive of any pricing threshold.

CITY OF WORCESTER
INITIAL STATEMENT AND CERTIFICATION OF COMPLIANCE
WITH THE RESPONSIBLE EMPLOYER ORDINANCE

PROJECT: **CONTRACTOR:**

ALL GENERAL BIDDERS, PROPOSERS, TRADE CONTRACTORS, SUBCONTRACTORS, INCLUDING SUBCONTRATORS THAT ARE NOT SUBJECT TO G.L. c. 149, § 44F, UNDER THE GENERAL BIDDER FOR PROJECTS SUBJECT TO G.L. c. 149, § 44A(2) OR UNDER PROPOSERS FOR PROJECTS SUBJECT TO G.L. c. 149A, SHALL AS A CONDITION TO SUBMITTING A BID OR A PROPOSAL, OR OTHERWISE AS A CONDITION TO SUBCONTRACTING, VERIFY COMPLIANCE WITH THE FOLLOWING OBLIGATIONS AND SHALL CERTIFY SUCH COMPLIANCE ON A WEEKLY BASIS FOR THE DURATION OF THE PROJECT:

1) That the appropriate lawful Prevailing Wage Rates shall be paid to all employees and the Weekly Payroll Report Form and Statement of Compliance shall be submitted to the Contract Compliance Office on a weekly basis for the entire duration of the project;

2) That the contractor maintains or participates in a bona fide apprentice training program as defined by G.L. c.23, §§11H and 11I for each apprenticeable trade or occupation represented in its workforce that is approved by the Division of Apprentice Training (DAT) of the Dept. of Labor and Workforce Development of the Commonwealth, regardless of whether or not the program qualifies as an employee welfare benefit plan under ERISA, and must register all apprentices with the Division and abide by the apprentice to journeyman ratio for each trade prescribed therein; ***(COMPLIANCE WITH THE APPRENTICE TRAINING PROVISION IS CURRENTLY SUSPENDED-7/24/14)***

3) That appropriate industrial accident insurance coverage shall be furnished and maintained, for the duration of the project, for all its employees employed on the project in accordance with M.G.L. c. 152;

4) That the contractor/company will properly classify employees on the project as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance coverage, unemployment taxes, social security taxes and income tax withholding. (G.L. c.149, §148B on employee classification);

5) That at the time employees begin work at the worksite, each employee will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration;

6) That the contractor/company is in compliance with the health and hospitalization requirements of the Massachusetts Health Care Reform law established by Chapter 58 of the Acts of 2006, as amended, and regulations promulgated pursuant to that statute by the Commonwealth Health Insurance Connector Authority;

7) That the contractor/company, for the duration of the contractor's/company's work on the project, shall make arrangements to ensure that each of its employees entering or leaving the project

CITY OF WORCESTER
INITIAL STATEMENT AND CERTIFICATION OF COMPLIANCE
WITH THE RESPONSIBLE EMPLOYER ORDINANCE

PROJECT: **CONTRACTOR:**

individually completes the appropriate entries in a daily sign-in/sign-out log to be maintained by the contractor/company;

8) That the contractor/company is not debarred or otherwise prevented from bidding for or performing work on a public project in the Commonwealth of Massachusetts or in the city of Worcester

THE UNDERSIGNED ACKNOWLEDGES HE/SHE HAS READ THE ABOVE OBLIGATIONS AND CERTIFIES THE CONTRACTOR'S COMPLIANCE WITH THEM.

Signed as a True Statement under Oath:

_____ **By:** _____
(Bidder/Company) **(Name/Signature)**

Date: _____ **By:**_____
(Print Name and Corporate Title

(Seal)

PROJECT: **CONTRACTOR:**

POST CONTRACT AWARD SUBMISSIONS

THE SUCCESSFUL GENERAL CONTRACTOR, CONSTRUCTION MANAGER AT RISK, TRADE CONTRACTORS AND SUBCONTRACTORS, INCLUDING SUBCONTRATORS THAT ARE NOT SUBJECT TO G.L. c. 149, §44F, UNDER THE GENERAL CONTRACTOR FOR PROJECTS SUBJECT TO G.L. c. 149, §44A(2) OR UNDER THE CONSTRUCTION MANAGER AT RISK FOR PROJECTS SUBJECT TO G.L. c. 149A, SHALL SUBMIT THE FOLLOWING INFORMATION AS OUTLINED BELOW FOR THE DURATION OF THE PROJECT:

1, PRIOR TO EACH EMPLOYEE BEGINNING WORK AT THE WORKSITE, SUBMIT DOCUMENTATION EVIDENCING THE EMPLOYEE'S SUCCESSFUL COMPLETION OF A COURSE IN CONSTRUCTION SAFETY AND HEALTH THAT IS APPROVED BY THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION. A QUALIFYING PROGRAM MUST BE A MINIMUM OF TEN HOURS IN DURATION.

2. ON A DAILY BASIS, SUBMIT DAILY SIGN-IN/SIGN-OUT LOGS THAT HAVE BEEN FILLED OUT BY EACH INDIVIDUAL EMPLOYEE ENTERING OR LEAVING THE WORKSITE. THE LOG SHALL INCLUDE THE FOLLOWING: THE LOCATION OF THE PROJECT; CURRENT DATE; PRINTED EMPLOYEE NAME; SIGNED EMPLOYEE NAME; AND THE TIME OF EACH ENTRY OR EXIT. THE LOG SHALL ALSO INCLUDE A PROMINENT NOTICE THAT EMPLOYEES ARE ENTITLED UNDER STATE LAW TO RECEIVE THE PREVAILING WAGE RATE FOR THEIR WORK ON THE PROJECT.

MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION

FORM EOO-D/102

BIDDERS INFORMATION ON PROCEDURES AND FORMS

To make all contractors aware of their obligation to follow certain procedures and file appropriate reports pertaining to those procedures, the following is an outline of the Minority/Women Business Enterprise and Worker Utilization Program, and the Responsible Employer Ordinance. Also included here is the Affidavit of Acknowledgement and Certification of Compliance, Form E00-101. This form is to be completed and filed as part of your bid.

The following documents are included in this bid:

1. **AFFIDAVIT OF ACKNOWLEDGEMENT AND CERTIFICATION OF COMPLIANCE, E00-101**

   General Contractors, Trade Contractors, Filed Subcontractors and Non-Filed Subcontractors complete and submit this form as part of their bid on all City of Worcester construction projects.

   Each additional subcontractor shall complete this form and submit it to the general contractor who shall forward it to the Contract Compliance Office, **PRIOR** to the subcontractor's beginning work on the project.

2. **SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTI-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM E00-D/3**

   The agreement between the City of Worcester and the Massachusetts Commission Against Discrimination establishing the goals and procedures for the utilization of minority and women owned businesses and minority and women workers on City Construction projects.

3. **RESPONSIBLE EMPLOYER ORDINANCE**
   This Ordinance sets certain minimal requirements for all General Contractors, Trade Contractors, Filed Subcontractors and Non-Filed Subcontractors bidding on City of Worcester construction projects.

4. **SUCCESSFUL BIDDER'S OBLIGATION TO PROCEDURES AND FORMS, EOO-D/103**

   This is a listing of the procedures and forms that will be provided to the successful bidder for use prior to beginning work and at various times throughout the life of the project.

CITY OF WORCESTER
MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION PROGRAM

AFFIDAVIT OF ACKNOWLEDGEMENT and CERTIFICATE OF COMPLIANCE

FORM EOO-101

TO ALL CONTRACTORS:
The Bidder or Proposer and all Trade Contractors and Subcontractors under the Bidder or Proposer must complete and submit this form as part of their bid.

I. THE MINORITY AND WOMEN BUSINESS AND UTILIZATION PROGRAMS

Pursuant to an agreement between the City of Worcester and the Commonwealth of Massachusetts, during the performance of any contract with the City of Worcester, all General Contractors, Trade Contractors, Filed Subcontractors, and Subcontractors are bound by the obligations of the Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program. All contractors and subcontractors if subcontracting any portion of the work are obligated to make a good faith effort to engage 10% minority and 15% women owned businesses. Further, each contractor shall make a good faith effort to maintain a workforce that is 38% people of color and 10% women.

The undersigned hereby certifies that he/she is familiar with the provisions of The Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Programs and agrees to adhere to the provisions therein.

II. This contractor IS ☐ or IS NOT ☐ certified by the State Office of Minority and Women Business Assistance to be a minority or women owned and operated business; and

III. WILL ☐ or WILL NOT ☐ subcontract any portion of this contract.

Project Name: _____ Bid Number_____

Authorized Signature: _____ Business Name_____

Printed Name: _____ Title: _____

Address: _____ Date: _____

THE CITY OF WORCESTER

SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTI-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

I. AGREEMENT

During the performance of this contract, the Contractor or Filed Subcontractor and all subcontractors (herein collectively referred to as the Contractor), for himself/herself, his/her assignees, and successors in interest, agree as follows:

1. In conjunction with the performance of work under this contract, the contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, sex, or handicap. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising; layoff; termination, rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The contractor shall post hereafter in a conspicuous place, available to employees and applicants for employment, notices to be provided by the Commission setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (M.G.L. Chapter 151 B).

2. In connection with the performance of work under this contract, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age, sex, or handicap, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, sex, or handicap. The purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future City public construction projects.

II. OBLIGATION

1. As part of the obligation of remedial action under the foregoing section, the Contractor shall maintain goals on this project no less than 38 percent (38%) people of color employee and 10 percent (10%) women employee hours of the total work hours in each job category including but not limited to, bricklayers, carpenters, cement masons, electricians, iron workers, operating engineers, and those “classes of work” enumerated in section 44C of chapter 149 of the Massachusetts General Laws.

2. In the hiring of minority and women journeymen, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the City, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the City.

III. REPORTS

1. Contractor shall provide a completed **Project Minority / Women & Veteran Business Enterprise Table** at the beginning of the project along with an updated final report at project completion**.** The report will reflect the contributions of each business type to the overall project by dollar amount for all filed and unfiled subcontractors performing work on the project.

2. Records of employment referral orders, prepared by the Contractor, shall be made available to the City on request.

3. The Contractor shall prepare the **Certified Payroll Report on a weekly basis,** which lists the hours worked in each trade by each employee identified as minority, non-minority, male and female. Copies of these shall be provided to the City at the end of each week.

4. Every Contractor and Subcontractor, at any and all tiers, shall complete and submit each week along with the Weekly Payroll Report Form, the **"Weekly Workforce Utilization Form (v3)"** to the Contract Compliance Office.

IV. SUBCONTRACTING WORK

If the Contractor shall use any Subcontractor on any work performed under this contract, affirmative action shall be taken to negotiate with qualified minority and women contractors. This affirmative action shall cover both pre-bid and post-bid periods.

V. EMPLOYMENT

In the employment of journeymen, apprentices, trainees, and advanced trainees, the Contractor shall give preference, first to citizens of the Commonwealth who have served in the armed forces of the United States in time of war and have been honorably discharged there from or released from active duty therein, and who are qualified to perform the work to which the employment relates, and, secondly, to citizens of the Commonwealth generally, and, if such cannot be obtained in sufficient numbers, then to citizens of the United States.

VI. RIGHT OF ACCESS

A designee of the City shall have the right of access to the construction site.

VII. COMPLIANCE WITH REQUIREMENTS

The contractor shall comply with the provisions of Executive Order No. 227 amending and revising Executive Order No. 74, as amended by executive Order No. 16 dated May 1, 1975 and of Chapter 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made part of this contract.

VIII. NON-DISCRIMINATION

The Contractor, in the performance of all work after the award, and prior to completion of the contract work, will not discriminate on the grounds of race, color, religious creed, national origin, age, sex, or handicap in employment practices, in the selection or retention of other contractors or in the procurement of materials and rentals of equipment.

IX. SOLICITATIONS FOR SUBCONTRACTORS, AND FOR THE PROCUREMENT OF MATERIALS AND EQUIPMENT

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or supplies, each entity solicited shall be notified in writing by the contractor of the Contractor's obligation under this contract relative to non-discrimination and affirmative action.

X. CONTRACTOR'S CERTIFICATION

Contractors bidding as General Contractors or Filed Sub-contractors shall certify that they will comply with the minority and women manpower and business enterprise goals and specific affirmative action steps contained in this Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program by signing and submitting with the bid the **Affidavit of Acknowledgement and Certification of Compliance, Form E00-101.**

If any Contractor subcontracts any portion of the work, the Contractor is required to obtain from each Subcontractor, regardless of tier, an Affidavit of Acknowledgement and Certification of Compliance, Form E00-101 **stating** that **it will comply with the minority and women subcontracting and manpower ratios and specific affirmative action steps contained in this Supplemental Equal**
Employment Opportunity Anti-Discrimination and Affirmative Action Program by signing this form and submitting it to the Contractor for submission to the awarding authority not later than five working days following the opening of the bids.

XI. COMPLIANCE – INFORMATION, REPORTS, AND SANCTIONS

1. The Contractor will provide all information and reports required by the City on instructions issued and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the City to affect the employment of personnel. This provision shall apply only to information pertinent to the City's supplementary affirmative action contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the City and shall set forth what efforts have been made to obtain the information.

2. Whenever the City believes the Contractor may not be operating in compliance with the terms of this Section, the City directly, or through its designated agent, shall conduct an appropriate investigation, and confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Section. If the City or its agent finds the Contractor not in compliance, it shall make a
preliminary report of non-compliance and notify such Contractor in writing of such steps as will in the judgment of the City or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the City shall make a final report of non-compliance, and recommend the imposition of one or more of the sanctions listed below. If, however, the City believes the Contractor has taken or is taking every possible measure to achieve compliance, it shall not make final a report on non-compliance. Within fourteen (14) days of the receipt of recommendations of the City, the administering agency shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement.

a. The recovery by the administering agency from the Contractor of l/10 of 1% of the contract award price or $l000.00, whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the administering agency from the Contractor as a back charge against the Subcontractor of l/10 of 1% of the subcontract price, or $400.00, whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply:

b. The suspension of any payment or part thereof due under the contract until such time as the Contractor or any Subcontractor is able to demonstrate compliance with the terms of the contract;

c. The termination, or cancellation, of the contract, in whole or in part, unless the Contractor is able to demonstrate within a specified time his compliance with the terms of the contract;

d. The denial to the Contractor of the right to participate in any further contracts awarded by the administering agency for a period of up to three years.

3. If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that he/she is in compliance with this section, he/she may request the administering agency in consultation with the City, to suspend the sanctions conditionally, pending a final determination by the City as to whether the contractor is in compliance. Upon final determination, based on the recommendations of the adjudicatory body, the City shall either lift the sanctions or reimpose them.

4. Sanctions enumerated under Section XII-2 shall not be imposed except after an adjudicatory proceeding, as that term is used in M.G.L. Chapter 30, has been conducted. No investigation by the City or its agent shall be initiated without prior notice to the Contractor.

XII. SEVERABILITY

The provisions of this Section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decisions of such court shall not affect or impair any of the remaining provisions.

XIII. WAIVER

The City of Worcester reserves the right to waive any stipulation in the M/WBE Program when deemed necessary or appropriate for the general good of the City and its programs.

DEFINITIONS

Contractor - Except where otherwise specifically stated the term “Contractor” shall mean any General Contractor.

City - is the City of Worcester, Massachusetts

M/WBE - is Minority and Women Business Enterprise as certified by the State Office of Minority and Women Business Assistance to be 5l% or more minority or women owned and operated.

RESPONSIBLE EMPLOYER ORDINANCE

and

MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION

==========

FORM E00-D/103

SUCCESSFUL BIDDER'S OBLIGATION TO PROCEDURES AND FORMS

All successful bidders on City of Worcester construction projects will receive a package of procedures and forms that are to be used at specific times throughout the life of the project.
The following is a list of the documents that will be sent to successful bidders when this office is notified that a contract has been, or is about to be, executed.

I. BUILDING TRADES – CONTACT LIST, E00-D/6

When a contractor cannot fulfill the worker utilization percentages, the appropriate building trades locals may be contacted to request assistance in locating and engaging qualified workers.

II. AFFIDAVIT OF ACKNOWLEDGEMENT and CERTIFICATION OF COMPLIANCE, (FOR SUBCONTRACTORS), E00-101

If any portion of a project is to be subcontracted at any tier, each additional subcontractor shall complete this form and send it to the Contract Compliance Office within two business days of contract execution and PRIOR to beginning work on the project.

III. TABLE OF PROJECTED SUBCONTRACTORS, E00-103

The use of subcontractors at any tier shall be reported to the Contract Compliance Office on this form prior to the subcontractor beginning work on the project.

IV. SUBCONTRACTOR'S CERTIFICATE OF INTENT TO PARTICIPATE, E00-104

Each Non-Filed subcontractor engaged to work a project shall complete and forward this form to the Contract Compliance Office prior to beginning work on the project.

V. Project Minority / Women & Veteran Business Enterprise Table

Contractor shall provide a completed **Project Minority / Women & Veteran Business Enterprise Table** at the beginning of the project along with an updated final report at project completion**.** The report will reflect the contributions of each business type to the overall project by dollar amount for all filed and unfiled subcontractors performing work on the project.

VI. INITIAL STATEMENT and CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE, REO-101 (Pages 1 & 2)

General Contractors, Trade Contractors, Filed Subcontractors and Subcontractors complete and submit this form as part of their bid on all City of Worcester construction projects subject to the provisions of G.L. Chapter 149 and Chapter 149A.

The REO requirements are applicable under Chapter 149 to contracts of $150,000 or more. Under Chapter 149A the requirements are applicable only to contracts $5M and above.

> Note: Under the September 2012 revision of the REO, there is no minimum threshold for subcontractors. Hence all subcontractors, i.e., Trade Contractors, Filed Subcontractors and Non-Filed Subcontractors at every tier must comply with the requirements of the REO

The General Contractor shall forward all Trade Contractor's, Filed Subcontractor's and Subcontractor's REO-101 Forms and REO evidence to the Contract Compliance Office for approval, PRIOR to said subcontractors beginning work.

VII. WEEKLY STATEMENT AND CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE, REO-102

At the end of each week of work, ALL Contractors, Trade Contractors, Filed Subcontractors, and Non-Filed Subcontractors regardless of tier, subject to the provisions of G.L. Chapter 149 and Chapter 149A,.shall complete and submit this form along with their certified payroll reports to the Contract Compliance Office.

VIII. INITIAL STATEMENT AND ADDITIONAL CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE, REO-103

General Contractors, Trade Contractors, Filed Subcontractors and Subcontractors complete and submit this form as part of their bid on all City of Worcester construction projects subject to the provisions of G.L. Chapter 149 and Chapter 149A.

If any portion of a project is to be subcontracted at any tier, each additional subcontractor shall complete this form and send it to the General Contractor who, in turn will transmit this form to the Contract Compliance Office within two business days of contract execution and PRIOR to the subcontractor beginning work on the project.

IX. WEEKLY CERTIFIED PAYROLL REPORT and WEEKLY WORKFORCE UTILIZATION REPORT

At the end of each week of work, all Contractors, Filed Subcontractors, and Non-Filed Subcontractors, regardless of tier, shall complete and submit these forms to the Contract Compliance Office.

The Contract Compliance Office will also accept computer generated payroll reports. However, if the computer payroll does not reflect the prevailing wage, the Contractor must provide a breakdown of the benefits paid to each employee which when added to the base wage equals the prevailing wage.

Every Contractor and Subcontractor, at any and all tiers, shall complete and submit each week along with the Weekly Payroll Report Form, the **"Weekly Workforce Utilization Form (v3)"** to the Contract Compliance Office.

The City of Worcester regards the monitoring of weekly certified payroll reports to be a most important function. Therefore, all certified payroll reports shall be scrutinized by the Contract Compliance Office and any violations of the Commonwealth's prevailing wage law will be vigorously enforced.

SECTION 00 31 00

AVAILABLE PROJECT INFORMATION

PART 1 - GENERAL

1.1 GENERAL:

A. A subsurface exploration program consisting of soil borings, test pits, geotechnical laboratory testing, and monitoring well installation has been performed, with reasonable care. The following geotechnical reports are appended hereto and are for informational purposes as described below:

"Preliminary Geotechnical Engineering Report, South Division Fire House & Emergency Communications Facility, Worcester, Massachusetts" prepared by Weston & Sampson, dated February 28, 2024.

"Supplementary Geotechnical Engineering Report, South Division Fire House & Emergency Communications Center, Worcester, Massachusetts" prepared by Weston & Sampson, dated January 3, 2025.

B. Laboratory analytical data for soil and groundwater samples collected from the site in June 2022 and July/August 2025 are summarized in the data tables attached to this Section. Associated laboratory analytical reports summarized in the attached data tables are available upon request.

C. The attached subsurface data is provided for informational purposes only. The Contractor shall not rely on the interpretations, opinions, conclusions, or recommendations included in the report, only the factual data relative to the specific times, locations, and depths/elevations. Specific project requirements are referenced only in the drawings and specifications.

D. If Contractors deem the subsurface information insufficient, they may, after obtaining Owner's permission, carry out additional subsurface explorations, at no expense to the Owner.

E. Subsurface information provided in the Contract Documents is limited by the methods used for obtaining and expressing such data and is subject to various interpretations. The terms used to describe soils, rock, groundwater, and such other conditions are subject to local usage and individual interpretation.

F. Borings and test pits have been completed substantially at the locations indicated on the drawings and advanced to the depths shown on the logs. Soil information presented in the boring logs, as to classification, gradation, properties, density and consistency, is based on visual observation of recovered samples. Reported groundwater levels are those measured in the field at the particular location and at the time measurements were made, and do not necessarily represent permanent or seasonal groundwater elevations. Groundwater elevations may be affected by temperature, rainfall, tidal fluctuation, and other factors that may not have been present at the time the measurements were made. The Contractors should be aware that groundwater level fluctuations may affect methods of construction.

G. Subsurface exploration, soil and rock data are for the general information of the Contractors. The Contractors are obligated to examine the site, review boring and test pit logs, all available information and records of explorations, investigations and other pertinent data for the site, and then based upon their own interpretations and investigations decide the character of material to be encountered and excavated, the suitability of the materials to be used for backfilling and such other purposes, the groundwater conditions, difficulties or obstacles likely to be encountered, and other conditions affecting the work. The subsurface data is accurate only at the particular locations and times the subsurface explorations were made. No other warranty either expressed or implied by the Owner, Engineer or their agents is made as to the accuracy of the subsurface information and data shown on the drawings or presented in the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

South Division Fire House and Emergency Communications Facility

Worcester, Massachusetts



Preliminary Geotechnical Engineering Report

Prepared for:
City of Worcester, Massachusetts

Prepared by:
Weston & Sampson Engineers, Inc.

February 28, 2024

Weston & Sampson SM

55 Walkers Brook Drive, Reading, MA 01867 (HQ)
Tel: 978.532.1900

55 Walkers Brook Drive, Reading, MA 01867 (HQ)
Tel: 978.532.1900

WSE Project No. ENG23-3281

February 28, 2024

City of Worcester, Massachusetts
c/o Mr. Frank Occhipinti, PE
Weston & Sampson
427 Main Street, Suite 400
Worcester, Massachusetts

Re: Preliminary Geotechnical Engineering Report
Worcester South Division Fire House and Emergency Communications Facility
Worcester, Massachusetts

Weston & Sampson is pleased to submit our Preliminary Geotechnical Engineering Report for the subject project. This report presents a description of our services, a summary of field explorations, descriptions of site and subsurface conditions, and preliminary geotechnical engineering recommendations for design and construction of the proposed project.

We appreciate the opportunity to be of service to you. If you have questions concerning this report or require additional information, please contact us at 978-532-1900.

Very truly yours,
WESTON & SAMPSON ENGINEERS, INC.

Jennifer A. C. MacGregor
Technical Leader- Geotechnical Engineering

Stephen T. Spink, PE
Team Leader - Geotechnical Engineering

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FIGURES

Figure 1 Locus Map
Figure 2 Site Plan

APPENDICES

Appendix A Boring Logs
Appendix B Test Pit Logs
Appendix C Geotechnical Laboratory Test Results
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1.0 INTRODUCTION

This report presents Weston & Sampson's preliminary geotechnical engineering evaluation for the proposed South Division Fire House and Emergency Communications Facility project in Worcester, Massachusetts. This report includes the results of subsurface explorations at the proposed fire house and emergency communications site (the "Site") and provides preliminary geotechnical design recommendations and construction considerations for foundation design. The proposed Site's location relative to surrounding physical features is shown in *Figure 1 - Locus Map*.

Project details including, but not limited to, the proposed structure dimensions, configuration, grading, related site improvements, and proposed construction approach were not finalized at the time of this report. Conclusions and recommendations presented in this preliminary report are based on our understanding of the proposed development as described herein, subsurface conditions encountered at discrete exploration locations, the provisions of the Limitations section of this report, and the document titled "Important Information about this Geotechnical Engineering Report" by Geoprofessional Business Association (GBA), Inc., enclosed as *Appendix D*. ***We should be contacted to review and modify our recommendations as necessary as the design is finalized. Additional investigations, laboratory testing, analyses, and recommendations may be necessary during final design.***

1.1 Site Description and Existing Conditions

The Site is located at 25 Madison Street in Worcester, Massachusetts and is bounded by Beacon Street to the west, Madison Street to the north, Southbridge Street to the east, and a commercial property to the south.

The Site is currently developed as a municipal parking lot with various underground utilities and landscape areas. The topography across the central portion of the site is generally flat and slopes gently upwards towards Madison Street to the north-northeast. There is an approximately 7-foot-high grassed slope on the eastern side of the parcel that slopes downward towards Southbridge Street and a variable height stone retaining wall along the west side of the Site supporting Beacon Street.

Based upon a Boundary and Topographic Survey plan prepared by KCI Technologies, Inc, dated July 26, 2022, we understand that the existing ground surface elevations range from approximately El. 474 to El. 475 feet within the parking lot in the central portion of the site, as shown in *Figure 2*. On the eastern portion of the Site, grades slope downward from approximately El. 477 to El. 470 feet toward Southbridge Street. There is a dry-stacked stone retaining wall along the western side of the parking lot; grades slope up behind the wall to a concrete retaining wall along Beacon Street. The grade change along the western portion of the Site, ranges from about 11 feet at the northwestern corner to about 30 feet at the southwestern corner.

1.2 Proposed Project

We understand the City is seeking to acquire the Site and redevelop it by constructing a new combined fire station and emergency communications center building covering a footprint of approximately 30,000 square feet (SF). While not yet designed, it is understood that the new structure may consist of a three-story, masonry and steel structure. A new radio tower for emergency communications is also proposed.

We understand schematic design layout alternatives are currently being evaluated for the proposed structure and related site development. Associated site improvements are expected to include new driveway and parking areas, sidewalks, and utilities. Project details including, but not limited to, the proposed structure dimensions, configuration, grading, related site improvements, structural loads, and proposed construction approach were not finalized at the time of this report. Basements and/or below grade areas are not anticipated.

The proposed radio tower dimensions and configuration also have not yet been determined but it is assumed the tower will be supported on a reinforced concrete isolated spread footing. The embedment depth of the footing and structural loading information of the radio tower were not available at the time of this report.

The existing retaining wall along the western portion of the site will remain in-place. Replacement, modification, or repairs to the existing wall were not planned at the time of this report.

The recommendations in this report are based on the above stated assumptions and the currently available information. As design progresses, we should be provided with project information as it becomes available and have the opportunity to review and revise our recommendations as necessary if proposed conditions differ from those described above.

1.3 Survey and Datum

Existing site topography and dimensions discussed in this report are based on the topographic survey referenced above. Elevations (El.) are in feet and reference the North American Vertical Datum of 1988 (NAVD88).

2.0 SUBSURFACE CONDITIONS

2.1 Geologic Setting

Surficial geologic information available from the United States Geological Survey (USGS) "Surficial Materials Map of the Worcester North Quadrangle, Massachusetts" (2018) compiled by Byron D. Stone, Janet R. Stone, and Mary L. DiGiacomo-Cohen, indicate the soils in the vicinity of the project site consist of thin glacial till, coarse deposits, and artificial fill. Thin glacial till is composed predominantly of a non-sorted, non-stratified matrix of sand, silt, and clay containing scattered pebbles, cobbles, and boulders. Bedrock outcrops or shallow bedrock are mapped less than approximately 800 feet from the site.

Based on the map titled "Bedrock Geologic Map of Massachusetts" by E-an Zen, bedrock at the site consists of pelitic and calcareous siltstone and muscovite schist of the Oakdale Formation (Silurian), aluminous mica schist, quartzose shist, and aluminous Phyllite of the Littleton Formation (Lower Devonian) or carbonaceous slate and garnet phyllite of the Coal Mine Brook Formation (Middle Pennsylvanian).

2.2 Explorations

Subsurface conditions at the Site were explored by advancing twelve borings (B-101 through B-112) and six test pits (TP-1, TP-1A, and TP-2 through TP-5) between December 11 and 15, 2023. The borings and test pits were completed by Geosearch, Inc. of Sterling, Massachusetts at the approximate locations shown in *Figure 2 – Site Plan.* Weston & Sampson geotechnical engineering representatives observed drilling and excavation activities in the field and prepared logs for each exploration.

The borings were advanced using a truck mounted drill rig. Standard penetration tests (SPTs) were conducted in each boring by driving a split spoon sampler with an automatic hammer in general accordance with ASTM D1586. The borings were advanced to approximate depths between 27 and 49 feet. Copies of the boring logs and a Guide to Subsurface Exploration Logs are included in *Appendix A*. Following completion of drilling, the borings were backfilled with cuttings and the surface was finished with an asphalt cold patch.

The test pits were excavated using a John Deere 60G compact excavator equipped with a 30-inch toothed bucket at the approximate locations shown in *Figure 2 – Site Plan.* The test pits were advanced to approximate depths between 0.3 and 10.3 feet. The test pit logs are included in *Appendix B*. Following completion of excavation, the test pits were backfilled with excavated material to match existing grades.

2.3 Subsurface Profile

2.3.1.1 General

Subsurface conditions encountered in the borings and test pits were generally consistent with the mapped surficial geology. The conditions encountered in our explorations are described below, in

general order of occurrence with depth. Depths provided herein are relative to the existing surface. The general Unified Soil Classification System (USCS) designation(s) for each stratum is included in the descriptions below in parentheses.

The subsurface descriptions are based on a limited number of explorations. Variations may occur and should be expected between exploration locations. The strata boundaries shown in our logs are based on our interpretations and the actual transition may be gradual. Refer to the boring and test pit logs for detailed descriptions of the soil samples collected.

Surficial Materials – Borings B-101 through B-112 and test pits TP-1A, TP-4 and TP-5 were completed in existing pavement areas and encountered between approximately 2 to 5 inches of asphalt concrete (AC) pavement. Test pits TP-1, TP-2 and TP-3 were completed in existing grass-covered landscape areas and encountered approximately 4 to 10 inches of topsoil. Test pit TP-1 was terminated in the topsoil due to the presence of a possible electric utility.

Fill – Medium dense to very dense fill was encountered in each of the borings and test pits below the surficial materials and extended to depths ranging from approximately 2 to 7.5 feet where fully penetrated. The fill generally consisted of fine to coarse SAND with little to some gravel and few to some non-plastic fines (SP-SM, SM). Test pit TP-1A was terminated in the fill due to the presence of a possible drainage utility.

Native Soils – Medium dense to very dense or stiff to hard native glacial deposits were encountered in each of the borings below the fill. The glacial deposits generally consisted of a mix of fine-grained (e.g., silt, clay) and coarse-grained (e.g., sand, gravel) soils with cobbles and boulders. Due to the variability of the glacial deposits, the following soils were encountered: sandy lean CLAY with gravel (CL), clayey SAND with gravel (SC), silty SAND with gravel (SM), lean CLAY with sand (CL), and sandy SILT (ML). Frequent cobbles and boulders were encountered within the native soil strata. Test pits TP-2 through TP-5 were terminated in this stratum at depths ranging between approximately 9 and 10½ feet.

Weathered Rock – Possible weathered rock was encountered below the native soils in borings B-101 and B-102 at depths of approximately 45.5 and 37 feet, respectively. The weathered rock generally consisted of very dense, fine to coarse GRAVEL with some non-plastic to medium plastic fines and little to some sand (GM).

2.3.1.2 Refusal

Split-spoon sampler refusal was encountered in B-101 and B-102 at depths ranging from about 36 to 50 feet. Split-spoon refusal, where noted in the boring logs, is defined as 100 hammer blows for less than 6-inches of sampler penetration. Due to the depth of the encountered refusal conditions and our understanding of the proposed project, rock coring was not completed. Therefore, the refusal may have been due to the presence of boulders and/or bedrock.

2.3.1.3 Groundwater

Perched groundwater conditions were encountered close to the ground surface based upon observed shallow seepage into the test pits. The perched groundwater is not considered representative of permanent static groundwater elevations but is likely the result of sloping site grades as well as the density and consistency of the site soils. Perched groundwater conditions should be anticipated during construction, especially during and after extended periods of wet weather.

Following completion of B-108, a groundwater monitoring well was installed to evaluate static groundwater conditions. Groundwater measurements in the monitoring well were obtained approximately three days after installation at a depth of approximately 22.5 feet, corresponding to approximately El. 451.5 feet.

In B-111, groundwater depth was estimated based on observations of wet soil samples from the borings at a depth of approximately 21 feet, corresponding to approximately El. 454.0 feet. The presence and/or depth of groundwater could not be estimated at locations drive-and-wash methods were used to advance the borings since water is introduced to the boreholes with this method.

We anticipate that the surface and groundwater levels will fluctuate with season, variations in precipitation, construction in the area, and other factors.

2.4 Geotechnical Laboratory Testing

Ten soil samples were selected and submitted to Thielsch Engineering of Cranston, RI for grain size (ASTM D6913) and Atterberg limit (ASTM D4318) analyses. Laboratory test results are included on the boring logs and in *Appendix C*.

3.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

3.1 General

Based on conditions observed in our explorations and assumptions stated herein, the proposed buildings and radio tower can be supported on conventional shallow spread footings bearing on subgrades of medium dense (or denser) or stiff (or stiffer) native glacial deposits or on properly placed and compacted Structural Fill directly overlying these materials.

The existing pavement, topsoil, and non-engineered fill that were generally encountered to depths up to about 7.5 feet are not suitable for support of foundations or other rigid structural site improvements that could be adversely affected by differential settlement. Additionally, the International Building Code (IBC) as adapted by the Massachusetts State Building Code does not allow support of foundations on non-engineered fill or organic soils. The in-place existing fill may provide adequate support of flexible asphalt pavements provided subgrades are prepared and evaluated as recommended herein. Topsoil, fill and other unsuitable soils, as determined by the engineer, should be completely removed from within the zone-of-influence (ZOI), as defined herein, beneath proposed structures and slabs-on-grade, and the resulting excavation backfilled with compacted Structural Fill.

The existing native soils encountered in the explorations typically contained greater than 40 percent fine-grained (i.e., silt and clay) particles. Such materials are extremely sensitive to variations in moisture content, are easily disturbed by construction activities and are not suitable for reuse in wet conditions. We recommend placement of a working mat above exposed subgrades as described herein. The on-site native soils are therefore not considered suitable for reuse as Structural Fill. On-site soils may be suitable for use as Common Borrow in landscaped areas and areas of future development if properly moisture conditioned and compacted as described herein.

Perched groundwater conditions were observed in our subsurface explorations. Therefore, it should be anticipated that dewatering will be required by the Contractor. Considerations and specific geotechnical recommendations for excavation, temporary excavation support, and dewatering are provided in *Section 02*.

3.2 Shallow Foundations

We recommend that shallow foundations be supported on medium dense (or denser) or stiff (or stiffer) native glacial soils or Structural Fill directly overlying these materials. Topsoil, previously placed fill or otherwise unsuitable bearing materials (identified by the geotechnical engineer during construction) should be completely removed from within the zone-of-influence (ZOI) beneath proposed foundations. The “zone-of-influence” is defined by a plane extending horizontally away from the bottom outside edge of foundation elements, slabs, and other structural features a distance of 2 feet in all directions, then down and away at 1H:1V slopes to the intersection with suitable native soils.

Footings for proposed structures should be designed in accordance with the provisions of the current edition of the Massachusetts State Building Code (MSBC) and be embedded at least 4 feet below the nearest proposed adjacent ground surface exposed to freezing. Interior footing bearing surfaces not exposed to freezing can be embedded at least 18 inches below the lowest overlying floor slab elevation but will likely require special frost protection measures if constructed during freezing conditions.

Shallow foundations for the proposed structures bearing on the aforementioned materials can be designed using an allowable bearing pressure of 4,000 psf. The allowable bearing pressure can be increased by one-third to resist transient wind and seismic loads provided the vertical component of the resultant of all forces due to load eccentricities remains within the middle third of the footing.

Resistance to lateral loads can be obtained by a passive equivalent fluid pressure of 250 pounds per cubic foot (pcf), ignoring the top 12 inches of embedment, and by a footing base friction coefficient of 0.35. We recommend a minimum factor of safety of 1.5 when using sliding friction alone. A larger magnitude of movement is required to engage passive resistance than sliding friction. Therefore, a minimum factor of safety of 2.0 is recommended when using passive pressure in addition to friction to resist lateral loads. The passive resistance values discussed above are only applicable where the concrete for footings is either placed directly against undisturbed soils or Structural Fill and that the trenches created for foundation construction are backfilled with properly compacted soil.

Footing and slab subgrades should be prepared as recommended herein and observed by a Weston & Sampson geotechnical engineer prior to placement of overlying materials including reinforcing steel (rebar) and concrete forms.

3.3 Slabs on Grade

Slabs on-grade supporting loads up to 250 psf and bearing on properly constructed Structural Fill overlying medium dense (or denser) or stiff (or stiffer) native glacial soils are expected to induce less than one inch of total settlement. Topsoil, existing non-engineered fill or otherwise unsuitable bearing materials (identified by the geotechnical engineer during construction) should be completely removed from within the zone-of-influence (ZOI) beneath proposed slabs-on-grade.

A minimum of six inches of clean, angular crushed stone with no more than 6 percent passing a #200 sieve is recommended for underslab stone. Any areas contaminated with fines or debris should be removed and replaced with clean stone. If the underslab stone is saturated or trapping water, the water should be removed prior to slab placement. Structural Fill below the crushed stone layer should contain no more than 10 percent passing a #200 sieve (such as MassDOT M1.03.0-type B Gravel Borrow or M2.01.7 Dense-graded Crushed Stone).

The ground floor slab should be insulated and dampproofed in accordance with the Building Code. Some flooring manufacturers require specific slab moisture levels and/or vapor barriers to validate the warranties on their products. A properly installed and protected vapor flow retardant can reduce slab

moistures. If a vapor flow retardant is used, care should be taken not to trap moisture within the overlying granular fill and floor slab concrete.

3.4 Retaining Walls

As design progresses, retaining walls may be needed along the eastern and western sides of the Site. Feasible retaining wall alternatives include mechanically stabilized earth (MSE), cast in-place concrete, and soldier piles with concrete lagging walls.

The retaining walls should be designed by a Professional Engineer licensed in the Commonwealth of Massachusetts to resist lateral pressures exerted by soil, water, permanent structures, and any additional surcharge loads including sloped backfill and adjacent traffic as appropriate. The design should include, but not be limited to, bearing capacity, settlement, sliding, overturning, and global static and seismic stability.

Weston & Sampson can provide geotechnical design and construction recommendation for the retaining walls (if required) as design progresses and retaining wall types and heights are determined.

3.5 Seismic Design

Seismic site class was determined in accordance with the International Building Code (IBC) as adapted by the Massachusetts State Building Code using a weighted average of SPT blow counts in the upper 100 feet of soil. In accordance with the International Building Code (IBC) as adapted by the Massachusetts State Building Code and based on our explorations and analyses, the project should be evaluated using parameters associated with Site Class D.

Liquefaction can occur in loose, saturated, granular soils. Strong shaking, such as that experienced during earthquakes, can cause a sudden loss of shear strength, densification, and subsequent settlement of these soils. Based on the anticipated depth to groundwater and the soil types and consistencies encountered in our explorations, the risk of structurally damaging ground deformations related to liquefaction is low.

4.0 EARTHWORK AND CONSTRUCTION RECOMMENDATIONS

4.1 General

Excavation will be required for site preparation, grading, retaining wall construction, foundation and slab construction, utility installation, and construction of other below-grade structures including stormwater detention chambers (if proposed as design progresses). Foundations and utilities should be designed and constructed so that excavations into the zones of influences below and adjacent to new structures, roadways and utilities are not required.

Perched groundwater and surface water should be controlled during construction and prevented from eroding temporary slopes, retaining walls and disturbing subgrade materials. Caving and disturbance of subgrade materials should be expected where seepage is present. Moisture control of excavated soil that is planned to be reused on-site in fill areas should be expected to require adequate time and extended periods of warm and dry weather conditions to be able to be properly placed and compacted for use as Common Fill.

4.2 Site Preparation

Prior to earthwork and site construction, the site should be prepared by removing existing abandoned utilities, pavement, topsoil, and vegetation from all building, interior/exterior concrete slabs, pavement and fill areas, and a 5-foot perimeter around those areas. Loose and unsuitable fill materials and debris above or surrounding foundation elements should also be removed. Site preparation for earthwork will also require removal of all existing fill from within the zone-of-influence (ZOI) beneath the proposed buildings, retaining walls, and equipment pads.

Existing granular, inorganic fill can remain below proposed pavement areas provided the subgrades are prepared and evaluated by the Geotechnical Engineer as recommended in this report. If, however, debris and/or organic materials are present at pavement subbase elevations, these materials should be removed to expose native, inorganic soils.

Excavations resulting from site preparation should be brought back to grade with compacted Structural Fill as recommended herein. Filling of smaller areas or voids may require use of grout or controlled density fill (CDF).

4.3 Subgrade Preparation and Protection

Based on the subsurface conditions encountered in our explorations and expected excavation depths, stripping and subgrade preparation will expose predominantly fine-grained materials containing sand and gravel with frequent cobbles and/or boulders. Some variability should be expected, however, and areas of soft, disturbed fine-grained or organic soils should be anticipated. We recommended that the

project budget and schedule include contingencies for over-excavation and stabilization of soft and variable subgrade conditions.

Weston & Sampson should be contacted to evaluate the exposed subgrade following stripping and prior to placement of overlying materials. Evaluation should include visual observation, probing, and/or proof-rolling using a loaded 10-yard dump truck or construction equipment of similar size, weight, and configuration. Proof-rolling should uniformly cover the subgrade with several passes in perpendicular directions. One of the purposes of proof-rolling is to expose areas of weakness or instability. Soft and/or disturbed areas may require over-excavation and backfilling with compacted angular crushed stone or Structural Fill. A geosynthetic separation layer between the excavation subgrade and crushed stone backfill may also be required. We recommend that a geosynthetic used for stabilization consist of a non-woven geosynthetic with an AOS of #70 to # 100 sieve, and a minimum puncture resistance of at least 120 pounds (such as Mirafi 180N or equivalent).

As described above, the subgrade soil conditions at the Site generally consist of predominantly fine-grained soils. Soils containing more than trace amounts of silt are highly susceptible to softening and disturbance by construction activity during wet or freezing weather. We recommend placement of a working mat above the prepared subgrades to provide protection during construction activities. The working mat should either consist of a minimum of 12 inches of Structural Fill, 6 inches of ¾ inch crushed stone wrapped in filter fabric, or 4 inches of lean concrete.

Subgrade protection is the responsibility of the contractor and special precautions and protective measures appropriate for the weather and traffic conditions during construction should be used during earthwork and foundation construction to preserve the integrity of subgrades. Construction traffic should not operate directly on subgrades.

If footing construction occurs during freezing conditions, insulating blankets, heaters, or other suitable measures should be employed to prevent foundation subgrades from freezing until the foundations are backfilled sufficiently to prevent frost from reaching the footing subgrades.

4.4 Reuse of On-Site Soils

Based on the materials observed in the explorations and the results of laboratory testing, on-site soils are not expected to be suitable for reuse as Structural Fill in their current condition. Mixing the on-site materials with imported coarse-grained material may also be required to increase the on-site soils' re-use efficiency.

In order to reuse the existing on-site soils in areas of future development, moisture conditioning will also be required. Moisture conditioning could consist of drying by scarification and frequent mixing in thin lifts during warm, dry conditions. On-site materials that are stockpiled and are intended for re-use should be frequently mixed in warm, dry conditions and should be covered with plastic sheeting during

precipitation events. Once moisture contents are within 3 percent of optimum, the material should be compacted to at least 95 percent relative to ASTM D-1557.

4.5 Excavation Considerations

4.5.1.1 Temporary Excavation Support

Temporary excavation support will be required for excavation depths greater than 4 feet where sloping of the excavation is not feasible. Temporary excavation support should also be anticipated if excavations are required within the zone-of-influence beneath existing structures, utilities, site features, or property lines; or proximate to existing slopes.

The selection, design, and construction of excavation support systems should be the responsibility of the Contractor. The shoring system should be designed and stamped by a professional engineer licensed in the Commonwealth of Massachusetts to support lateral earth pressures, construction surcharge loads, unbalanced hydrostatic pressures, and surcharges from adjacent structures and utilities, if present. At a minimum, a lateral temporary construction surcharge of 100 psf should be applied uniformly over the height of the wall. All excavations should be made in accordance with applicable OSHA safety regulations.

Shoring systems restrained from lateral movement should be designed using at-rest lateral earth pressures. Shoring systems which can be allowed to deflect 1 to 2 percent of the exposed wall height may be designed assuming active earth pressure conditions.

4.5.1.2 Water Control

Water levels should be controlled to complete excavations, subgrade preparation, and foundation construction in dry conditions and to maintain the integrity of existing soil deposits and bearing surfaces. Flow rates for dewatering are likely to vary depending on location, soil type, and the season during which the excavation occurs. The dewatering systems should be designed by the contractor and capable of adapting to variable flows and conditions. Dewatering systems should be capable of maintaining groundwater at least 24 inches below the bottom of excavations and should be designed and operated to prevent pumping of soil, loss of fines, and adverse effects to existing structures. If possible, pumped groundwater should be recharged on site.

Dewatering efforts must satisfy requirements of local, state and federal environmental and conservation authorities. The Contractor should also develop a water management plan to accommodate storm precipitation events.

4.6 Slopes

Soil slopes should be excavated with a smooth excavator bucket with the surface repaired if disturbed. Surface runoff should be routed so that it does not run down the face of the slopes. Erosion control is critical to maintaining all slopes and should be in place immediately after construction of all slopes. All slopes and excavations should be constructed in accordance with applicable OSHA and local safety standards.

Temporary slopes up to 10 feet high can be inclined up to 1.5H:1V provided no seepage or sloughing is present. Equipment should not be allowed to induce vibration or infiltrate water above the slopes and no surcharges should be located within ten feet of slope crests. Temporary slopes should be expected to ravel somewhat, depending on weather conditions, soil conditions, seepage, and duration of exposure. Soft or loose fill soils and the presence of seepage may require flatter slopes, erosion control measures, drainage elements, and/or temporary excavation support.

Permanent slopes up to 10 feet high should be formed at 3H:1V or flatter. The face of fill slopes should be overbuilt and cut back into compacted materials with a smooth excavator bucket. If steeper fill slopes are desired, we should be consulted to evaluate use of grid reinforcement, rock blankets, or rock fill buttresses.

The presence of slow seepage may require drainage in the form of a blanket of angular crushed stone or a suitably revegetated reinforced erosion control blanket (such as North American Green SC150 or equivalent). Faster seepage, or the presence of soft or loose sandy soils or layers may require improved erosion control measures, including additional drainage elements, and/or flatter slopes, and we should be consulted.

Site improvements, including foundations adjacent to permanent slopes should be setback such that the outside edge of the foundation or feature is a minimum of 5 feet horizontally from the crest or toe of the slope. Slopes adjacent to foundations should be erosion protected immediately as recommended above.

Stormwater should not be discharged onto or above slopes. Stormwater outfalls should be located at the bottom of slopes and include erosion control protections and energy dissipation appropriate for the anticipated flows and volumes.

4.7 Fill

Well graded imported sand and gravel with less than approximately 10 percent fines (such as MassDOT M1.03.0-type B Gravel Borrow or M2.01.7 Dense-graded Crushed Stone) is recommended for use as Structural Fill within the zone of influence beneath foundations and around foundation elements, and below slabs. Structural Fill should have a maximum particle size of 3-inches and be placed in maximum

10-inch-thick loose lifts (measured prior to compaction) with each lift compacted to at least 95 percent of maximum dry density as determined by ASTM D1557 (modified Proctor) for the specific fill material.

As described above, the majority of native soils at the site are not expected to be suitable for reuse as Structural Fill. On-site granular soils containing less than approximately 20 percent fines and free of organics, contamination (including metals, VOCs, SVOCs, etc.), and other deleterious materials may be suitable for use as fill in areas outside proposed structures (i.e., Common Fill) if properly moisture conditioned. Once moisture contents are within 3 percent of optimum, the material should be compacted to at least 95 percent relative to ASTM D1557. Fill should be placed in maximum 10-inch-thick loose lifts.

Density testing should be completed on each lift of fill during construction to confirm compaction requirements are met. In addition to density testing, we recommend that the fill lifts pass a proof roll using a fully loaded dump 10-wheel truck or equipment of similar size and weight and observed by the geotechnical engineer. In confined areas and where only hand-guided compaction equipment can be used, the lift thickness should be reduced to not more than 6-inches and the maximum particle size reduced to two inches.

5.0 LIMITATIONS

5.1 Observation of Construction

Satisfactory earthwork and foundation performance depends to a large degree on the quality of construction. The actual subsurface conditions encountered during construction may vary from those encountered in the subsurface investigations and may require revisions to the recommendations provided in this report. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated. In addition, sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications.

5.2 Variations of Subsurface Conditions and Use of Report

We have prepared this report for use by the City of Worcester and members of the design and construction team for the subject project and site, only. The data and report can be used for estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions and are not applicable to other sites. Additional information about interpretation and use of this report is included in *Appendix D*.

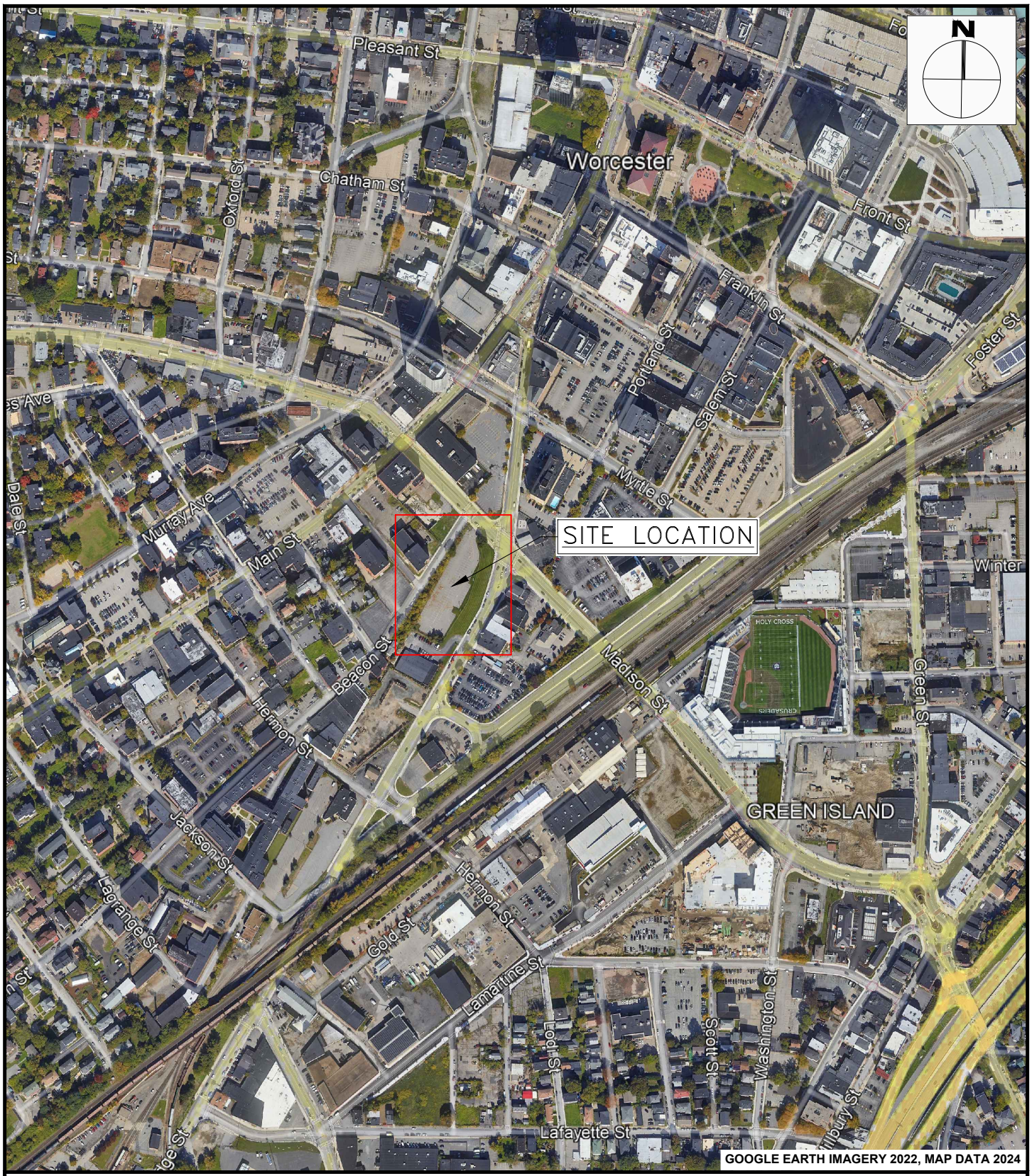
Soil borings and test pits indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect subsurface conditions that may exist between exploration locations. If subsurface conditions differing form those described are noted during the course of excavation and construction, reevaluation will be necessary.

Site development plans and design details were considered preliminary at the time this report was prepared. If changes are made in site grades, configuration, design loads, or type of construction for the structure, the conclusions and recommendations may not be applicable. We should be consulted to review final design drawings and specifications to see that our recommendations are suitably followed. If design changes are made, we should be retained to review our conclusions and recommendations and provide a written evaluation or modification. Additional geotechnical engineering analyses and explorations may be necessary.

The recommendations in this report are preliminary as actual subsurface conditions may differ from those interpreted based on our subsurface explorations. In order for our recommendations to be considered final, we must be retained to observe the actual subsurface conditions encountered during construction. Our observations will allow us to interpret the actual conditions present during construction and adapt our recommendations if needed.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, are given.

FIGURES

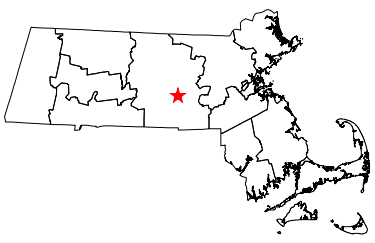


Weston & Sampson

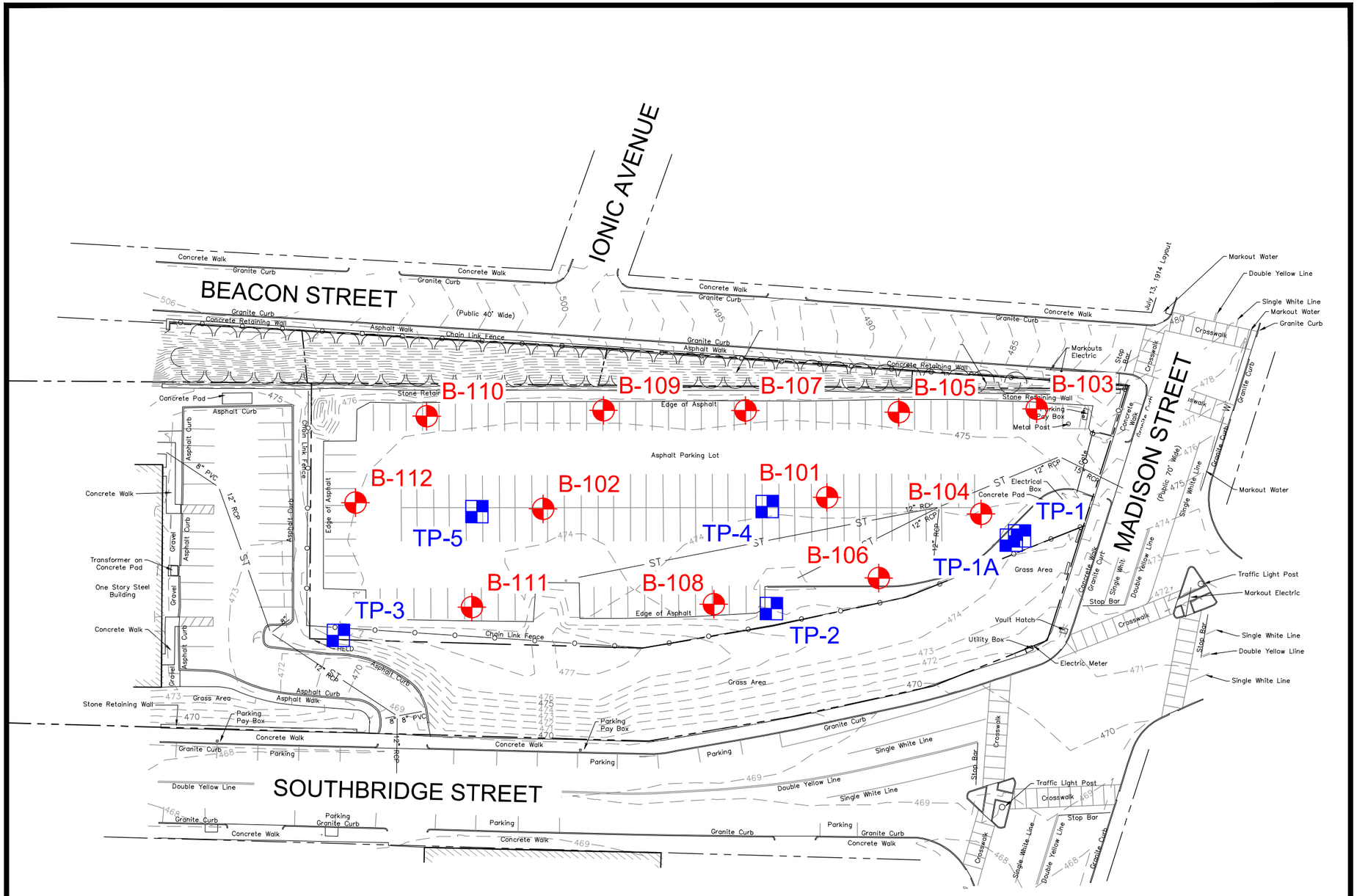
SCALE IN FEET

0 500 1000

FIGURE 1
LOCUS MAP
SOUTH DIVISION FIRE HOUSE AND EMERGENCY COMMUNICATIONS CENTER
25 MADISON STREET
WORCESTER, MA
WORCESTER COUNTY



\\wse03.local\WSE\Projects\MA\Worcester MA\2239999 Worcester Fire Station\Geotechnical\Figures\CAD\Worcester Locus Map.dwg


BEACON STREET
(Public 40' Wide)
IONIC AVENUE
MADISON STREET
(Public 70' Wide)
SOUTHBRIDGE STREET
B-101
B-102
B-103
B-104
B-105
B-106
B-107
B-108
B-109
B-110
B-111
B-112
TP-1
TP-1A
TP-2
TP-3
TP-4
TP-5
Concrete Walk
Granite Curb
Concrete Retaining Wall
Asphalt Walk
Chain Link Fence
Asphalt Curb
Edge of Asphalt
Asphalt Parking Lot
Concrete Pad
Stone Retaining Wall
Parking Pay Box
Metal Post
Markouts Electric
Markout Water
Double Yellow Line
Single White Line
Crosswalk
Stop Bar
Traffic Light Post
Markout Electric
Electrical Box
Grass Area
Vault Hatch
Utility Box
Electric Meter
Transformer on Concrete Pad
One Story Steel Building
Gravel
Parking
Granite Curb
Concrete Walk
Double Yellow Line
Single White Line
Stone Retaining Wall
Chain Link Fence
Edge of Asphalt
Grass Area
Asphalt Curb
Asphalt Walk
Concrete Pad
Parking Pay Box
Metal Post
Markouts Electric
Markout Water
Double Yellow Line
Single White Line
Crosswalk
Stop Bar
Traffic Light Post
Markout Electric
Vault Hatch
Utility Box
Electric Meter
Grass Area
Asphalt Parking Lot
Edge of Asphalt
Concrete Walk
Granite Curb
Asphalt Curb
Gravel
Transformer on Concrete Pad
One Story Steel Building
Chain Link Fence
Concrete Retaining Wall

APPENDIX A

Boring Logs

GUIDE TO SUBSURFACE EXPLORATION LOGS

Weston & Sampson℠

INDEX SHEET 1 GENERAL INFORMATION

GENERAL NOTES AND USE OF LOGS

1.) Explorations were made by ordinary and conventional methods and with care adequate for Weston & Sampson's study and/or design purposes. The exploration logs are part of a specific report prepared by Weston & Sampson for the referenced project and client, and are an integral part of that report. Information and interpretations are subject to the explanations and limitations stated in the report. Weston & Sampson is not responsible for any interpretations, assumptions, projections, or interpolations made by others.

2.) Exploration logs represent general conditions observed at the point of exploration on the date(s) stated. Boundary lines separating soil and rock layers (strata) represent approximate boundaries only and are shown as solid lines where observed and dashed lines where inferred based on drilling action. Actual transitions may be gradual and changes may occur over time.

3.) Soil and rock descriptions are based on visual-manual examination of recovered samples, direct observation in test pits (when permissible), and laboratory testing (when conducted).

4.) Water level observations were made at the times and under the conditions stated. Fluctuations should be be expected to vary with seasons and other factors. Use of fluids during drilling may affect water level observations. The absence of water level observations does not necessarily mean the exploration was dry or that subsurface water will not be encountered during construction.

5.) Standard split spoon samplers may not recover particles with any dimension larger than 1-3/8 inches. Reported gravel conditions or poor sample recovery may not reflect actual in-situ conditions.

6.) Sections of this guide provide a general overview of Weston & Sampson's practices and procedures for *identifying* and *describing* soil and rock. These procedures are predominantly based on ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, the International Society of Rock Mechanics (ISRM) standards, and the *Engineering Geology Field Manual* published by the Bureau of Reclamation. Not all aspects of this guide relating to description and identification procedures of soil and rock may be applicable in all circumstances.

SAMPLER GRAPHICS

- Split Spoon (Standard) 2" OD, 1-3/8" ID
- Split Spoon (Oversize) 3" OD, 2-3/8" ID
- Shelby or Piston Tube 3" OD, 2-7/8" ID
- Double-Tube Rock Core Barrel 2" Core Diameter
- Direct Push with Acetate Liner Various Liner Sizes
- A — Auger Sample *(from cuttings or hand auger)*
- G — Grab Sample *(manual, from discrete point)*
- C — Composite Sample *(multiple grab samples)*

WELL GRAPHICS

- Cement concrete seal around casing or riser pipe
- Bentonite seal around casing or riser pipe
- Cement grout seal around casing or riser pipe
- Soil backfill around riser pipe or beneath screen
- Gravel backfill around screen or riser pipe
- Sand backfill around screen or riser pipe (filter sand)
- Solid-wall riser; Sch. 40 PVC, 1" ID unless noted otherwise
- Slotted screen; Sch. 40 PVC, 1" ID with machined slots

CAVING / SEEPAGE TERMS

The following caving and/or seepage terms may appear on a test pit log.

Caving Term	Criteria
Minor	less than 1 cubic ft.
Moderate	1 to 3 cubic ft.
Severe	greater than 3 cubic ft.

Seepage Term	Criteria
Slow	less than 1 gpm
Moderate	1 to 3 gpm
Fast	greater than 3 gpm

KEY TO WATER LEVELS

- Observed in exploration during advancement.
- Measured in exploration at completion, prior to backfilling or well installation.
- Measured in exploration after the stated stabilization period, prior to backfilling, or in well installation if noted.

DEFINITIONS OF COMMON TERMS

Sample Recovery Ratio - The length of material recovered in a drive or push type sampler over the length of sampler penetration, in inches (e.g. 18/24).

Standard Penetration Test (*SPT*) - An in-situ test where a standard split-spoon sampler is driven a distance of 12 or 18 inches (after an initial 6-inch seating interval) using a 140-lb. hammer falling 30 inches for each blow.

SPT Blows - The number of hammer blows required to drive a split-spoon sampler each consecutive 6-inch interval during a *Standard Penetration Test*. If no discernable advancement of a split spoon sampler is made after 50 consecutive hammer blows, 50/X indicates *sampler refusal* and is the number of blows required to drive the sampler X inches.

SPT N-Value (*N*) - The uncorrected blow count representation of a soil's penetration resistance over a 12-inch interval after an initial 6-in. seating interval, reported in blows per foot (bpf). The N-value is correlated to soil engineering properties.

Auger Refusal - No discernable advancement of the auger over a period of 5 minutes with full rig down pressure applied.

Casing Refusal (Driven) - Casing penetration of less than 6 inches after a minimum 50 blows of a drop hammer weighing 300 lbs. or a minimum 100 blows of a drop hammer weighing 140 lbs.

PID Measurement - A measurement (electronic reading) taken in the field using a photoionization detector (PID) to detect the presence of volatile organic compounds in a soil sample. Values are reported as benzene equivalent units in parts per million (ppm) unless noted otherwise.

Rock Quality Designation (RQD) - A qualitative index measure of the degree of jointing and fracture of a rock core taken from a borehole. The RQD is defined as the sum length of solid core pieces 4 inches or longer divided by the run (cored) length, expressed as a percentage. Higher RQD values may indicate fewer joints and fractures in the rock mass.

Fill (Made Ground) - A deposit of soil and/or artificial waste materials that has been placed or altered by human processes.

LABORATORY TESTS AND FIELD MEASUREMENTS

MC	Moisture Content	IC	1D Incremental Consolidation
OC	Organic Content	VS	Laboratory Vane Shear
PL	Plastic Limit	US	Unconfined Compression
LL	Liquid Limit	TC	Triaxial Compression
GC	Gravel Content	PP	Pocket (Hand) Penetrometer
SC	Sand Content	TV	Torvane (Hand Vane)
FC	Fines Content	PID	Photoionization Detector
DS	Direct Shear	FID	Flame Ionization Detector

BORING ADVANCEMENT METHODS

Hollow-Stem Auger Drilling - Utilizes continuous flight auger sections with hollow stems to advance the borehole. Drill rods and a plug are inserted into the auger stem to prevent the entrance of soil cuttings into the augers.

Rotary Wash Drilling - Utilizes downward pressure and rotary action applied to a non-coring bit while washing the cuttings to the surface using a circulating fluid injected down the drill rods. The borehole is supported with either steel casing or the drilling fluid. Where a casing is used, the borehole is advanced sequentially by driving the casing to the desired depth and then cleaning out the casing. The process of driving and cleaning the casing is commonly referred to as the 'drive-and-wash' technique.

Continuous Sampling - Includes a variety of methods and procedures during which the borehole is advanced via continuous recovery of soil samples. *Direct Push* sampling is a common method that uses static downward pressure combined with percussive energy to drive a steel mandrel into the ground at continuous intervals while recovering soil samples in disposable acetate liners.

Rock Coring - Utilizes downward pressure and rotary action applied to a core barrel equipped with a diamond-set or tungsten carbide coring bit. During conventional coring, the entire barrel is retrieved from the hole upon completion of a core run. Wireline coring allows for removal of the inner barrel assembly containing the actual core while the the drill rods and outer barrel remain in the hole. Various types and sizes of core barrels and bits are used.

GUIDE TO SUBSURFACE EXPLORATION LOGS

Weston & Sampson℠

INDEX SHEET 2
SOIL DESCRIPTION

SOIL CONSTITUENTS

Naturally occurring soils consist of one or more of the following matrix constituents defined in terms of particle size.

Constituent		U.S. Sieve Size			Observed Size (in.)		
Gravel	(Coarse)	3/4 in.	-	3 in.	3/4	-	3
Gravel	(Fine)	No. 4	-	3/4 in.	1/5	-	3/4
Sand	(Coarse)	No. 10	-	No. 40	1/16	-	1/5
Sand	(Medium)	No. 40	-	No. 10	1/64	-	1/16
Sand	(Fine)	No. 200	-	No. 40	1/300	-	1/64
Fines	(Silt or Clay)	Smaller than		No. 200	Less than		1/300

SOIL IDENTIFICATION

Soil identification refers to the grouping of soils with similar physical characteristics into a category defined by a **group name** and corresponding **group symbol** based on estimation of the matrix soil constituents to the nearest 5% and simple manual tests. Proportions of cobbles, boulders, and other non-matrix soil materials are not considered during this procedure but are included in the overall soil description if observed or thought to be present. Refer to the following descriptions and tables adapted from ASTM D2488.

Coarse-Grained Soil - Coarse-grained soils contain fewer than 50% fines and are identified based on the following table.

Primary Constituent	Fines Percent	Type of Fines and Gradation		Group Symbol	Group Name [1]
GRAVEL *% gravel > % sand*	≤ 5%	well graded		GW	Well graded gravel
		poorly graded		GP	Poorly graded gravel
	10%	clayey fines	well graded	GW-GC	Well graded gravel with clay
			poorly graded	GP-GC	Poorly graded gravel with clay
		silty fines	well graded	GW-GM	Well graded gravel wth silt
			poorly graded	GP-GM	Poorly graded gravel with silt
	15% to 45%	clay fines		GC	Clayey gravel
		silt fines		GM	Silty gravel
SAND *% sand ≥ % gravel*	≤ 5%	well graded		SW	Well graded sand
		poorly graded		SP	Poorly graded sand
	10%	clayey fines	well graded	SW-SC	Well graded sand with clay
			poorly graded	SP-SC	Poorly graded sand with clay
		silty fines	well graded	SW-SM	Well graded sand with silt
			poorly graded	SP-SM	Poorly graded sand with silt
	15% to 45%	clay fines		SC	Clayey sand
		silt fines		SM	Silty sand

[1] If soil is a gravel and contains 15% or more sand, add "with sand" to the group name. If soil is a sand and contains 15% of more gravel, add "with gravel" to the group name.

Inorganic Fine-Grained Soil - Fine-grained soils contain 50% or more fines and are identified based on the following table.

Plasticity Criteria	Dry Strength	Coarse Fraction S = Sand, G = Gravel		Group Symbol	Group Name [1]
Medium	Medium to high	< 15% S + G		CL	Lean clay
		≥ 30%	% S ≥ % G	CL	Sandy lean clay
		S + G	% S < % G	CL	Gravelly lean clay
Non-plastic	None to low	< 15% S + G		ML	Silt
		≥ 30%	% S ≥ % G	ML	Sandy silt
		S + G	% S < % G	ML	Gravelly silt
High	High to very high	< 15% S + G		CH	Fat clay
		≥ 30%	% S ≥ % G	CH	Sandy fat clay
		S + G	% S < % G	CH	Gravelly fat clay
Low to Medium	Low to medium	< 15% S + G		MH	Elastic silt
		≥ 30%	% S ≥ % G	MH	Sandy elastic silt
		S + G	% S < % G	MH	Gravelly elastic silt

[1] If soil contains 15% to 25% sand or gravel, add "with sand" or "with gravel" to the group name.

Organic Fine-Grained Soil - Fine-grained soils that contain enough organic particles to influence the soil properties are identified as Organic Soil and assigned the group symbol **OL** or **OH**.

Highly Organic Soil (Peat) - Soils composed primarily of plant remains in various stages of decomposition are identified as Peat and given the group symbol **PT**. Peat usually has an organic odor, a dark brown to black color, and a texture ranging from fibrous (original plant structure intact or mostly intact) to amorphous (plant structure decomposed to fine particles).

SOIL DESCRIPTION

Soils are *described* in the following general sequence. Deviations may occur in some instances.

Identification Components

(1) Group Name and Group Symbol

Description Components

(2) Consistency (Fine-Grained) or Apparent Density (Coarse-Grained)
(3) Color (*note, the term "to" may be used to indicate a gradational change*)
(4) Soil Moisture
(5) Matrix Soil Constituents (Gravel, Sand, Fines)
  └► Proportion (*by weight*), particle size, plasticity of fines, angularity, etc.
(6) Non-Matrix Soil Materials and Proportions (*by volume*)
(7) Other Descriptive Information (Unusual Odor, Structure, Texture, etc.)
(8) [Geologic Formation Name or Soil Survey Unit]

SPT N-VALUE CORRELATIONS

Consistency	SPT N-Value	Apparent Density	SPT N-Value
Very soft	0 - 2	Very loose	0 - 5
Soft	2 - 4	Loose	5 - 10
Medium stiff	4 - 8	Medium dense	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very stiff	15 - 30	Very dense	> 50
Hard	> 30		

SOIL MOISTURE

Dry..... Apparent absence of moisture; dry to the touch.
Moist..... Damp but no visible water.
Wet..... Visible free water; saturated.

PROPORTIONS / PERCENTAGES

Proportions of gravel, sand, and fines (excluding cobbles, boulders, and other constituents) are stated in the following terms indicating a range of percentages by weight (to nearest 5%) of the minus 3-in. soil fraction and add up to 100%.

Mostly ..... 50% - 100%
Some ..... 30% - 45%
Little ..... 15% - 25%
Few ..... 5% - 10%
Trace..... Less than 5%

Proportions of cobbles, boulders, and other non-matrix soil materials including artificial debris, roots, plant fibers, etc. are stated in the following terms indicating a range of percentages by volume (to the nearest 5%) of the total soil.

Numerous ..... 40% - 50%
Common ..... 25% - 35%
Occasional ..... 10% - 20%
Trace..... Less than 5%

PLASTICITY (FINES ONLY)

Non-plastic.....Dry specimen ball falls apart easily. Cannot be rolled into thread at any moisture content.
Low.....Dry specimen ball easily crushed with fingers. Can be rolled into 1/8-in. thread with some difficulty.
Medium.....Difficult to crush dry specimen ball with fingers. Easily rolled into 1/8-in. thread.
High.....Cannot crush dry specimen ball with fingers. Easily rolled and re-rolled into 1/8-in. thread.

COBBLES AND BOULDERS

Cobbles - Particles of rock that will pass a 12-in. square opening and be retained on a 3-in. sieve.

Boulders - Particles of rock that will not pass a 12-in. square opening.

Note: Where the percentage (by volume) of cobbles and/or boulders cannot be accurately or reliably estimated, the terms "with cobbles", "with boulders", or "with cobbles and boulders" may be used to indicate observed or inferred presence.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-101

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 14, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger to Rotary Wash	DATE FINISH:	December 15, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	474.0 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	Driven Flush-Joint Casing (3" ID)	FINAL DEPTH:	49.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919320.0500 / E:573790.1930
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 24/24	17 14 23 17	0.3 0.2	37		Asphalt- 3 inches thick. **Silty sand with gravel (SM)** - Dense; dark brown; moist; mostly fine to coarse SAND, little fine to coarse gravel, little non plastic fines. **[FILL]**		Depth to groundwater could not be assessed due to use of rotary wash drilling.
		S-2 24/24	18 17 20 10	0.1	37		**Poorly graded sand with silt and gravel (SP-SM)** - Brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines; trace debris (brick). **[FILL]**		
5		S-3 24/24	6 6 13 13	0.0	19		**Gravelly lean clay with sand (CL)** - Very stiff to hard; gray to brown; wet; mostly medium plasticity FINES, some fine to coarse gravel, little fine to coarse sand.	469	[5.0] Drilling method changed from hollow stem auger to rotary wash.
							[8.0-17.5] Soil less gravelly (little fine to coarse gravel)		
10		S-4 20/24	9 8 12 12	0.5	13 ⊕ ▶ ◀ 20			464	[9.0] Casing advancement terminated. [11.0 - 12.0] Roller bit grinding through cobbles/boulders.
15		S-5 15/24	8 9 15 13	0.6	24		*[17.5 - 22.5] Soil more gravelly (some fine to coarse gravel).*	459	[17.5 - 18.5] Roller bit grinding through cobbles/boulders.
20		S-6 20/24	13 11 18 21	0.4	29		*[22.5 - 38.5] Fines more plastic (medium plasticity fines).*	454	
25		S-7 24/24	9 8 13 15	0.8	21			449	

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-101

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100				Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
30		S-8 24/24	9 10 13 14	0.3	● 23		**Gravelly lean clay with sand (CL)** - Very stiff to hard; gray to brown; wet; mostly medium plasticity FINES, some fine to coarse gravel, little fine to coarse sand.	444	
35		S-9 24/24	7 11 18 19	0.3	● 29			439	
40		S-10 14/16	26 39 50/4	0.6			**Clayey sand with gravel (SC)** - Very dense; gray; wet; some fine to medium SAND, some fine to coarse gravel, some low plasticity fines.	434	[38.5 - 39.0] Roller bit grinding through cobbles/boulders.
45		S-11 8/9	76 50/3	0.4			**Silty gravel with sand (GM)** - Very dense; brown to gray; wet; mostly fine to coarse GRAVEL, some non plastic fines, little fine to coarse sand; **[POSSIBLE WEATHERED ROCK].**	429	[45.5 - 49.0] Slow and consistent roller bit advancement into possible rock. Flakey, dark gray rock chips in roller bit cuttings.
50		S-12 0/0	55/0					424	**Exploration ended at 49.0 ft.**
55								419	
60								414	

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-102

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 14, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger to Rotary Wash	DATE FINISH:	December 14, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	474.0 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	Driven Flush-Joint Casing (3" ID)	FINAL DEPTH:	44.1 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919181.0730 / E:573725.5390
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 11/15	15 12 52/3	34.1			Asphalt- 3 inches thick. **Silty sand with gravel (SM)** - Dark brown to black; moist; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines. **[FILL]** Possible concrete debris. *[2.0 - 2.2] No recovery.*		Depth to groundwater could not be assessed due to use of rotary wash drilling. [1.6 - 7.5] Auger grinding through possible concrete debris. Slow and difficult auger advancement and possible concrete with strong petroleum-like odor in cuttings.
		S-2 0/2	55/2						
5		S-3 0/1	65/1				*[5.0 - 5.1] No recovery.*	469	
		S-4 11/24	16 16 31 21	57.6	47 ●		**Silty sand with gravel (SM)** - Dense to very dense; brown to gray; wet; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel; petroleum-like odor.		
10		S-5 0/24	20 21 30 34		>> 51 ●		*[10.0 - 12.0] No recovery.*	464	
							Lean clay with sand (CL) - Hard; brown to gray; wet; mostly medium plasticity FINES, little fine to medium sand, few fine gravel.		
15		S-6 23/24	13 13 21 20	13.0	34 ●			459	
20		S-7 0/24	22 28 37 37		>> 65 ●		*[20.0 - 22.0] No recovery.*	454	
							Sandy lean clay with gravel (CL) - Hard; gray to brown; wet; mostly medium plasticity FINES, little fine to coarse sand, little fine gravel.		[22.0 - 23.0] Auger grinding through cobbles/boulders.
25		S-8 24/24	14 18 26 27	1.4	44 ●			449	[25.0] Drilling method changed from hollow stem auger to rotary wash.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

BORING ID: B-102

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA (● N-Value, Raw (bpf); ⊠ Organic Content (%); 10 20 30 40; ⊕ Moisture Content (%); ▶ Plastic Limit, PL (%); ◀ Liquid Limit, LL (%); 25 50 75 100)	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
									Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
30		S-9 24/24	16 24 41 49	0.3	>> 65 ●		**Sandy lean clay with gravel (CL) -** Hard; gray to brown; wet; mostly medium plasticity FINES, little fine to coarse sand, little fine gravel.	444	[29.0] Casing advancement terminated.
35		S-10 4/4	50/4	0.3			**Silty sand (SM)** - Very dense; gray to brown; wet; mostly fine to coarse SAND, some non plastic fines, few fine gravel.	439	
40		S-11 0/0	50/0				**Silty gravel with sand (GM)** - Very dense; brown to gray; wet; mostly fine to coarse GRAVEL, some non plastic fines, little fine to coarse sand; **[POSSIBLE WEATHERED ROCK].** *[39.0] No recovery.*	434	[37.0 - 44.0] Slow and consistent roller bit advancement into possible rock. Flakey, dark gray rock chips in roller bit cuttings.
45		S-12 1/1	58/1	0.3				429	**Exploration ended at 44.1 ft.**
50								424	
55								419	
60								414	

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-103

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 11, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 11, 2023
LOGGED BY:	H. Flores, PE	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	475.5 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919442.4610 / E:573799.5630
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 19/24	11 11 15 9	0.0	26		Asphalt- 4 inches thick. **Silty sand (SM)** - Medium dense; dark brown to gray; moist to wet; mostly fine to coarse SAND, little non plastic fines, few fine to coarse gravel; trace asphalt. **[FILL]**		
		S-2 12/24	7 6 7 7	1.8	13				
5		S-3 0/24	7 6 9 10		15		*[4.3 - 6.3] No recovery.*	471	
		S-4 15/24	9 9 19 11	0.1 0.0	28		**Silty gravel with sand (GM)** - Medium dense; gray; wet; mostly fine to coarse GRAVEL, little fine to coarse sand, little non plastic fines. **[FILL]** **Sandy silt (ML)** - Very stiff; gray; moist; mostly non plastic FINES, some fine to coarse sand.		
10		S-5 24/24	6 6 11 11	0.0	17		**Sandy lean clay (CL)** - Very stiff; gray; moist; mostly medium plasticity FINES, little fine to medium sand, few fine to coarse gravel.	466	
							[13.5 - 16.5] Some fine to coarse sand.		
15		S-6 21/24	4 6 25 50/3	0.1 0.1	31		*[16.0] Rock bits in spoon tip* **Sandy lean clay with gravel (CL)** - Very stiff; gray; moist; some medium plasticity FINES, some fine to coarse sand, some fine to coarse gravel.	461	[17.0] Auger chatter.
20		S-7 19/24	6 11 17 14	0.2	28			456	[21.0] GC: 31%, SC: 34%, FC: 36%
							[23.5-27.0] Soil less gravelly (little fine to coarse gravel)	451	
25		S-8 8/24	6 8 14 12	0.2	22				**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-104

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 11, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 11, 2023
LOGGED BY:	H. Flores, PE	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	474.0 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919389.8540 / E:573836.1920
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA (● N-Value, Raw (bpf); ⊠ Organic Content (%); ⊕ Moisture Content (%); ▶ Plastic Limit, PL (%); ◀ Liquid Limit, LL (%))	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					10 20 30 40 / 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 19/24	25 20 32 26	0.3 0.3	>> 52		Asphalt- 3 inches thick. **Silty sand with gravel (SM)** - Very dense; dark brown to brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines. **[FILL]**		
		S-2 14/24	17 17 15 14	0.2	32		*[2.] Rock fragments* **Sandy lean clay (CL)** - Stiff to hard; brown to gray; moist; mostly medium plasticity FINES, some fine to coarse sand, few fine gravel.		
5		S-3 12/24	16 8 10 10	0.2	18			469	[5.2] GC: 11%, SC: 43%, FC: 46%
10		S-4 8/24	5 6 9 8	0.4	15			464	
15		S-5 18/24	5 5 8 9	0.3	13			459	
20		S-6 18/24	6 7 10 10	0.3	17		**Sandy lean clay with gravel (CL)** - Very stiff; gray; moist; mostly medium plasticity FINES, some fine to medium sand, little fine to coarse gravel.	454	
25		S-7 24/24	5 6 11 11	0.3	17			449	**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-105

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 11, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 11, 2023
LOGGED BY:	H. Flores, PE	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	475.5 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919375.5240 / E:573767.1100
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		
		S-1 13/24	7 8 13 9	0.5 0.4	21		Asphalt- 3 inches thick. **Silty sand with gravel (SM)** - Medium dense; dark brown to brown; moist; mostly fine to coarse SAND, little fine to coarse gravel, little non plastic fines; trace asphalt. **[FILL]**		
		S-2 15/24	11 8 10 11	0.5 0.9	18		**Clayey sand with gravel (SC)** - Medium dense; brown to gray; moist; some fine to coarse SAND, some medium plasticity fines, little fine to coarse gravel.	471	
5		S-3 19/24	5 9 13 10	0.8	22				
							Sandy lean clay (CL) - Stiff; gray; moist; mostly medium plasticity FINES, some fine to coarse sand.	466	
10		S-4 22/24	2 6 5 10	2.6	19 ⊕ 11				
							Sandy lean clay with gravel (CL) - Very stiff; gray; moist; mostly medium plasticity FINES, some fine to medium sand, little fine to coarse gravel.	461	
15		S-5 24/24	7 8 15 13	0.8	23				
							Clayey sand with gravel (SC) - Medium dense; gray; moist; some fine to medium SAND, some medium plasticity fines, little fine to coarse gravel.	456	
20		S-6 23/24	7 11 19 15	0.3	30				
							Sandy lean clay with gravel (CL) - Very stiff; gray; moist; mostly medium plasticity FINES, some fine to medium sand, little fine to coarse gravel.	451	
25		S-7 24/24	7 9 14 19	0.3	23		*[26.5 - 27] Silt seams.*		
									Exploration ended at 27.0 ft.

Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-106

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 12, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 12, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	474.0 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919324.9680 / E:573841.6460
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA (N-Value, Raw (bpf); Organic Content (%); Moisture Content (%); Plastic Limit, PL (%); Liquid Limit, LL (%))	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					10 20 30 40 / 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 9/24	15 15 16 8	0.7	31		Asphalt- 2 inches thick. **Silty sand with gravel (SM)** - Dense; brown; moist; little fine and coarse gravel, little non plastic fines. **[FILL]**		
		S-2 17/24	10 6 10 7	0.7 0.3	16		**Sandy lean clay with gravel (CL)** - Very stiff; brown to gray; wet; some medium plasticity FINES, some fine to coarse sand, little fine gravel.		[3.0 - 5.0] Auger grinding through cobbles/boulders. [3.2] GC: 15%, SC: 39%, FC: 46%
5		S-3 22/24	4 6 9 9	6.8	15			469	
10		S-4 4/24	4 6 11 11	4.3	17			464	[9.0 - 10.0] Auger grinding through cobbles/boulders.
15		S-5 22/24	4 5 8 8	1.3	13		**Gravelly lean clay with sand (CL)** - Stiff to very stiff; gray to brown; moist to wet; mostly medium plasticity FINES, some fine to coarse gravel, little fine to coarse sand.	459	
20		S-6 24/24	6 8 12 14	1.3	20			454	[22.0 - 24.0] Auger grinding through cobbles/boulders.
25		S-7 24/24	6 8 14 16	0.4	22			449	**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-107

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 12, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 12, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	475.5 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919302.4140 / E:573728.4090
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		
		S-1 16/24	14 14 15 9	0.5 2.5	29		Asphalt- 4 inches thick. **Silty sand with gravel (SM)** - Medium dense; dark brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines. **[FILL]**		
		S-2 7/24	7 4 4 5	38.0	8		**Silty sand with gravel (SM)** - Loose; gray to brown; wet; some fine to coarse SAND, some non plastic fines, little fine to coarse gravel; petroleum-like odor; trace debris (slag); possible petroleum staining. **[FILL]**		[3.0 - 4.5] Auger grinding through cobbles/boulders.
5		S-3 12/24	9 15 28 33	0.3	43		**Sandy lean clay with gravel (CL)** - Hard; gray to brown; wet; mostly medium plasticity FINES, some fine to coarse sand, little fine to coarse gravel.	471	
10		S-4 21/24	4 9 15 14	0.3	17 24		**Gravelly lean clay with sand (CL)** - Very stiff; gray to brown; wet; mostly medium plasticity FINES, some fine to coarse gravel, little fine to coarse sand.	466	
15		S-5 24/24	8 12 21 22	0.1	33		**Sandy lean clay with gravel (CL)** - Hard; gray to brown; wet; mostly medium plasticity FINES, some fine to coarse sand, little fine to coarse gravel.	461	
20		S-6 24/24	7 11 20 19	0.1	31		**Clayey sand with gravel (SC)** - Medium dense to dense; gray to brown; wet; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel.	456	
25		S-7 24/24	5 9 15 20	0.0	24			451	**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-108

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 12, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 12, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	474.0 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919239.4300 / E:573813.4580
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Monitoring Well Installed	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
	S-1 9/24	11 13 30 18	0.4	43		Asphalt- 2 inches thick. **Silty gravel with sand (GM)** - Dense; brown with gray; moist to wet; mostly fine to coarse GRAVEL, little fine to coarse sand, little non plastic fines. **[FILL]**		[0.5 - 3.0] Auger grinding through cobbles/boulders.
	S-2 15/24	10 9 9 13	1.8	18		**Clayey sand with gravel (SC)** - Medium dense to dense; brown to gray; wet; some fine to coarse SAND, some medium plasticity fines, little fine gravel. *[4.6 - 15] Soil more gravelly (some fine to coarse gravel).*		
5	S-3 24/24	6 9 17 12	0.1	26			469	
								[8.0 - 9.0] Auger grinding through cobbles/boulders.
10	S-4 22/24	12 13 17 26	0.2	30			464	
15	S-5 24/24	22 15 20 20	0.1	35		**Sandy silt (ML)** - Hard; gray; wet; mostly non plastic FINES, some fine to coarse sand, few fine gravel.	459	[16.0 - 17.5] Auger grinding through cobbles/boulders. [16.0] GC: 9%, SC: 43%, FC: 48%
20	S-6 24/24	10 10 13 15	0.0 0.3	23		**Sandy lean clay (CL)** - Gray to brown; moist; mostly medium plasticity FINES, some fine to coarse sand, trace fine gravel.	454	Water level measured at 22.5 ft. on 12/15/23 (well reading).
25	S-7 24/24	8 11 20 19	0.4	31		**Silty gravel with sand (GM)** - Dense; brown to gray; moist to wet; some fine to coarse gravel, some medium plasticity fines, some fine to coarse sand.	449	**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-109

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 12, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 13, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	475.5 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919234.3930 / E:573693.2440
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA (N-Value, Raw (bpf); Organic Content (%); Moisture Content (%); Plastic Limit, PL (%); Liquid Limit, LL (%))	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
							Surface: Asphalt concrete pavement.		
							Asphalt- 5 inches thick.		
		S-1 18/24	16 17 17 12	0.2 0.1	34		**Silty sand with gravel (SM)** - Dense; black; mostly fine to coarse SAND, little fine to coarse gravel, little non plastic fines. **[FILL]**		
		S-2 20/24	11 7 16 16	0.2	23		**Poorly graded sand with silt and gravel (SP-SM)** - Brown; moist; mostly fine to coarse SAND, little fine to coarse gravel, few non plastic fines. **[FILL]**		
5		S-3 24/24	10 13 16 15	0.1	29		**Clayey sand (SC)** - Medium dense to dense; brown to gray; wet; mostly fine to coarse SAND, some medium plasticity fines, trace fine gravel.	471	[6.0] GC: 7%, SC: 48%, FC: 45%
							[8.5 - 17.5] Soil more gravelly (some fine to coarse gravel).		
10		S-4 21/24	11 12 21 18	0.0	33			466	
15		S-5 12/24	11 14 26 17	0.0	40		**Clayey sand with gravel (SC)** - Dense; gray to brown; wet; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel.	461	
20		S-6 24/24	12 16 25 25	0.2	41			456	
25		S-7 24/24	7 12 21 32	0.2	33		**Sandy lean clay with gravel (CL)** - Hard; brown with streaked gray; wet; mostly medium plasticity FINES, little fine to coarse sand, little fine to coarse gravel.	451	**Exploration ended at 27.0 ft.**

Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-110

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 13, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 13, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	475.5 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919148.1720 / E:573652.3290
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA (N-Value, Raw (bpf); Organic Content (%); Moisture Content (%); Plastic Limit, PL (%); Liquid Limit, LL (%))	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
							Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 18/24	15 14 15 11	0.3	29		Asphalt- 4 inches thick. **Silty sand with gravel (SM)** - Medium dense; brown to black; wet; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines. **[FILL]**		
		S-2 19/24	13 9 13 12	0.4 0.6	22		**Poorly graded sand with silt and gravel (SP-SM)** - Black; wet; mostly fine to coarse SAND, little fine to coarse gravel, few non plastic fines. **[FILL]**		
5		S-3 20/24	10 10 12 21	0.2	22		**Clayey sand with gravel (SC)** - Medium dense to dense; brown to gray; moist to wet; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel.	471	
10		S-4 21/24	10 15 24 21	0.2	39			466	
							Sandy lean clay (CL) - Very stiff; gray to brown; moist; mostly medium plasticity FINES, some fine to coarse sand, few fine to coarse gravel.	461	[13.5 - 14.5] Auger grinding through cobbles/boulders.
15		S-5 24/24	11 10 17 20	0.1	27				[16.0] GC: 12%, SC: 40%, FC: 48%
							Clayey sand with gravel (SC) - Medium dense; gray to brown; moist to wet; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel.	456	
20		S-6 24/24	10 11 19 18	0.1	30				
							Sandy lean clay with gravel (CL) - Hard; gray with brown; moist; mostly medium plasticity FINES, little fine to coarse sand, little fine to coarse gravel.	451	
25		S-7 24/24	9 16 23 36	0.1	39				**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-111

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 13, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 13, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	475.0 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919122.6600 / E:573755.1090
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ☒ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 9/24	17 18 36 18	0.5	>> 54		Asphalt- 4 inches thick. **Silty sand with gravel (SM)** - Very dense; black; wet; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines. **[FILL]**		[1.0 - 3.5] Auger grinding through cobbles/boulders.
		S-2 2/13	18 17 50/1	0.5			**Silty gravel with sand (GM)** - Wet; mostly fine to coarse GRAVEL, some fine to coarse sand, little non plastic fines. **[FILL]**		
5		S-3 0/24	20 20 26 21		46		*[5.0 - 7.0] No recovery.*	470	
		S-4 9/24	25 33 49 43	1.1	>> 82		**Clayey sand with gravel (SC)** - Dense to very dense; brown to gray; wet; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel.		
10		S-5 24/24	11 13 21 20	0.2	⊕ 9 34			465	[11.0 - 12.0] Auger grinding through cobbles/boulders.
15		S-6 24/24	11 15 21 21	0.2	36		*[18.5-23.5] Soil less gravelly (little fine to coarse gravel)*	460	
20		S-7 24/24	13 15 16 15	0.2	31			455	[21.0] Estimated water level at time of drilling based on changes in sample moisture.
25		S-8 24/24	9 14 18 18		32		**Silty sand with gravel (SM)** - Dense; brown to gray; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel.	450	**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-112

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	December 13, 2023
FOREMAN:	S. Preston	ADVANCE METHOD:	Hollow-Stem Auger Drilling	DATE FINISH:	December 14, 2023
LOGGED BY:	S. Wuebbolt, EIT	AUGER DIAMETER:	4-1/4" ID (Stem), 7-5/8" OD (Flights)	GROUND EL:	475.0 ± (NAVD88)
CHECKED BY:	H. Flores, PE	SUPPORT CASING:	N/A	FINAL DEPTH:	27.0 ft.
EQUIPMENT:	Truck Mounted Drill Rig	CORING METHOD:	N/A	GRID COORDS:	N:2919092.6950 / E:573676.2250
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	PID MEASUREMENT, PPM BY VOLUME (HEADSPACE)	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
					● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-1 19/24	13 12 18 17	0.2	30		Asphalt- 3 inches thick. **Poorly graded sand with silt and gravel (SP-SM)** - Medium dense to dense; brown; wet; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines. **[FILL]**		[1.0 - 3.0] Auger grinding through cobbles/boulders.
		S-2 15/24	24 18 22 29	0.1 0.1	40		**Clayey sand (SC)** - Gray to brown; wet; mostly fine to coarse SAND, some medium plasticity fines, trace fine gravel.		
5		S-3 21/24	14 15 20 17	0.1	35		**Clayey sand with gravel (SC)** - Medium dense to dense; brown to gray; wet; some fine to coarse SAND, some medium plasticity fines, little fine to coarse gravel.	470	[7.0 - 8.0] Auger grinding through cobbles/boulders.
							[8.5 - 18.5] Soil more gravelly (some fine to coarse gravel).		
10		S-4 21/24	25 14 21 20	0.1 0.1	35			465	
15		S-5 24/24	12 10 16 18		26		**Gravelly lean clay with sand (CL)** - Hard; gray to brown; moist; mostly medium plasticity FINES, little fine to coarse gravel, little fine to coarse sand.	460	
20		S-6 24/24	11 15 25 24	0.0	40			455	
25		S-7 24/24	11 13 21 24	25.0	34			450	**Exploration ended at 27.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

APPENDIX B

Test Pit Logs

Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-1

WSE Project: ENG23-3281

CONTRACTOR:	**Geosearch, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**December 14, 2023**
OPERATOR:	**M. Bovenzi**	PLAN DIMENSIONS:	**Length: 4.0 ft. , Width: 3.0 ft.**	DATE FINISH:	**December 14, 2023**
LOGGED BY:	**S. Wuebbolt, EIT**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**474.0 ± (NAVD88)**
CHECKED BY:	**H. Flores, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**0.3 ft.**
EQUIPMENT:	**Hydraulic Excavator, Compact**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N:2919403 ± / E:573856 ±**
BUCKET TYPE:	**Toothed, 30-in. (8.5 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass area.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Topsoil- At least 4 inches thick.		**Possible electrical utility encountered at 0.3 ft. Test pit excavation terminated and offset approximately 5 feet south to test pit TP-1A**
5				469	
10				464	
15				459	

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-1A

WSE Project: ENG23-3281

CONTRACTOR:	**Geosearch, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**December 14, 2023**
OPERATOR:	**M. Bovenzi**	PLAN DIMENSIONS:	**Length: 8.0 ft. , Width: 3.0 ft.**	DATE FINISH:	**December 14, 2023**
LOGGED BY:	**S. Wuebbolt, EIT**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**474.0 ± (NAVD88)**
CHECKED BY:	**H. Flores, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**3.0 ft.**
EQUIPMENT:	**Hydraulic Excavator, Compact**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N:2919398 ± / E:573856 ±**
BUCKET TYPE:	**Toothed, 30-in. (8.5 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Asphalt concrete pavement- 4 inches thick.		
			Silty sand with gravel (SM) - Brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines; trace debris (brick). **[FILL]**		
					Possible abandoned drainage utility encountered at 3 ft. Test pit excavation terminated.
5				469	
10				464	
15				459	





Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-2

WSE Project: ENG23-3281

CONTRACTOR:	**Geosearch, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**December 14, 2023**
OPERATOR:	**M. Bovenzi**	PLAN DIMENSIONS:	**Length: 10.0 ft. , Width: 3.0 ft.**	DATE FINISH:	**December 14, 2023**
LOGGED BY:	**S. Wuebbolt, EIT**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**474.5 ± (NAVD88)**
CHECKED BY:	**H. Flores, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**10.3 ft.**
EQUIPMENT:	**Hydraulic Excavator, Compact**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N:2919266 ± / E:573830 ±**
BUCKET TYPE:	**Toothed, 30-in. (8.5 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass area.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Topsoil- 9 inches thick.		
			Silty sand with gravel (SM) - Brown; moist; mostly fine to coarse SAND, some non plastic fines, little fine to coarse gravel; trace cobbles. **[FILL]**		
			Sandy lean clay with gravel (CL) - Brown to gray; moist; mostly medium plasticity FINES, little fine to coarse sand, little fine to coarse gravel; trace cobbles.		
5				470	
10				465	**Exploration ended at 10.3 ft.**
15				460	







Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-3

WSE Project: ENG23-3281

CONTRACTOR:	**Geosearch, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**December 14, 2023**
OPERATOR:	**M. Bovenzi**	PLAN DIMENSIONS:	**Length: 12.0 ft. , Width: 3.0 ft.**	DATE FINISH:	**December 14, 2023**
LOGGED BY:	**S. Wuebbolt, EIT**	SEEPAGE REMARKS:	**Slow Seepage at 2.5 ft.**	GROUND EL:	**475.0 ± (NAVD88)**
CHECKED BY:	**H. Flores, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**10.0 ft.**
EQUIPMENT:	**Hydraulic Excavator, Compact**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N:2919052 ± / E:573736 ±**
BUCKET TYPE:	**Toothed, 30-in. (8.5 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Grass area.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Topsoil- 10 inches thick.		
			Poorly graded sand with silt and gravel (SP-SM) - Brown; moist; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines; occasional cobbles; trace debris (brick). **[FILL]**		
			Silty sand with gravel (SM) - Gray to black; moist to wet; mostly fine to coarse SAND, little non plastic fines, little fine to coarse gravel; trace debris (wood with petroleum-like odor, brick). **[FILL]**		[2.5] Perched groundwater observed.
			Clayey sand with gravel (SC) - Brown; moist; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel; occasional cobbles; trace boulders up to 16" diameter.		
5				470	
10				465	**Exploration ended at 10.0 ft.**
15				460	







Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-4

WSE Project: ENG23-3281

CONTRACTOR:	**Geosearch, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**December 14, 2023**
OPERATOR:	**M. Bovenzi**	PLAN DIMENSIONS:	**Length: 7.5 ft. , Width: 3.0 ft.**	DATE FINISH:	**December 14, 2023**
LOGGED BY:	**S. Wuebbolt, EIT**	SEEPAGE REMARKS:	**Slow Seepage at 0.9 ft.**	GROUND EL:	**474.0 ± (NAVD88)**
CHECKED BY:	**H. Flores, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**10.0 ft.**
EQUIPMENT:	**Hydraulic Excavator, Compact**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N:2919289 ± / E:573780 ±**
BUCKET TYPE:	**Toothed, 30-in. (8.5 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Asphalt concrete pavement- 3 inches thick.		
			Poorly graded sand with silt and gravel (SP-SM) - Dark brown to black; moist to wet; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines. **[FILL]**		[0.9] Perched groundwater observed.
			Poorly graded sand with silt and gravel (SP-SM) - Brown; moist to wet; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines; occasional cobbles; occasional debris (possible rock blocks up to 36" diameter). **[FILL]**		
5			**Clayey sand with gravel (SC)** - Brown to gray; moist; some fine to coarse sand, some fine to coarse gravel, some medium plasticity fines.	469	
10				464	**Exploration ended at 10.0 ft.**
15				459	







Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-5

WSE Project: ENG23-3281

CONTRACTOR:	**Geosearch, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**December 14, 2023**
OPERATOR:	**M. Bovenzi**	PLAN DIMENSIONS:	**Length: 9.5 ft. , Width: 2.5 ft.**	DATE FINISH:	**December 14, 2023**
LOGGED BY:	**S. Wuebbolt, EIT**	SEEPAGE REMARKS:	**Slow Seepage at 1.3 ft.**	GROUND EL:	**474.5 ± (NAVD88)**
CHECKED BY:	**H. Flores, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**9.0 ft.**
EQUIPMENT:	**Hydraulic Excavator, Compact**	BACKFILL MATERIAL:	**Excavated Soil**	GRID COORDS:	**N:2919149 ± / E:573711 ±**
BUCKET TYPE:	**Toothed, 30-in. (8.5 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Asphalt concrete pavement- 3 inches thick.		
			Silty sand with gravel (SM) - Dark brown; moist to wet; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines; trace debris (wood); trace organics (roots). **[FILL]**		[1.3] Perched groundwater observed.
			Clayey sand with gravel (SC) - Brown to gray; moist; some fine to coarse sand, some medium plasticity fines, some fine to coarse gravel.		
5				470	
10				465	**Exploration ended at 9.0 ft.**
15				460	







Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Appendix C

Geotechnical Laboratory Test Results

Thielsch
DIVISION OF THE RISE GROUP

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
cts.thielsch.com
Let's Build a Solid Foundation

Client Information:	
Weston & Sampson	
Worcester, MA 01608	
Project Manager:	Hector Flores
Assigned By:	Hector Flores
Collected By:	Client

Project Information:	
Worcester Fire Station	
25 Madison Street, Worcester MA	
Project Number:	ENG23-3281
Summary Page:	1 of 1
Report Date:	01.03.24

LABORATORY TESTING DATA SHEET, Report No.: 7423-M-198

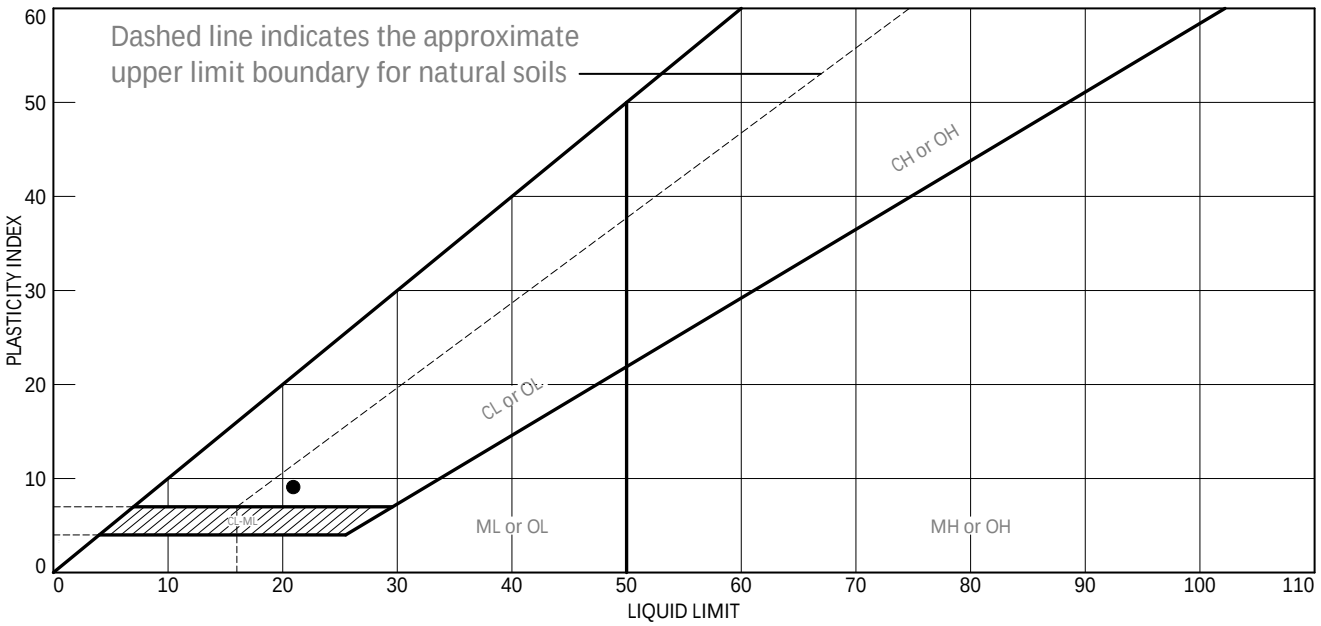
Boring No.	Sample ID	Depth (ft)	Laboratory No.	Identification Tests									Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Rcvd Moisture Content %	LL %	PL %	OD LL	Gravel %	Sand %	Fines %	Org. %	pH	g_d MAX (pcf) W_{opt} (%)	g_d MAX (pcf) W_{opt} (%) (Corr.)	Dry unit wt. (pcf)	Test Moisture Content %	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318			D6913			D2974	D4792	D1557								
B-101	S-4	9-11	23-S-5184	13.3	21	12															Grey SILT & CLAY
B-103	S-7	20-22	23-S-5185					30.8	33.6	35.6											Grey CLAYEY SILT, some f-c Sand, some f-c Gravel
B-104	S-3	4.25-6.25	23-S-5186					11.0	42.9	46.1											Grey SILT & CLAY and f-c SAND, little fine Gravel
B-105	S-4	10-12	23-S-5187	19.3	29	16															Grey CLAY & SILT
B-106	S-2B	2.2-4.2 (Bot 10")	23-S-5188					15.2	38.9	45.9											Grey SILT & CLAY and f-c SAND, little fine Gravel
B-107	S-4	10-12	23-S-5189	16.7	30	16															Grey CLAY & SILT
B-108	S-5	15-17	23-S-5190					8.9	43.4	47.7											Grey SILT and f-c SAND, trace fine Gravel
B-109	S-3	5-7	23-S-5191					7.0	47.9	45.1											Grey f-c SAND and SILT & CLAY, trace fine Gravel
B-110	S-5	15-17	23-S-5192					11.8	40.2	48.0											Grey SILT & CLAY and f-c SAND, little f-c Gravel
B-111	S-5	10-12	23-S-5193	8.8	20	12															Grey SILT & CLAY

Date Received: **12.21.23** Reviewed By: Date Reviewed: **01.03.24**

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LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grey SILT & CLAY	21	12	9			

Project No. ENG23-3281 Client: Weston & Sampson

Project: Worcester Fire Station

25 Madison St, Worcester MA

Source of Sample: Boring Depth: 9-11'

Sample Number: B-101 / S-4

Remarks:

Thielsch Engineering Inc.

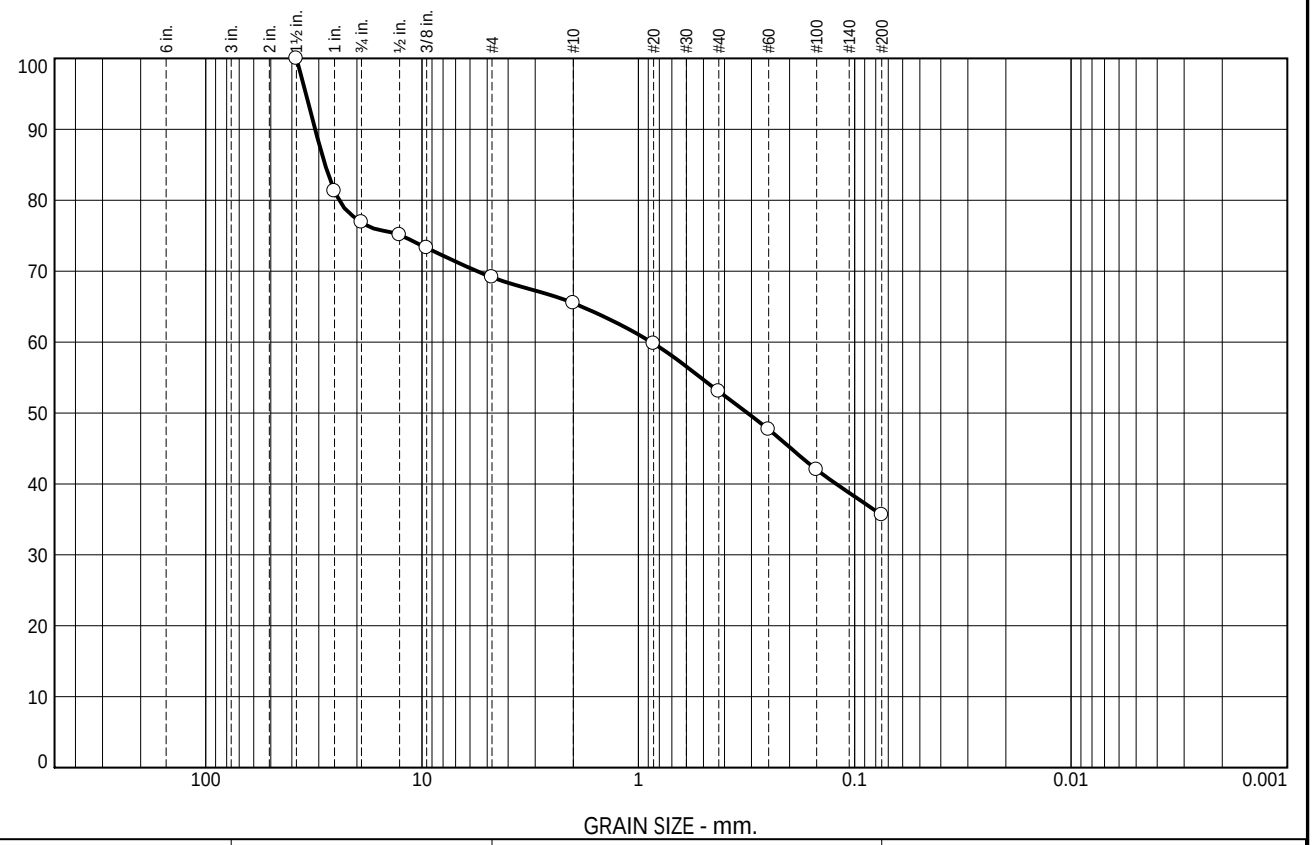
Cranston, RI

Figure 23-L-5184

Tested By: SF Checked By: Kris Roland

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.1	7.7	3.7	12.5	17.4	35.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	81.3		
3/4"	76.9		
1/2"	75.1		
3/8"	73.3		
#4	69.2		
#10	65.5		
#20	59.8		
#40	53.0		
#60	47.7		
#100	42.0		
#200	35.6		

* (no specification provided)

Soil Description

Grey CLAYEY SILT, some f-c Sand, some f-c Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 31.1937 D_{85}= 28.0524 D_{60}= 0.8714
D_{50}= 0.3131 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample visually classified as plastic. Sample rolled to 1/4"

Source of Sample: Boring Depth: 20-22'
Sample Number: B-103 / S-7

Date: 12.29.23

Thielsch Engineering Inc.

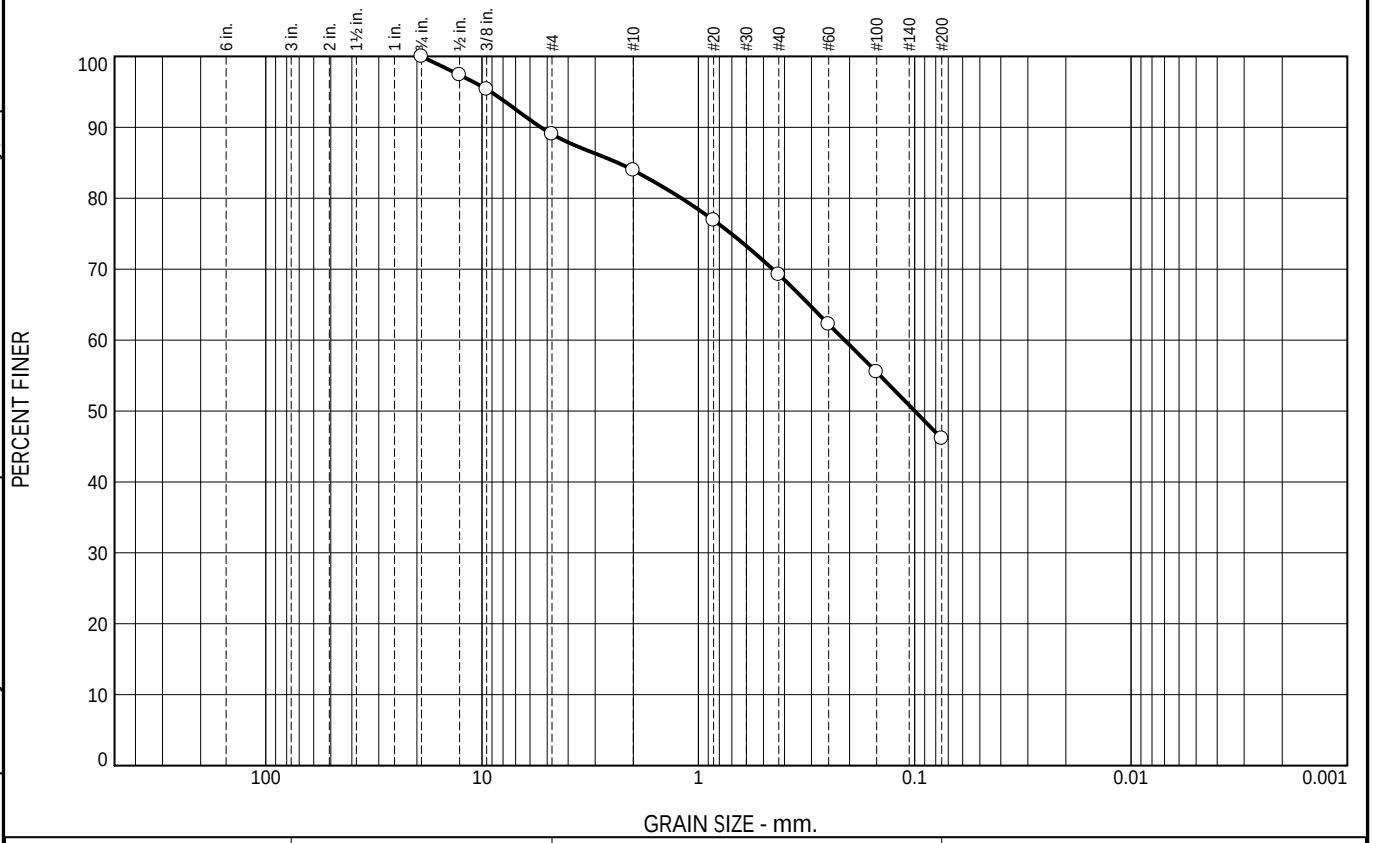
Cranston, RI

Client: Weston & Sampson
Project: Worcester Fire Station
25 Madison St, Worcester MA
Project No: ENG23-3281 Figure 23-S-5185

Tested By: AV / JB Checked By: Kris Roland

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.0	5.0	14.8	23.1	46.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	97.4		
3/8"	95.4		
#4	89.0		
#10	84.0		
#20	76.9		
#40	69.2		
#60	62.2		
#100	55.5		
#200	46.1		

* (no specification provided)

Soil Description

Grey SILT & CLAY and f-c SAND, little fine Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 5.3440 D_{85}= 2.3550 D_{60}= 0.2110
D_{50}= 0.0999 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample visually classified as plastic. Sample rolled to 1/8".

Source of Sample: Boring Depth: 4.25-6.25'
Sample Number: B-104 / S-3

Date: 12.29.23

Thielsch Engineering Inc.

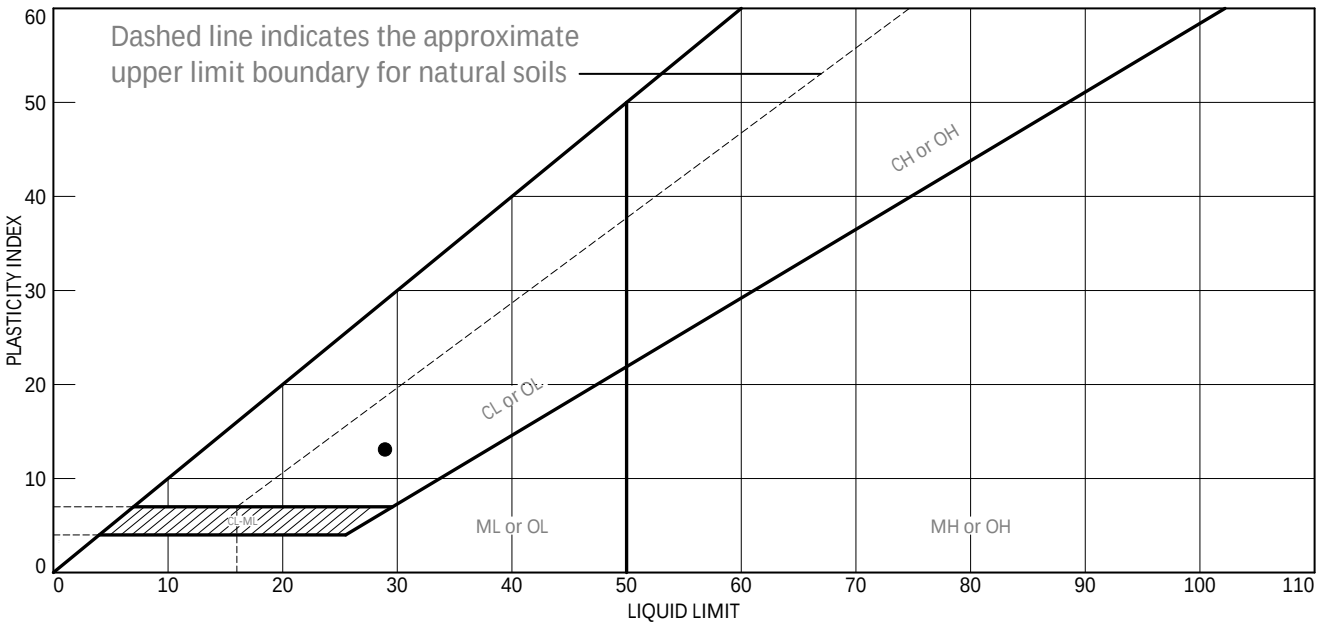
Cranston, RI

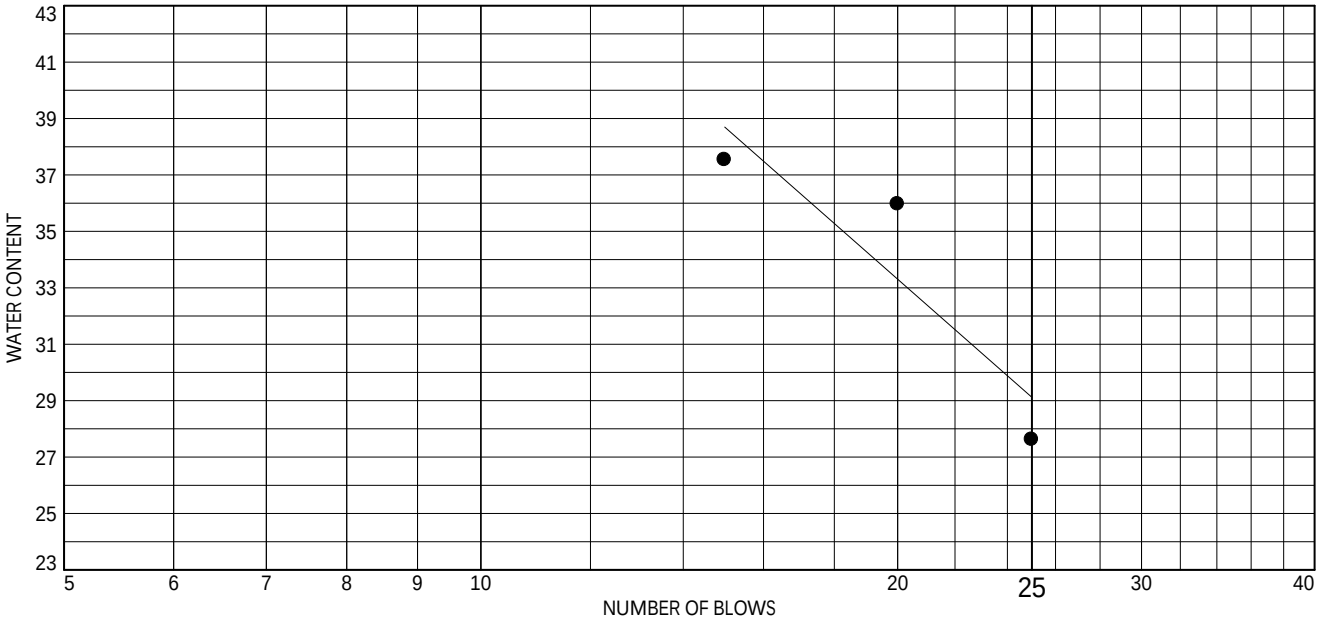
Client: Weston & Sampson
Project: Worcester Fire Station
25 Madison St, Worcester MA
Project No: ENG23-3281 Figure 23-S-5186

Tested By: JB / AV Checked By: Rebecca Roth

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LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grey CLAY & SILT	29	16	13			

Project No. ENG23-3281 Client: Weston & Sampson

Project: Worcester Fire Station

25 Madison St, Worcester MA

Source of Sample: Boring Depth: 10-12'

Sample Number: B-105 / S-4

Remarks:

Thielsch Engineering Inc.

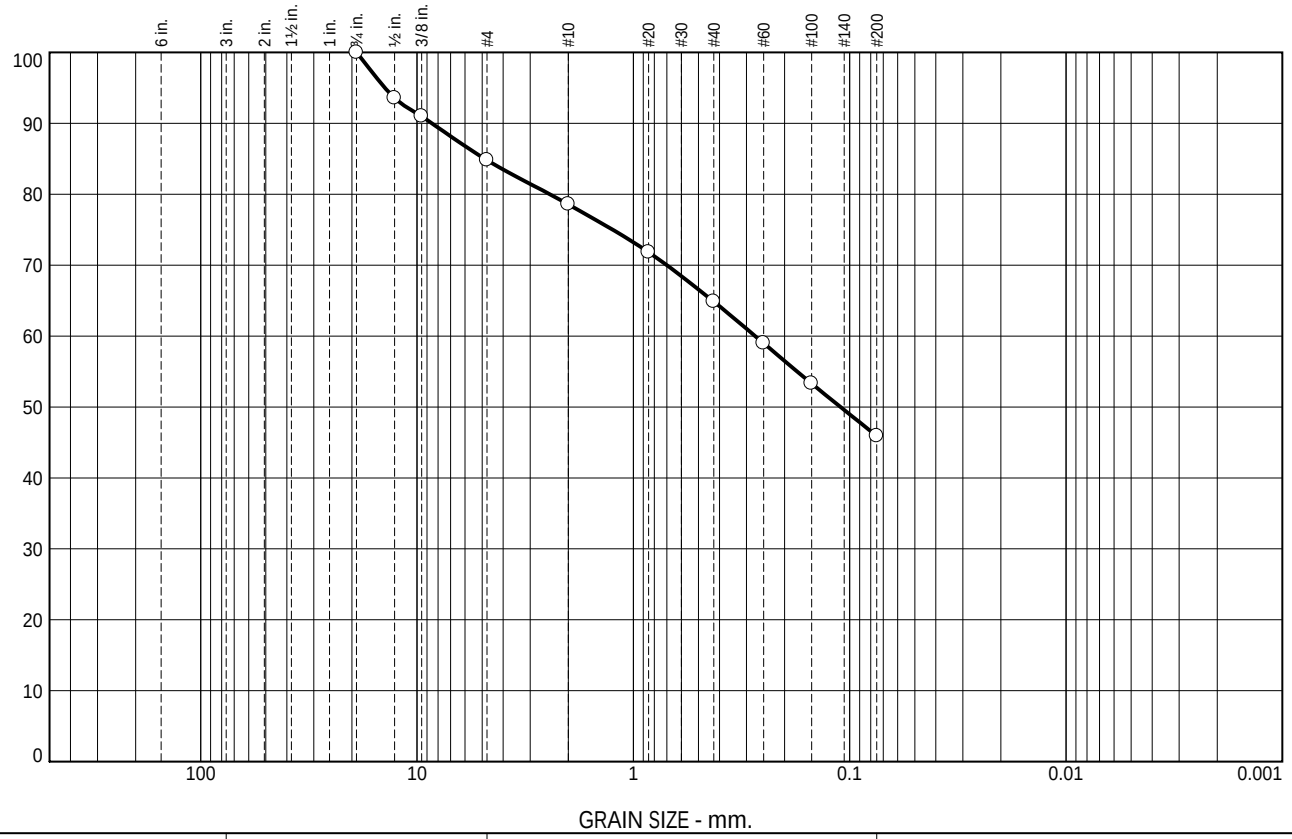
Cranston, RI

Figure 23-L-5187

Tested By: SF Checked By: Rebecca Roth

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	15.2	6.2	13.7	19.0	45.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	93.6		
3/8"	91.0		
#4	84.8		
#10	78.6		
#20	71.8		
#40	64.9		
#60	59.0		
#100	53.3		
#200	45.9		

* (no specification provided)

Soil Description

Grey SILT & CLAY and f-c SAND, little fine Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 8.5327 D_{85}= 4.8577 D_{60}= 0.2737
D_{50}= 0.1102 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample visually classified as plastic. Sample rolled to 1/8".

Source of Sample: Boring Depth: 2.2 - 4.2 (Bot 10")
Sample Number: B-106 / S-2B

Date: 12.29.23

Thielsch Engineering Inc.

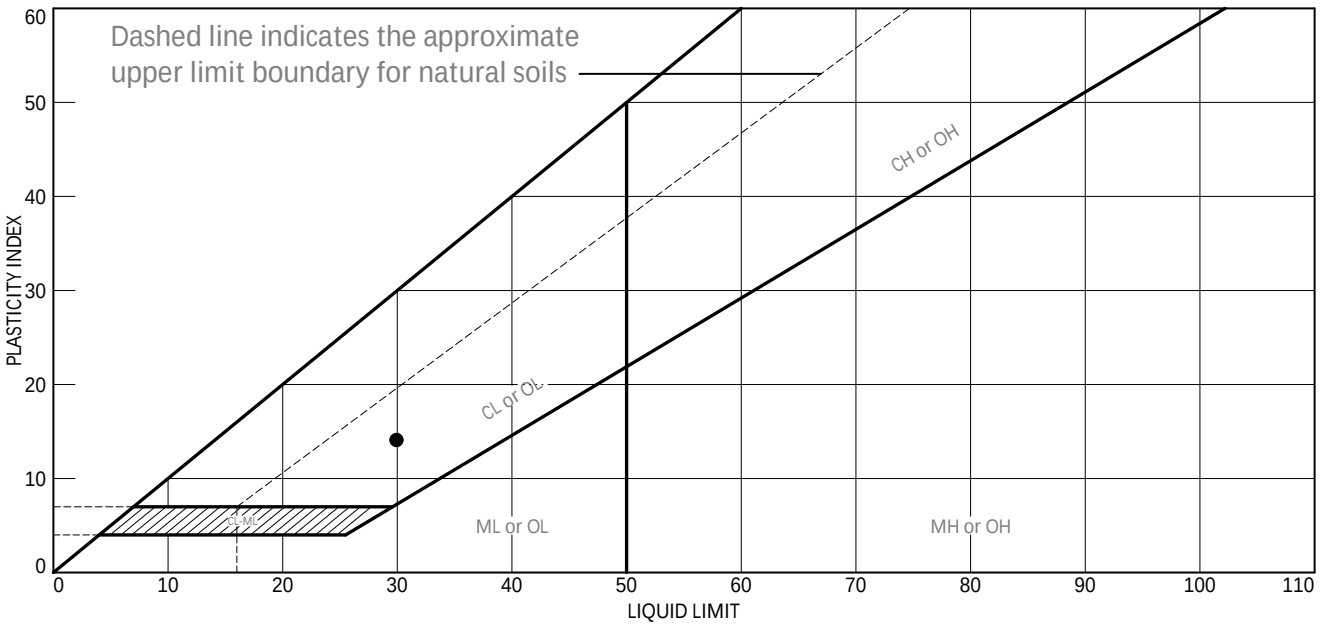
Cranston, RI

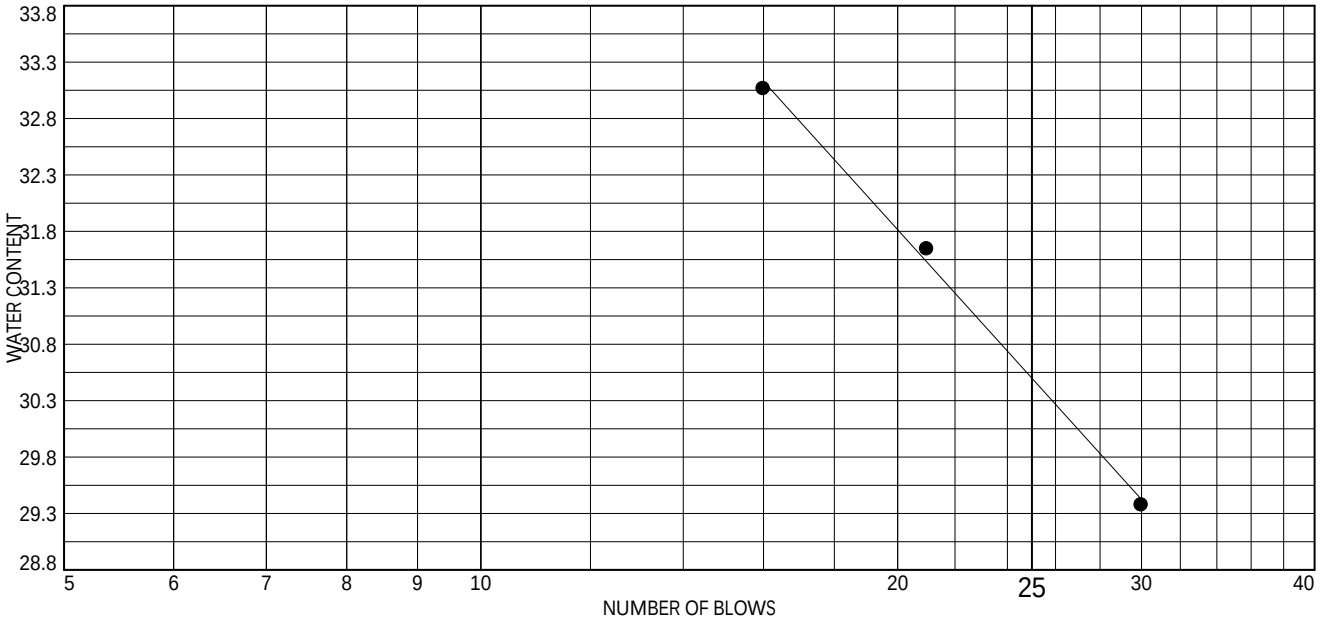
Client: Weston & Sampson
Project: Worcester Fire Station
25 Madison St, Worcester MA
Project No: ENG23-3281 Figure 23-S-5188

Tested By: JB / AV Checked By: Rebecca Roth

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LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grey CLAY & SILT	30	16	14			

Project No. ENG23-3281 Client: Weston & Sampson

Project: Worcester Fire Station

25 Madison St, Worcester MA

Source of Sample: Boring Depth: 10-12'

Sample Number: B-107 / S-4

Remarks:

Thielsch Engineering Inc.

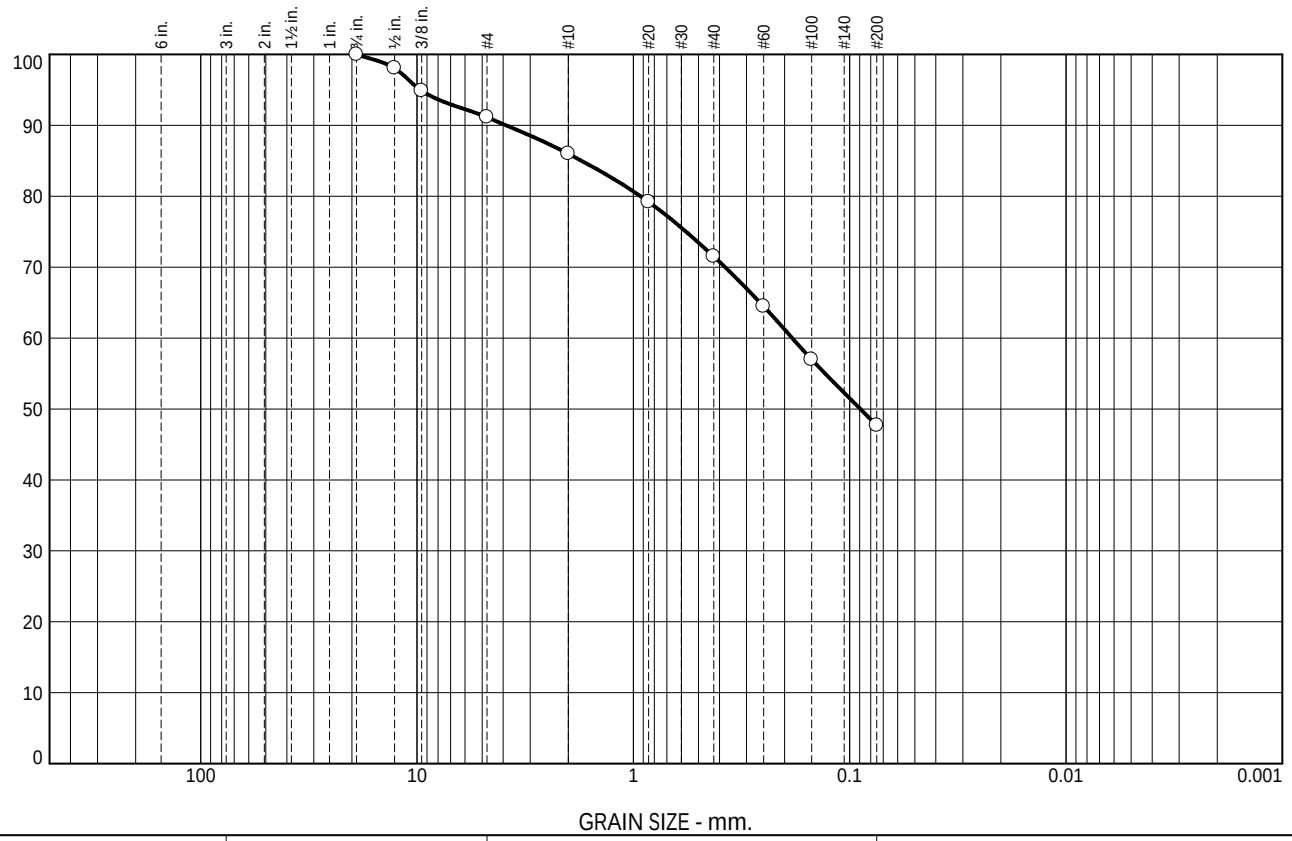
Cranston, RI

Figure 23-L-5189

Tested By: SF Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.9	5.1	14.5	23.8	47.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.1		
3/8"	94.9		
#4	91.1		
#10	86.0		
#20	79.2		
#40	71.5		
#60	64.5		
#100	57.0		
#200	47.7		

* (no specification provided)

Soil Description

Grey SILT and f-c SAND, trace fine Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.8703 D_{85}= 1.7349 D_{60}= 0.1844
D_{50}= 0.0893 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample visually classified as non-plastic.

Source of Sample: Boring Depth: 15-17'
Sample Number: B-108 / S-5

Date: 12.29.23

Thielsch Engineering Inc.

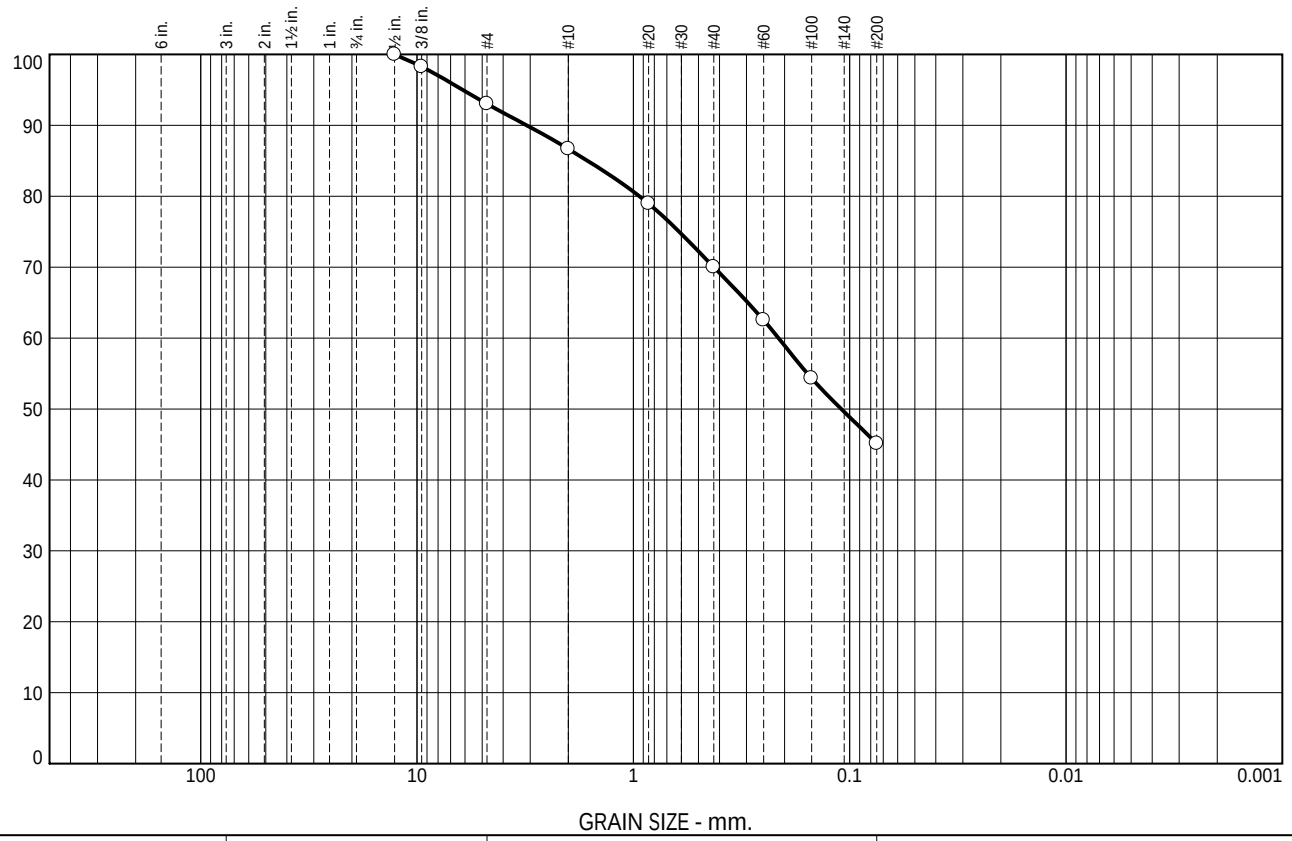
Cranston, RI

Client: Weston & Sampson
Project: Worcester Fire Station
25 Madison St, Worcester MA
Project No: ENG23-3281 Figure 23-S-5190

Tested By: JB / AV Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.0	6.3	16.7	24.9	45.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.3		
#4	93.0		
#10	86.7		
#20	79.0		
#40	70.0		
#60	62.5		
#100	54.3		
#200	45.1		

* (no specification provided)

Soil Description

Grey f-c SAND and SILT & CLAY, trace fine Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.1097 D_{85}= 1.6284 D_{60}= 0.2132
D_{50}= 0.1093 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample visually classified as plastic. Sample rolled to 1/8".

Source of Sample: Boring Depth: 5-7'
Sample Number: B-109 / S-3

Date: 12.29.23

Thielsch Engineering Inc.

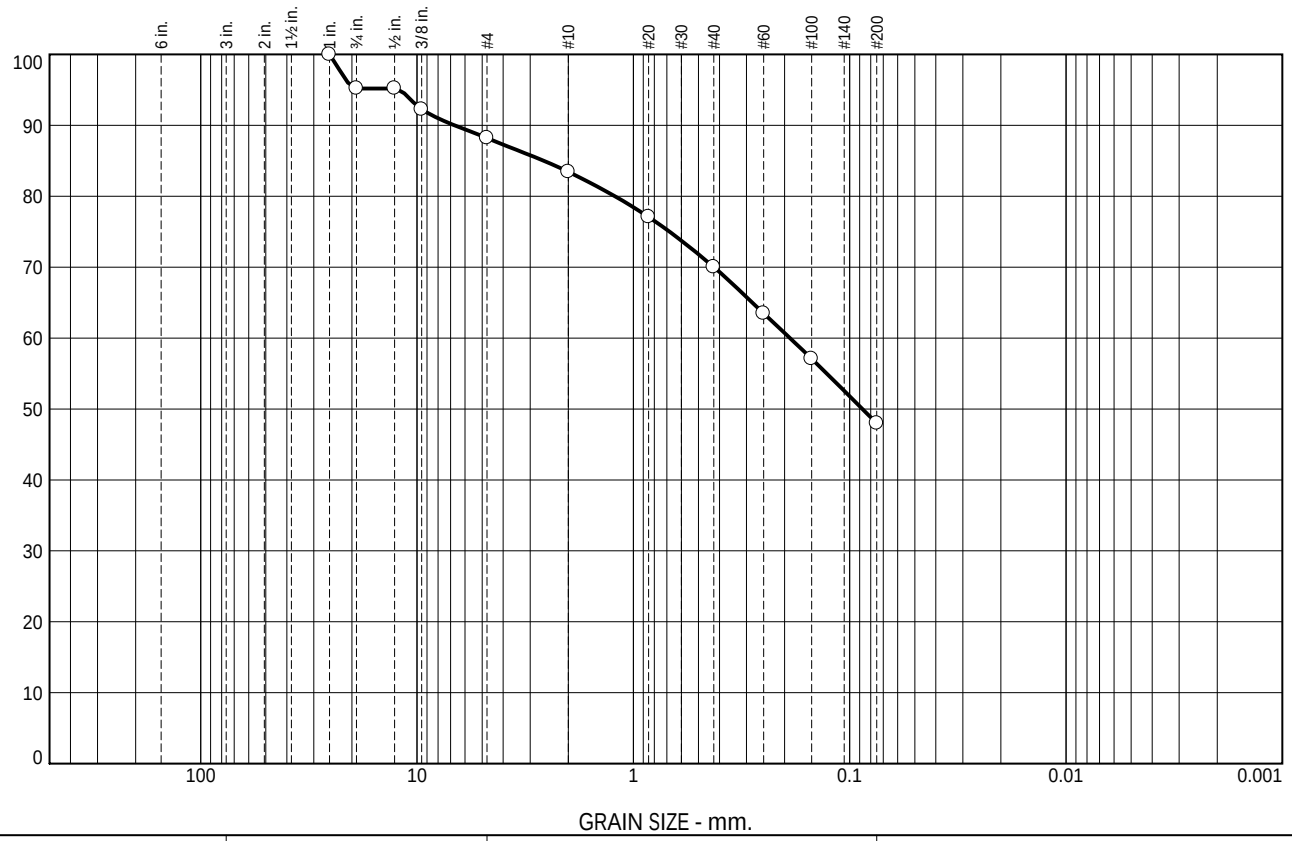
Cranston, RI

Client: Weston & Sampson
Project: Worcester Fire Station
25 Madison St, Worcester MA
Project No: ENG23-3281 Figure 23-S-5191

Tested By: JB / AV Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.8	7.0	4.7	13.5	22.0	48.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	95.2		
1/2"	95.2		
3/8"	92.2		
#4	88.2		
#10	83.5		
#20	77.1		
#40	70.0		
#60	63.5		
#100	57.1		
#200	48.0		

* (no specification provided)

Soil Description

Grey SILT & CLAY and f-c SAND, little f-c Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 6.6953 D_{85}= 2.5928 D_{60}= 0.1888
D_{50}= 0.0873 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample visually classified as plastic. Sample rolled to 1/8".

Source of Sample: Boring Depth: 15-17'
Sample Number: B-110 / S-5

Date: 12.29.23

Thielsch Engineering Inc.

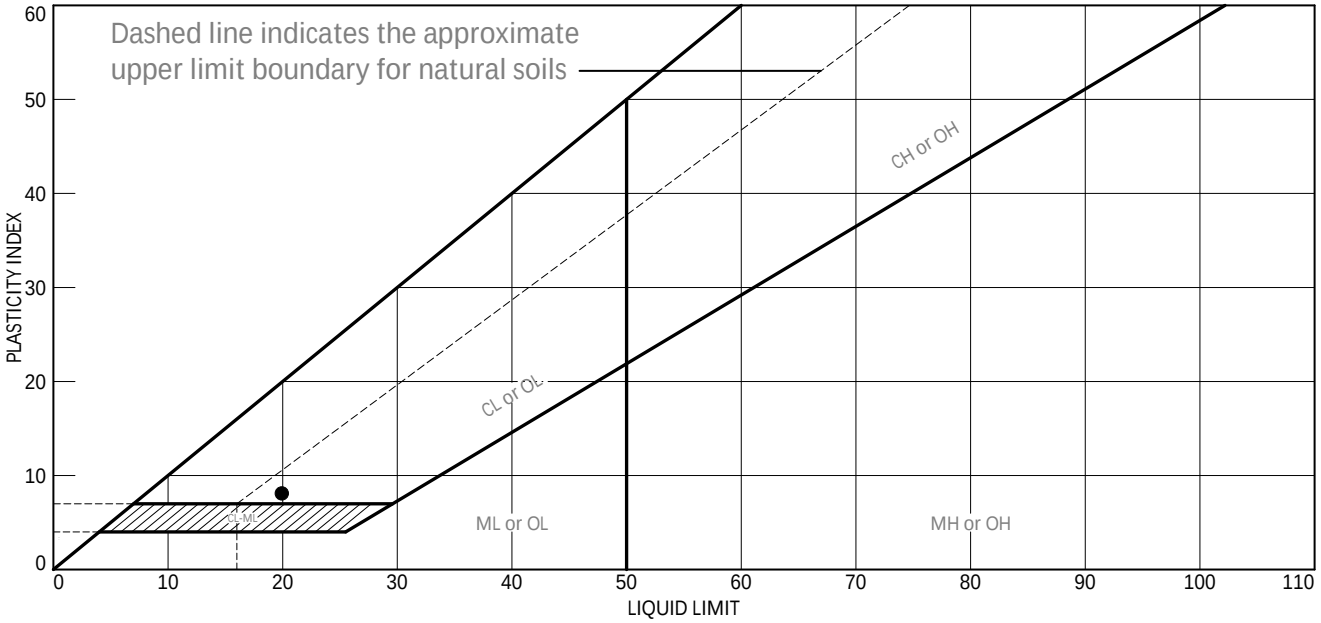
Cranston, RI

Client: Weston & Sampson
Project: Worcester Fire Station
25 Madison St, Worcester MA
Project No: ENG23-3281 Figure 23-S-5192

Tested By: JB / AV Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grey SILT & CLAY	20	12	8			

Project No. ENG23-3281 Client: Weston & Sampson

Project: Worcester Fire Station

25 Madison St, Worcester MA

Source of Sample: Boring Depth: 10-12'

Sample Number: B-111 / S-5

Remarks:

Thielsch Engineering Inc.

Cranston, RI

Figure 23-L-5193

Tested By: SF Checked By: Rebecca Roth

Appendix D

"Important Information about this Geotechnical Engineering Report" by GBA, Inc.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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January 3, 2025

K. Russell Adams, PE
Deputy Chief of Public Facilities
50 Officer Manny Familia Way
Worcester, MA 01605

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

RE: **Supplementary Geotechnical Engineering Report**
South Division Fire House & Emergency Communications Center
Worcester, Massachusetts

Dear Russ:

Weston & Sampson Engineers, Inc. (Weston & Sampson) is pleased to present our supplementary geotechnical engineering report for the proposed South Division Fire House and Emergency Communications Facility project in Worcester, Massachusetts. This report supplements our Preliminary Geotechnical Engineering Report dated February 28, 2024.

This report summarizes our geotechnical engineering explorations and evaluation for the slope and two existing retaining walls on the western side of the site. The subsurface information contained herein supplements the information provided in our February 28, 2024 report.

Information on the use of this report is provided in the Limitations section of this report.

SITE DESCRIPTION & PROJECT UNDERSTANDING

The Site is located at 25 Madison Street and is bound by Beacon Street to the west, Madison Street to the north, Southbridge Street to east and a commercial property to the south. The Site is currently developed as a public parking lot with various underground utilities and landscape areas. The topography within the parking lot is generally flat at about El. 475 and slopes gently towards Madison Street to the north-northeast. On the eastern side of the site, there is a grassed area that slopes downward towards Southbridge Street at about El. 469. On the western side of the site there is a slope approximately 31 ft high at the southern end and about 4 feet high at the northern end; the slope is supported by a variable height upper retaining wall supporting Beacon Street and a variable height lower retaining wall along the western edge of the existing parking lot as shown in *Image 1* below.



Image 1: Retaining walls along western side of the Site

Existing site topography and dimensions discussed in this report are based upon a Boundary and Topographic Survey plan prepared by KCI Technologies, Inc, dated July 26, 2022, and updated in January, 2024. Elevations (El.) are in feet and reference the North American Vertical Datum of 1988 (NAVD88).

We understand the City has selected a development option where the proposed building will be located in the northwestern portion of the parcel. We understand the proposed slab grade will be about El. 469.5 which is about 5.5 feet lower than the existing parking lot grade on the western side of the building. The edge of the building will be about 20 feet away from the existing lower retaining wall. The proposed conditions are illustrated on the November 22, 2024 concept design plans included in *Appendix A*.

SUBSURFACE CONDITIONS

Previous Subsurface Explorations

As a part of the preliminary design phase, in December 2023 Weston & Sampson advanced 12 geotechnical borings (B-101 through B-112) and 6 test pits (TP-1, TP-1A, and TP-2 through TP-5) at the approximate locations shown on *Figure 1 – Site Plan*. The subsurface conditions generally consist of 2 to 7.5 feet of fill over medium dense to dense glacial deposits extending to weathered rock. A groundwater observation well was installed in boring B-108 and groundwater was measured at a depth of 22 feet, corresponding to approximately El. 451.5 feet.

Recent Subsurface Exploration Program

As part of our recent scope of work, subsurface conditions were explored between November 5 and November 7, 2024 by advancing three borings (B-201, B-202 and B-204) along Beacon Street and two test pits (TP-101 and TP-102) in front of the lower retaining wall. Approximate exploration locations are shown in *Figure 1*. Weston & Sampson geotechnical engineering representatives observed drilling and excavation activities in the field and prepared logs for each exploration.

The borings were completed by Geosearch, Inc. of Sterling, MA. The upper five feet at each boring was advanced using a vacuum extractor to pre-clear for utilities. Standard penetration tests (SPTs) were subsequently conducted in each boring by driving a split spoon sampler with an automatic hammer in general accordance with ASTM D1586. The borings were advanced to approximate depths between 25 and 55 feet. Following completion of drilling, B-202 (OW) was completed as an observation well and B-201 and B-204 were backfilled with cuttings and the surface patched with asphalt cold patch. Boring logs are included in Attachment B.

Test pits were completed by Ricciardi Bros., Inc of Worcester, MA to depths of 4.5 and 5.2 feet. The test pits were backfilled with the excavated materials and the surface restored with hot mix pavement. Test pit logs are included in Attachment C.

Encountered Subsurface Conditions

The conditions encountered in our explorations on the western side of the site [B-103, B-105, B-107, B-109, B-201, B-202(OW), B-204, TP-101, and TP-102] are described below, in general order of occurrence with depth. Depths provided herein are relative to the existing surface. The general Unified Soil Classification System (USCS) designation(s) for each stratum is included in the descriptions below in parentheses.

The subsurface descriptions are based on a limited number of explorations. Variations may occur and should be expected between exploration locations. The strata boundaries shown in our logs are based on our interpretations and the actual transition may be gradual. Refer to the boring and test pit logs for detailed descriptions of the soil samples collected.

Surficial Materials – Surficial materials encountered in the borings and test pits consisted of 3 to 5 inches of asphalt concrete (AC) pavement.

Fill - Medium dense to very dense fill was encountered in each of the borings and test pits below the surficial materials and extended to depths ranging from approximately 2 to 7.5 feet where fully penetrated. The fill generally consisted of SAND with varying amounts of gravel, non-plastic fines, and low plasticity fines (SP-SM, SM, SC). Test pit TP-101 and TP-102 terminated in the fill at depths of approximately 4.5 and 5.2 feet, respectively.

Native Soils – Medium dense to very dense or very stiff to hard native glacial deposits were encountered in each of the borings below the fill. The glacial deposits generally consisted of a mix of fine-grained (e.g., silt, clay) and coarse-grained (e.g., sand, gravel) soils with cobbles and boulders. Due to the variability of the glacial deposits, the following soils were encountered: sandy lean CLAY with gravel (CL), clayey SAND with gravel (SC), lean CLAY with sand (CL), and sandy SILT (ML).

Refusal/Rock: Drilling refusal was not encountered in any of the borings on the western side of the site.

Groundwater – Groundwater was not measured in borings B-201 and B-204 due to drive and wash drilling methods. Ground water was not encountered in explorations B-103, B-105, B-107, B-109, TP-101, and TP-102. Groundwater measurements in monitoring well B-202(OW) were obtained approximately 20 days after installation at a depth of approximately 15.4 feet, corresponding to approximately El. 485.6 feet.

We anticipate that groundwater levels will fluctuate with season, variations in precipitation, construction in the area, and other factors. Perched groundwater conditions could exist close to the ground surface, especially during and after extended periods of wet weather.

Upper Retaining wall – The bottom of the upper retaining wall was not encountered in borings B-201 and B-202 which were advanced approximately 6 feet behind the edge of the wall. Native soils were encountered at a depth of approximately 6 feet (El. 498.5) in B-201 and approximately 8 feet (El. 493) in B-202. It is assumed that the upper retaining wall is reinforced concrete.

Lower Retaining wall – The bottom of stone retaining wall was observed in TP101 and TP-102 at 4.2 and 4.3 feet below ground surface in front of the wall, respectively, which corresponds to about El.471.3 and El. 471.2. The lower retaining wall is constructed of dry stacked cobbles and boulders.

SLOPE STABILITY ASSESSMENT

General

Weston & Sampson performed stability analyses of the western slope to assess whether the anticipated construction and proposed building are likely to impact the existing slope and retaining wall system, and the lower

retaining wall. Based on site observations, there is no apparent evidence of distress or instability of the upper retaining wall, slope, or lower retaining wall. Therefore, we have not reviewed the stability of these individual components.

Excavation for the proposed western foundation has the potential to decrease the stability of the western slope and retaining walls. Therefore, we modeled a sloped excavation about 15 feet away from the lower retaining wall extending about 7 feet below existing grade.

The factor of safety against slope instability is defined as the ratio of forces resisting slope failure to those driving slope failure along a given failure surface. A factor of safety less than 1.0 indicates failure, and a safety factor equal to 1.0 indicates marginal stability. The industry standard for the minimum factor of safety values against instability for embankments during construction (temporary condition) is 1.1 under static conditions. We utilized the slope stability program Slide2 by Rocscience to calculate the factor of safety (FOS) for sliding using the Spencer method of slices for non-circular failure surfaces under anticipated construction conditions.

The soil parameters used in our analyses were developed based on the results of our December 2023 and November 2024 explorations. Model geometry was based on surface elevations from the topographic survey updated in January 2024 and the November 22, 2024 concept design plans.

Slope Stability Results

The computed FOS are summarized in the table below. Stability model outputs generated by the Slide2 program are provided in Attachment D.

Scenario	Computed FOS	Minimum Recommended FOS
During Construction Conditions encompassing both walls and slope	1.11	1.1
During Construction Conditions for lower wall	1.1	1.1

Conclusion

Our stability analyses indicate that a sloped excavation to the bottom of proposed footing during construction approximately 15 feet away from the existing lower wall and 7 feet below existing grade is not anticipated to reduce the stability of the western two wall and slope system, or the lower stone wall.

LIMITATIONS

This supplemental report is subject to the limitations included in our Preliminary Geotechnical Engineering Report dated February 28, 2024.

It has been a pleasure assisting you with this project and we look forward to our continued involvement. Please call if you have any questions.

Sincerely,

WESTON & SAMPSON ENGINEERS, INC.

Valeria Segawa

Valeria Segawa, EIT
Engineer II

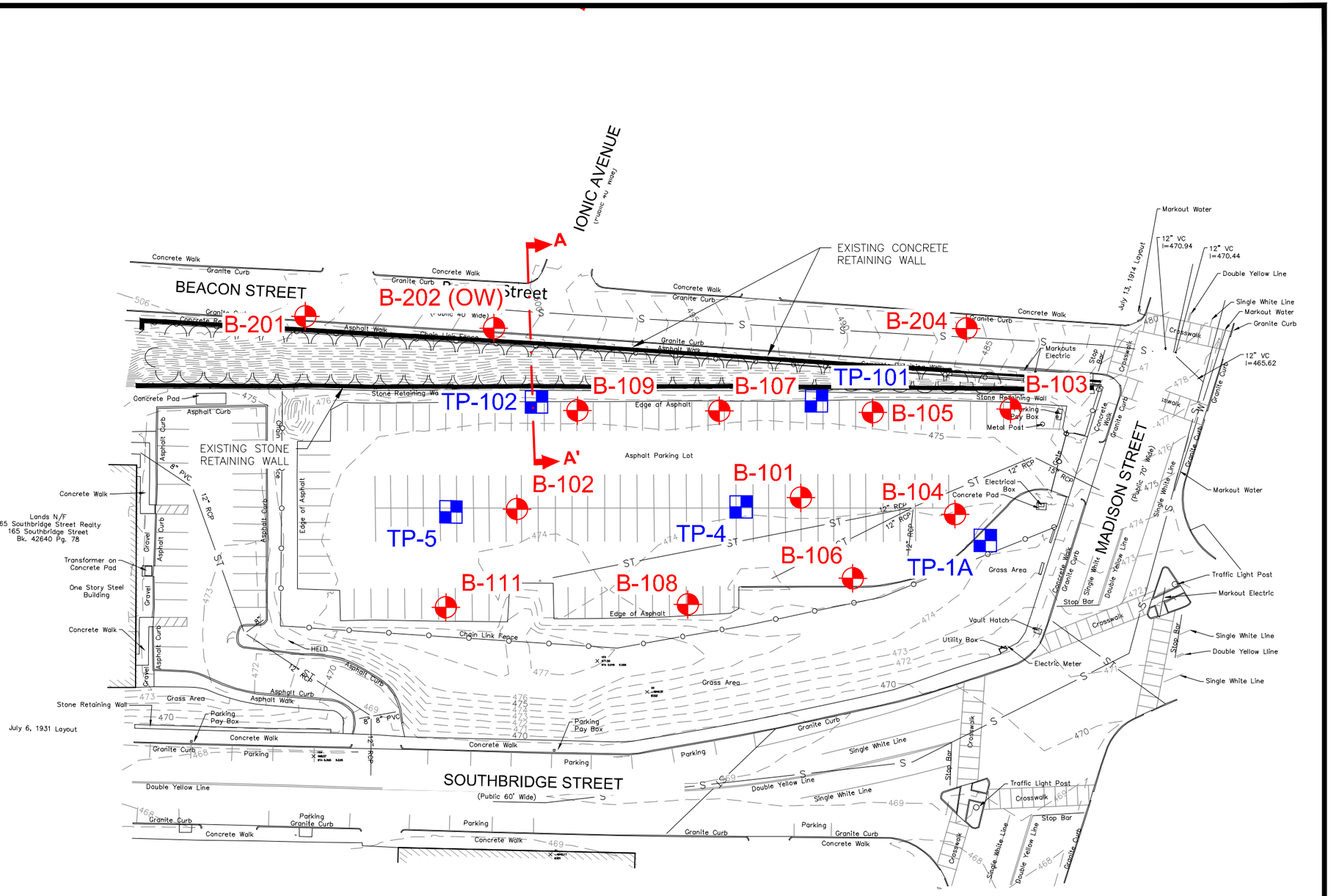
Jenifer MacGregor, PE
Technical Leader

Attachments:
Figure 1 – Site Plan

Attachment A – November 22, 2025 Concept Plans
Attachment B – Boring Logs
Attachment C – Test Pit Logs
Attachment D – Slope Stability Results

VS:JM

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\\wse03.local\WSE\Projects\MA\Worcester MA\223281-Worcester South Division Fire House - City Assistance\07-DesignMaterials\02-Geotechnical\3.0 Figures\CAD\Figure 2 - Site Plan.dwg

Weston & Sampson

Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978.532.1900 800.SAMPSON
www.westonandsampson.com

NOTES

1. THIS PLAN IS BASED ON A BOUNDARY & TOPOGRAPHIC SURVEY PREPARED BY KCI TECHNOLOGIES, INC. DATED JULY 26, 2022 AND UPDATED IN JANUARY, 2024.
2. BORINGS B-101 THROUGH B-112 WERE COMPLETED BY GEOSEARCH, INC. OF STERLING, MA BETWEEN DECEMBER 11 AND 15, 2023.
3. BORINGS B-201 THROUGH B-204 WERE COMPLETED BY GEOSEARCH, INC. OF STERLING, MA BETWEEN NOVEMBER 5 AND 7, 2024.
4. TEST PITS TP-1 THROUGH TP-5 WERE COMPLETED BY GEOSEARCH, INC. OF STERLING, MA ON DECEMBER 14, 2023.
5. TEST PITS TP-201 AND TP-202 WERE COMPLETED BY RICCIARDI BROS., INC OF WORCESTER, MA ON NOVEMBER 6, 2024.
6. ALL BORINGS AND TEST PITS WERE OBSERVED BY A WESTON & SAMPSON ENGINEER.
7. BORING AND TEST PIT LOCATIONS SHOWN ARE APPROXIMATE AND BASED ON FIELD MEASUREMENTS RELATIVE TO EXISTING SITE FEATURES.

LEGEND

- B-X — DESIGNATION AND APPROXIMATE LOCATION OF BORING
- TP-X — DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT
- SLOPE STABILITY SECTION

GRAPHIC SCALE

60 30 0 60 120

SCALE: 1"=60'

ORIENTATION	TITLE
	SITE PLAN
	PROJECT: SOUTH DIVISION FIRE HOUSE AND EMERGENCY COMMUNICATIONS CENTER 25 MADISON STREET WORCESTER, MA 01608

DATE	12/2024
DRWN BY	VS
CHKD BY	JM
PRJ. NO.	ENG23-3281
REV. NO.	-

FIGURE

FIGURE 1

Attachment A

November 22, 2025 Concept Plans

City of Worcester

South Division Firehouse

Concept Design Restart: Design Updates

November 22, 2024

Perkins&Will

Mitchell Associates Architects + Five Bugles Design

City of Worcester South Division Firehouse

Option A Scheme 2 - Level 1

Legend
FF = Firefighter Entry
P = Visitor Parking

Pros

- Maintains hot/cold separation
- Isolates sound and containments from the bunks for health and sleep quality
- No midpoint transition to pole, 14’ floor drop to bay
- Shorter stairs to apparatus bay
- Isolates engine and overhead door noise from bunks
- Quick access to the firepoles from bunks
- Access to daylight in living spaces

Cons

- Slightly Larger Footprint
- Less efficient Second Floor

Option A Scheme 2 GSF	
Level 1 GSF	19,324 SF
Level 2 GSF	11,145 SF
Total GSF	**30,469 SF**



City of Worcester South Division Firehouse

Option A Scheme 2 - Level 2

Legend
F = Firefighter Bunk
V = Visiting Officer Bunkroom
CO = Company Officer Bunkroom/Office
DC = District Chief Bunkroom/Office/Bath

Pros

- Maintains hot/cold separation
- Isolates sound and containments from the bunks for health and sleep quality
- No midpoint transition to pole, 14’ floor drop to bay
- Shorter stairs to apparatus bay
- Isolates engine and overhead door noise from bunks
- Quick access to the firepoles from bunks
- Access to daylight in living spaces

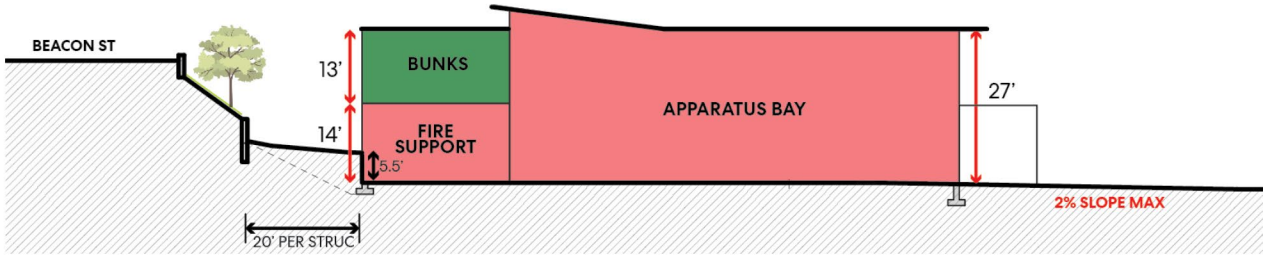
Cons

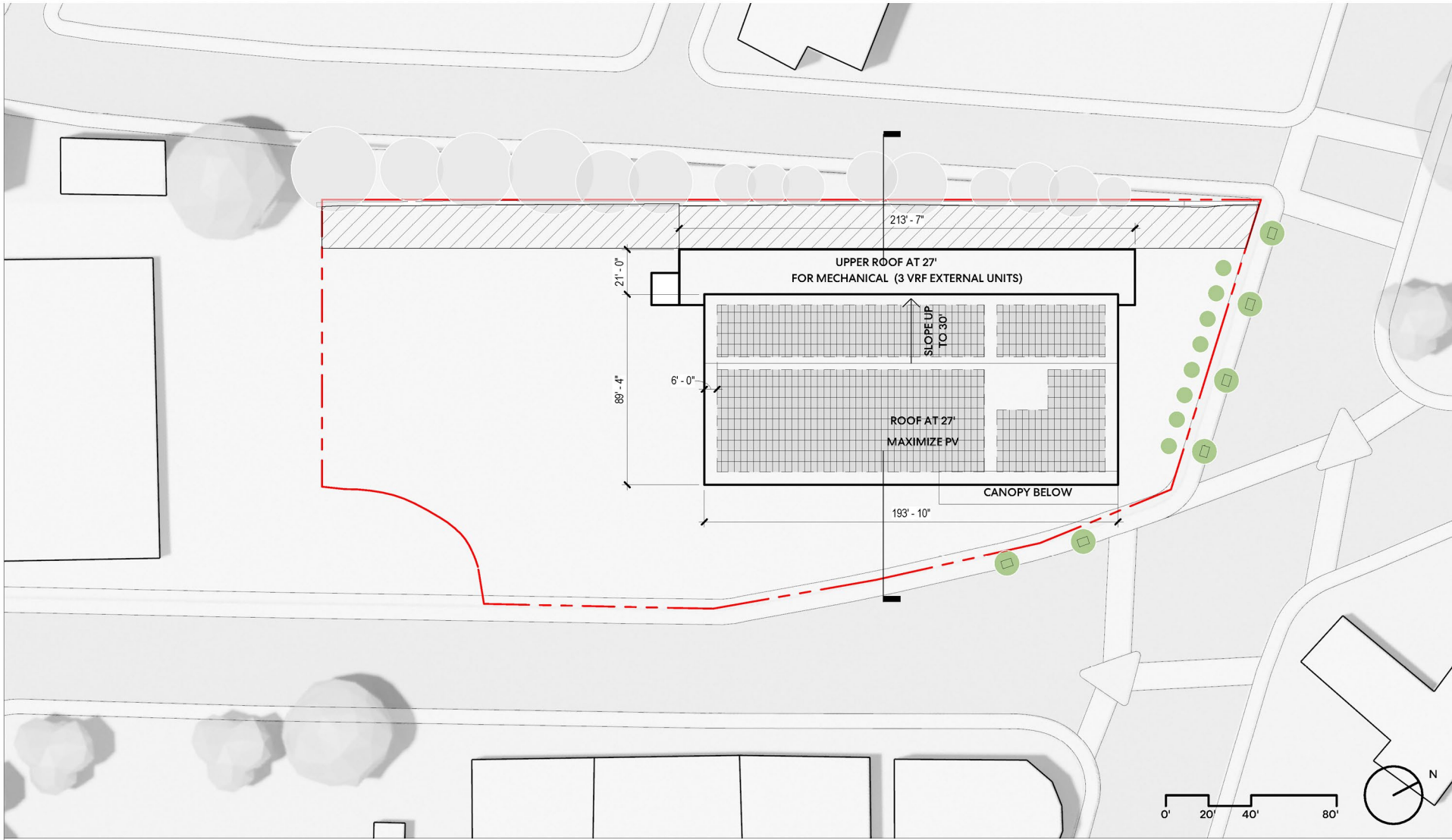
- Slightly Larger Footprint
- Less efficient Second Floor



City of Worcester South Division Firehouse

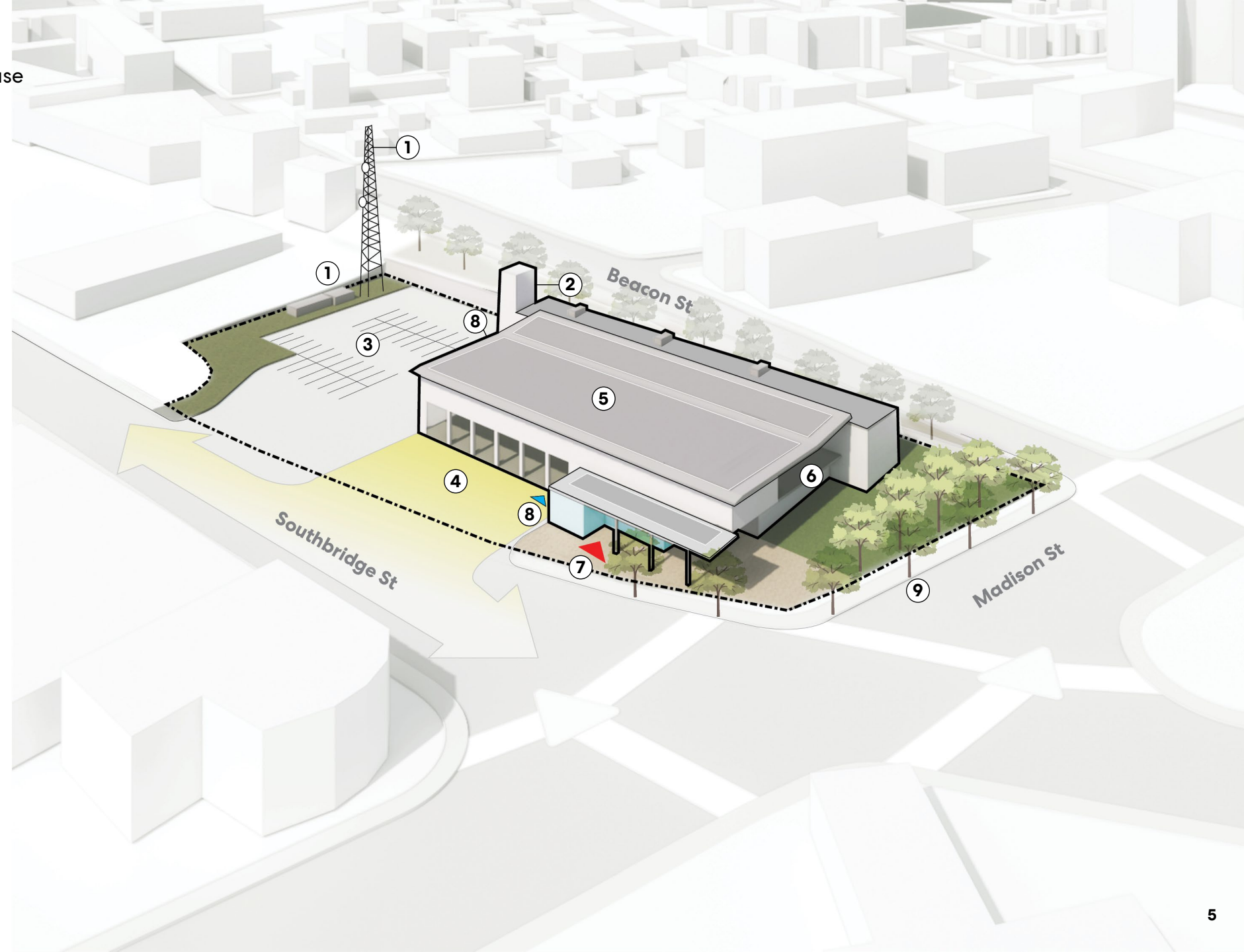
Roof Plan





City of Worcester South Division Firehouse

Massing



Legend

1. Communications Tower and services *(not in design scope)*
2. Training Tower
3. Staff and Visitor Parking
4. Apron (Southbridge Access)
5. Roof Maximized for PV
6. Outdoor Deck
7. Public/Business Entrance
8. Firefighter Entry
9. Street Trees

Attachment B

Boring Logs

Weston & Sampson

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-201

WSE Project: ENG23-3281

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	November 6, 2024
FOREMAN:	D. Newton	ADVANCE METHOD:	Rotary Wash Drilling	DATE FINISH:	November 7, 2024
LOGGED BY:	V. Segawa	AUGER DIAMETER:	N/A	GROUND EL:	505.5 ± (NAVD88)
CHECKED BY:	J. MacGregor, PE	SUPPORT CASING:	Driven Flush-Joint Casing (3" ID)	FINAL DEPTH:	55.0 ft.
EQUIPMENT:	CME 550, Truck Mounted	CORING METHOD:	N/A	GRID COORDS:	N:2919127.2 ± / E:573580.8 ±
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				N-Value, Raw (bpf); Organic Content (%); 10 20 30 40; Moisture Content (%); Plastic Limit, PL (%); Liquid Limit, LL (%); 25 50 75 100		Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
						Asphalt- 5 inches thick.		[0.0 - 6.0] Vacuum excavated on 11/6/2024.
	G	G-1				**Poorly graded sand with silt and gravel (SP-SM)** - Black; moist; mostly fine to coarse SAND, some fine to coarse gravel, few non plastic fines; occasional debris (slag). **[FILL]**		
	G	G-2				**Silty sand with gravel (SM)** - Dense; brown; mostly fine to coarse SAND, some fine to coarse gravel, little non plastic fines; Occassional debris (asphalt). **[FILL]**		
5		S-1 11/24	10 17 14 11	31			501	
		S-2 9/24	16 22 23 23	45		**Clayey sand with gravel (SC)** - Dense; gray; some fine to medium sand, some low plasticity fines, little fine to coarse gravel.		
10		S-3 10/24	17 20 21 22	41			496	
		S-4 11/24	18 21 26 27	47			491	
15								[17.0 - 18.0] Roller bit grinding.
		S-5 16/24	13 17 22 20	39			486	
20								
		S-6 10/24	12 18 24 28	42			481	
25								

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-201

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100				Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
30		S-7 11/24	14 21 23 29	44		**Clayey sand with gravel (SC)** - Dense; gray; some fine to medium sand, some low plasticity fines, little fine to coarse gravel.	476	
35		S-8 19/24	11 15 17 21	32			471	
40		S-9 16/24	12 19 25 19	44			466	
45		S-10 9/24	16 18 29 24	47		**Clayey sand with gravel (SC)** - Dense; gray; some fine to coarse sand, some fine to coarse gravel, some low plasticity fines.	461	
50		S-11 20/24	11 13 17 21	30			456	
55		S-12 20/24	7 12 19 29	31			451	**Exploration ended at 55.0 ft.**

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-202 (OW)

WSE Project: ENG23-3281

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	November 6, 2024
FOREMAN:	D. Newton	ADVANCE METHOD:	Rotary Wash Drilling	DATE FINISH:	November 6, 2024
LOGGED BY:	V. Segawa	AUGER DIAMETER:	N/A	GROUND EL:	501.0 ± (NAVD88)
CHECKED BY:	J. MacGregor, PE	SUPPORT CASING:	Driven Flush-Joint Casing (3" ID)	FINAL DEPTH:	47.0 ft.
EQUIPMENT:	CME 550, Truck Mounted	CORING METHOD:	N/A	GRID COORDS:	N:2919214.6 ± / E:573633.1 ±
SPT HAMMER:	Automatic (140-lb.)	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA (N-Value, Raw (bpf); Organic Content (%); Moisture Content (%); Plastic Limit, PL (%); Liquid Limit, LL (%))	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
						Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
						Asphalt- 5 inches thick.		[0.0 - 6.0] Vacuum excavated on 11/5/2024.
	G	G-1				**Silty sand with gravel (SM)** - Brown; moist; mostly fine to coarse SAND, some non plastic fines, little fine to coarse gravel; occasional debris (asphalt). **[FILL]**		
	G	G-2						
5		S-1 9/24	6 9 12 21	21		**Silty sand with gravel (SM)** - Medium dense; brown; moist; mostly fine to coarse SAND, some non plastic fines, little fine to coarse gravel. **[FILL]**	496	
		S-2 19/24	9 14 16 21	30		**Clayey sand with gravel (SC)** - Medium dense to dense; gray; wet; some fine to medium sand, some low plasticity fines, little fine to coarse gravel.		
10		S-3 15/24	13 16 12 32	28			491	
		S-4 19/24	15 20 18 30	38				
15							486	Water level measured at 15.4 ft. on 11/25/24 (well reading).
		S-5 17/24	10 10 18 20	28				
20							481	
		S-6 15/24	9 19 21 18	40				
25							476	

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

WSE Project: ENG23-3281

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-202 (OW)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
				● N-Value, Raw (bpf) ⊠ Organic Content (%) 10 20 30 40 ⊕ Moisture Content (%) ▶ Plastic Limit, PL (%) ◀ Liquid Limit, LL (%) 25 50 75 100				Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
		S-7 16/24	8 10 15 49	25		**Clayey sand with gravel (SC)** - Medium dense to dense; gray; wet; some fine to medium sand, some low plasticity fines, little fine to coarse gravel.		
30							471	
		S-8 6/24	15 12 12 13	24		**Clayey gravel with sand (GC)** - Medium dense; gray; wet; mostly fine to coarse GRAVEL, some fine to coarse sand, little medium plasticity fines.		
35							466	
		S-9 15/24	10 14 21 27	35		**Clayey sand with gravel (SC)** - Dense; gray; wet; some fine to medium sand, some low plasticity fines, little fine to coarse gravel.		
40							461	
						Sandy lean clay (CL) - Very stiff; gray; moist; mostly medium plasticity FINES, some fine to medium sand.		
45		S-10 20/24	10 15 14 17	29			456	
								Exploration ended at 47.0 ft.
50							451	
55							446	

Weston & Sampson

South Division Fire House and Emergency Communications Center
25 Madison Street, Worcester, MA

BORING ID: B-204

WSE Project: ENG23-3281

CONTRACTOR:	Geosearch, Inc.	BORING LOCATION:	See Attached Figure	DATE START:	November 7, 2024
FOREMAN:	D. Newton	ADVANCE METHOD:	Rotary Wash Drilling	DATE FINISH:	November 7, 2024
LOGGED BY:	V. Segawa	AUGER DIAMETER:	N/A	GROUND EL:	485.0 ± (NAVD88)
CHECKED BY:	J. MacGregor, PE	SUPPORT CASING:	Driven Flush-Joint Casing (3" ID)	FINAL DEPTH:	25.0 ft.
EQUIPMENT:	CME 550, Truck Mounted	CORING METHOD:	N/A	GRID COORDS:	N:2919441.2 ± / E:573750.0 ±
SPT HAMMER:	N/A	BACKFILL MATERIAL:	Drill Cuttings and Asphalt Patch	GRID SYSTEM:	NAD83 State Plane (MA)

DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	SAMPLE ID NUMBER AND RECOVERY RATIO [IN./IN.]	SPT BLOWS / 6 IN. (OR) CORE RATE / 12 IN. [MIN.]	GEOTECHNICAL TEST DATA	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
		G-1				Surface: Asphalt concrete pavement.		
	G					Asphalt- 3 inches thick.		
		G-2				**Silty sand with gravel (SM)** - Dark brown; dry; mostly fine to coarse SAND, little fine to coarse gravel, little non plastic fines; occasional cobbles. **[FILL]**		
	G					**Clayey sand with gravel (SC)** - Brown; dry; mostly fine to coarse SAND, some low plasticity fines, little fine to coarse gravel; petroleum-like odor; trace brick; occasional to numerous cobbles. **[FILL]**		
5							480	
		S-1 0/24	1 0 1 1	1		*No recovery.*		
		S-2 11/24	11 14 17 12	31		**Clayey sand with gravel (SC)** - Medium dense to dense; gray; moist; some fine to coarse sand, some medium plasticity fines, little fine to coarse gravel.		
10		S-3 15/24	15 23 18 22	41			475	
		S-4 19/24	11 13 15 23	28				
15							470	
		S-5 20/24	4 6 7 10	13				
20							465	
		S-6 10/24	9 13 22 20	35		*Change to some fine to coarse gravel at 23 ft.*		
25							460	**Exploration ended at 25.0 ft.**

GEOTECHNICAL TEST DATA: ● N-Value, Raw (bpf); ☒ Organic Content (%); 10 20 30 40; ⊕ Moisture Content (%); ▶ Plastic Limit, PL (%); ◀ Liquid Limit, LL (%); 25 50 75 100

Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

GUIDE TO SUBSURFACE EXPLORATION LOGS

Weston & Sampson℠

INDEX SHEET 1 GENERAL INFORMATION

GENERAL NOTES AND USE OF LOGS

1.) Explorations were made by ordinary and conventional methods and with care adequate for Weston & Sampson's study and/or design purposes. The exploration logs are part of a specific report prepared by Weston & Sampson for the referenced project and client, and are an integral part of that report. Information and interpretations are subject to the explanations and limitations stated in the report. Weston & Sampson is not responsible for any interpretations, assumptions, projections, or interpolations made by others.

2.) Exploration logs represent general conditions observed at the point of exploration on the date(s) stated. Boundary lines separating soil and rock layers (strata) represent approximate boundaries only and are shown as solid lines where observed and dashed lines where inferred based on drilling action. Actual transitions may be gradual and changes may occur over time.

3.) Soil and rock descriptions are based on visual-manual examination of recovered samples, direct observation in test pits (when permissible), and laboratory testing (when conducted).

4.) Water level observations were made at the times and under the conditions stated. Fluctuations should be be expected to vary with seasons and other factors. Use of fluids during drilling may affect water level observations. The absence of water level observations does not necessarily mean the exploration was dry or that subsurface water will not be encountered during construction.

5.) Standard split spoon samplers may not recover particles with any dimension larger than 1-3/8 inches. Reported gravel conditions or poor sample recovery may not reflect actual in-situ conditions.

6.) Sections of this guide provide a general overview of Weston & Sampson's practices and procedures for *identifying* and *describing* soil and rock. These procedures are predominantly based on ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)*, the International Society of Rock Mechanics (ISRM) standards, and the *Engineering Geology Field Manual* published by the Bureau of Reclamation. Not all aspects of this guide relating to description and identification procedures of soil and rock may be applicable in all circumstances.

SAMPLER GRAPHICS

- Split Spoon (Standard) 2" OD, 1-3/8" ID
- Split Spoon (Oversize) 3" OD, 2-3/8" ID
- Shelby or Piston Tube 3" OD, 2-7/8" ID
- Double-Tube Rock Core Barrel 2" Core Diameter
- Direct Push with Acetate Liner Various Liner Sizes
- A — Auger Sample *(from cuttings or hand auger)*
- G — Grab Sample *(manual, from discrete point)*
- C — Composite Sample *(multiple grab samples)*

WELL GRAPHICS

- Cement concrete seal around casing or riser pipe
- Bentonite seal around casing or riser pipe
- Cement grout seal around casing or riser pipe
- Soil backfill around riser pipe or beneath screen
- Gravel backfill around screen or riser pipe
- Sand backfill around screen or riser pipe (filter sand)
- Solid-wall riser; Sch. 40 PVC, 1" ID unless noted otherwise
- Slotted screen; Sch. 40 PVC, 1" ID with machined slots

CAVING / SEEPAGE TERMS

The following caving and/or seepage terms may appear on a test pit log.

Caving Term	Criteria
Minor	less than 1 cubic ft.
Moderate	1 to 3 cubic ft.
Severe	greater than 3 cubic ft.

Seepage Term	Criteria
Slow	less than 1 gpm
Moderate	1 to 3 gpm
Fast	greater than 3 gpm

KEY TO WATER LEVELS

- Observed in exploration during advancement.
- Measured in exploration at completion, prior to backfilling or well installation.
- Measured in exploration after the stated stabilization period, prior to backfilling, or in well installation if noted.

DEFINITIONS OF COMMON TERMS

Sample Recovery Ratio - The length of material recovered in a drive or push type sampler over the length of sampler penetration, in inches (e.g. 18/24).

Standard Penetration Test (*SPT*) - An in-situ test where a standard split-spoon sampler is driven a distance of 12 or 18 inches (after an initial 6-inch seating interval) using a 140-lb. hammer falling 30 inches for each blow.

SPT Blows - The number of hammer blows required to drive a split-spoon sampler each consecutive 6-inch interval during a *Standard Penetration Test*. If no discernable advancement of a split spoon sampler is made after 50 consecutive hammer blows, 50/X indicates *sampler refusal* and is the number of blows required to drive the sampler X inches.

SPT N-Value (*N*) - The uncorrected blow count representation of a soil's penetration resistance over a 12-inch interval after an initial 6-in. seating interval, reported in blows per foot (bpf). The N-value is correlated to soil engineering properties.

Auger Refusal - No discernable advancement of the auger over a period of 5 minutes with full rig down pressure applied.

Casing Refusal (Driven) - Casing penetration of less than 6 inches after a minimum 50 blows of a drop hammer weighing 300 lbs. or a minimum 100 blows of a drop hammer weighing 140 lbs.

PID Measurement - A measurement (electronic reading) taken in the field using a photoionization detector (PID) to detect the presence of volatile organic compounds in a soil sample. Values are reported as benzene equivalent units in parts per million (ppm) unless noted otherwise.

Rock Quality Designation (RQD) - A qualitative index measure of the degree of jointing and fracture of a rock core taken from a borehole. The RQD is defined as the sum length of solid core pieces 4 inches or longer divided by the run (cored) length, expressed as a percentage. Higher RQD values may indicate fewer joints and fractures in the rock mass.

Fill (Made Ground) - A deposit of soil and/or artificial waste materials that has been placed or altered by human processes.

LABORATORY TESTS AND FIELD MEASUREMENTS

MC	Moisture Content	IC	1D Incremental Consolidation
OC	Organic Content	VS	Laboratory Vane Shear
PL	Plastic Limit	US	Unconfined Compression
LL	Liquid Limit	TC	Triaxial Compression
GC	Gravel Content	PP	Pocket (Hand) Penetrometer
SC	Sand Content	TV	Torvane (Hand Vane)
FC	Fines Content	PID	Photoionization Detector
DS	Direct Shear	FID	Flame Ionization Detector

BORING ADVANCEMENT METHODS

Hollow-Stem Auger Drilling - Utilizes continuous flight auger sections with hollow stems to advance the borehole. Drill rods and a plug are inserted into the auger stem to prevent the entrance of soil cuttings into the augers.

Rotary Wash Drilling - Utilizes downward pressure and rotary action applied to a non-coring bit while washing the cuttings to the surface using a circulating fluid injected down the drill rods. The borehole is supported with either steel casing or the drilling fluid. Where a casing is used, the borehole is advanced sequentially by driving the casing to the desired depth and then cleaning out the casing. The process of driving and cleaning the casing is commonly referred to as the 'drive-and-wash' technique.

Continuous Sampling - Includes a variety of methods and procedures during which the borehole is advanced via continuous recovery of soil samples. *Direct Push* sampling is a common method that uses static downward pressure combined with percussive energy to drive a steel mandrel into the ground at continuous intervals while recovering soil samples in disposable acetate liners.

Rock Coring - Utilizes downward pressure and rotary action applied to a core barrel equipped with a diamond-set or tungsten carbide coring bit. During conventional coring, the entire barrel is retrieved from the hole upon completion of a core run. Wireline coring allows for removal of the inner barrel assembly containing the actual core while the the drill rods and outer barrel remain in the hole. Various types and sizes of core barrels and bits are used.

GUIDE TO SUBSURFACE EXPLORATION LOGS

Weston & Sampson℠

INDEX SHEET 2
SOIL DESCRIPTION

SOIL CONSTITUENTS

Naturally occurring soils consist of one or more of the following matrix constituents defined in terms of particle size.

Constituent		U.S. Sieve Size			Observed Size (in.)		
Gravel	(Coarse)	3/4 in.	-	3 in.	3/4	-	3
Gravel	(Fine)	No. 4	-	3/4 in.	1/5	-	3/4
Sand	(Coarse)	No. 10	-	No. 40	1/16	-	1/5
Sand	(Medium)	No. 40	-	No. 10	1/64	-	1/16
Sand	(Fine)	No. 200	-	No. 40	1/300	-	1/64
Fines	(Silt or Clay)	Smaller than		No. 200	Less than		1/300

SOIL IDENTIFICATION

Soil identification refers to the grouping of soils with similar physical characteristics into a category defined by a **group name** and corresponding **group symbol** based on estimation of the matrix soil constituents to the nearest 5% and simple manual tests. Proportions of cobbles, boulders, and other non-matrix soil materials are not considered during this procedure but are included in the overall soil description if observed or thought to be present. Refer to the following descriptions and tables adapted from ASTM D2488.

Coarse-Grained Soil - Coarse-grained soils contain fewer than 50% fines and are identified based on the following table.

Primary Constituent	Fines Percent	Type of Fines and Gradation		Group Symbol	Group Name [1]
GRAVEL *% gravel > % sand*	≤ 5%	well graded		GW	Well graded gravel
		poorly graded		GP	Poorly graded gravel
	10%	clayey fines	well graded	GW-GC	Well graded gravel with clay
			poorly graded	GP-GC	Poorly graded gravel with clay
		silty fines	well graded	GW-GM	Well graded gravel wth silt
			poorly graded	GP-GM	Poorly graded gravel with silt
	15% to 45%	clay fines		GC	Clayey gravel
		silt fines		GM	Silty gravel
SAND *% sand ≥ % gravel*	≤ 5%	well graded		SW	Well graded sand
		poorly graded		SP	Poorly graded sand
	10%	clayey fines	well graded	SW-SC	Well graded sand with clay
			poorly graded	SP-SC	Poorly graded sand with clay
		silty fines	well graded	SW-SM	Well graded sand with silt
			poorly graded	SP-SM	Poorly graded sand with silt
	15% to 45%	clay fines		SC	Clayey sand
		silt fines		SM	Silty sand

[1] If soil is a gravel and contains 15% or more sand, add "with sand" to the group name. If soil is a sand and contains 15% of more gravel, add "with gravel" to the group name.

Inorganic Fine-Grained Soil - Fine-grained soils contain 50% or more fines and are identified based on the following table.

Plasticity Criteria	Dry Strength	Coarse Fraction S = Sand, G = Gravel		Group Symbol	Group Name [1]
Medium	Medium to high	< 15% S + G		CL	Lean clay
		≥ 30%	% S ≥ % G	CL	Sandy lean clay
		S + G	% S < % G	CL	Gravelly lean clay
Non-plastic	None to low	< 15% S + G		ML	Silt
		≥ 30%	% S ≥ % G	ML	Sandy silt
		S + G	% S < % G	ML	Gravelly silt
High	High to very high	< 15% S + G		CH	Fat clay
		≥ 30%	% S ≥ % G	CH	Sandy fat clay
		S + G	% S < % G	CH	Gravelly fat clay
Low to Medium	Low to medium	< 15% S + G		MH	Elastic silt
		≥ 30%	% S ≥ % G	MH	Sandy elastic silt
		S + G	% S < % G	MH	Gravelly elastic silt

[1] If soil contains 15% to 25% sand or gravel, add "with sand" or "with gravel" to the group name.

Organic Fine-Grained Soil - Fine-grained soils that contain enough organic particles to influence the soil properties are identified as Organic Soil and assigned the group symbol **OL** or **OH**.

Highly Organic Soil (Peat) - Soils composed primarily of plant remains in various stages of decomposition are identified as Peat and given the group symbol **PT**. Peat usually has an organic odor, a dark brown to black color, and a texture ranging from fibrous (original plant structure intact or mostly intact) to amorphous (plant structure decomposed to fine particles).

SOIL DESCRIPTION

Soils are *described* in the following general sequence. Deviations may occur in some instances.

Identification Components

(1) Group Name and Group Symbol

Description Components

(2) Consistency (Fine-Grained) or Apparent Density (Coarse-Grained)
(3) Color (*note, the term "to" may be used to indicate a gradational change*)
(4) Soil Moisture
(5) Matrix Soil Constituents (Gravel, Sand, Fines)
  └► Proportion (*by weight*), particle size, plasticity of fines, angularity, etc.
(6) Non-Matrix Soil Materials and Proportions (*by volume*)
(7) Other Descriptive Information (Unusual Odor, Structure, Texture, etc.)
(8) [Geologic Formation Name or Soil Survey Unit]

SPT N-VALUE CORRELATIONS

Consistency	SPT N-Value	Apparent Density	SPT N-Value
Very soft	0 - 2	Very loose	0 - 5
Soft	2 - 4	Loose	5 - 10
Medium stiff	4 - 8	Medium dense	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very stiff	15 - 30	Very dense	> 50
Hard	> 30		

SOIL MOISTURE

Dry..... Apparent absence of moisture; dry to the touch.
Moist..... Damp but no visible water.
Wet..... Visible free water; saturated.

PROPORTIONS / PERCENTAGES

Proportions of gravel, sand, and fines (excluding cobbles, boulders, and other constituents) are stated in the following terms indicating a range of percentages by weight (to nearest 5%) of the minus 3-in. soil fraction and add up to 100%.

Mostly ..... 50% - 100%
Some ..... 30% - 45%
Little ..... 15% - 25%
Few ..... 5% - 10%
Trace..... Less than 5%

Proportions of cobbles, boulders, and other non-matrix soil materials including artificial debris, roots, plant fibers, etc. are stated in the following terms indicating a range of percentages by volume (to the nearest 5%) of the total soil.

Numerous ..... 40% - 50%
Common ..... 25% - 35%
Occasional ..... 10% - 20%
Trace..... Less than 5%

PLASTICITY (FINES ONLY)

Non-plastic.....Dry specimen ball falls apart easily. Cannot be rolled into thread at any moisture content.
Low.....Dry specimen ball easily crushed with fingers. Can be rolled into 1/8-in. thread with some difficulty.
Medium.....Difficult to crush dry specimen ball with fingers. Easily rolled into 1/8-in. thread.
High.....Cannot crush dry specimen ball with fingers. Easily rolled and re-rolled into 1/8-in. thread.

COBBLES AND BOULDERS

Cobbles - Particles of rock that will pass a 12-in. square opening and be retained on a 3-in. sieve.

Boulders - Particles of rock that will not pass a 12-in. square opening.

Note: Where the percentage (by volume) of cobbles and/or boulders cannot be accurately or reliably estimated, the terms "with cobbles", "with boulders", or "with cobbles and boulders" may be used to indicate observed or inferred presence.

GUIDE TO SUBSURFACE EXPLORATION LOGS

Weston & Sampson℠

INDEX SHEET 3
ROCK DESCRIPTION

ROCK DEFINITION

Where reported on an exploration log, *rock* is defined as any naturally formed aggregate of mineral matter occurring in larges masses or fragments. This definition of rock should not be taken as a replacement for any definitions relating to rock and/or rock excavation defined in construction documents. Intensely weathered or decomposed rock that is friable and can be reduced to gravel size particles or smaller by normal hand pressure is identified and described as soil. Poorly indurated formational materials which display both rock-like and soil-like properties are identified and described as rock followed by the soil description. In such cases, the term "poorly indurated" or "weakly cemented" is added to the rock name (e.g. weakly cemented sandstone).

ROCK IDENTIFICATION

Rock is identified by a combination of *rock type* (igneous, metamorphic, or sedimentary) followed by the the *rock name* (e.g. granite, schist, sandstone).

ROCK DESCRIPTION

Rock descriptions are presented in the following general sequence. The detail of description is dictated by the complexity and objectives of the project.

Identification Components

(1) Rock Type and Name

Description Components

(2) Rock Grain Size (*for clastic sedimentary rock*)
(3) Crystal Size (*for igneous and metamorphic rock*)
(4) Bedding Spacing (*for sedimentary rock*)
(5) Color
(6) Hardness and Weathering Descriptors
(7) Fracture Density
(8) [Geologic Formation Name]

ROCK QUALITY DESIGNATION

$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of intact core pieces} \geq 4 \text{ inches}}{\text{Total length of core run (inches)}} \times 100$$

The RQD should correlate with the fracture density in most cases. Higher RDQ values generally indicate fewer joints and fractures.

GRAIN / CRYSTAL SIZE

Grain Size for Clastic Sedimentary Rock

The names of clastic sedimentary rocks are generally based on their predominant clast or grain size (e.g. fine sandstone, medium sandstone, coarse gravel conglomerate, cobble conglomerate, siltstone, claystone).

Crystal Size for Igneous and Metamorphic Rock

Grain Size Description	Average Crystal Size (in.)
Very coarse grained (pegmatitic)	Greater than or equal to 3/8
Coarse-grained	Between 3/16 and 3/8
Medium-grained	Between 1/32 and 3/16
Fine-grained	Between 1/250 and 1/32
Aphanitic	Less than or equal to 1/250

BEDDING SPACING

Bedding Description	Thickness / Spacing
Massive	Less than 10 ft.
Very thickly bedded	3 ft. to 10 ft.
Thickly bedded	1 ft. to 3 ft.
Moderately bedded	4 in. to 1 ft.
Thinly bedded	1 in. to 4 in.
Very thinly bedded	1/4 in. to 1 in.
Laminated	Less than 1/4 in.

Note: Bedding is generally only applicable to sedimentary or bedded volcanic rocks.

HARDNESS

Hardness	Criteria
Extremely hard	Cannot be scratched with a pocketknife or sharp pick. Can only be chipped with repeated heavy hammer blows.
Very hard	Cannot be scratched with a pocketknife or sharp pick with difficulty. Breaks with repeated heavy hammer blows.
Hard	Can be scratched with with a pocketknife or sharp pick with difficulty. Breaks with heavy hammer blows.
Moderately hard	Can be scratched with a pocketknife or sharp pick with light or moderate pressure. Breaks with moderate hammer blows.
Moderately soft	Can be grooved 1/16 in. deep with a pocketknife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure.
Soft	Can be grooved or gouged easily with a pocketknife or sharp pick. Breaks with light to moderate manual pressure.
Very soft	Can be readily indented, grooved, or gouged with fingernail, or carved with a pocketknife. Breaks with light manual pressure.

WEATHERING (INTACT ROCK)

Weathering Description	Discoloration and/or Oxidation	General Characteristics
Fresh	Body of rock and fracture surfaces are not discolored or oxidized.	Rock texture unchanged. Hammer rings when crystalline rocks are struck.
Slightly weathered	Discoloration or oxidation limited to surface of, or short distance from, fractures. Most surfaces exhibit minor to complete discoloration.	Rock texture preserved. Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately weathered	Discoloration or oxidation extends usually throughout. Fe-Mg minerals appear rusty. All fracture surfaces are discolored or oxidized.	Rock texture generally preserved. Hammer does not ring when rock is struck. Body of rock slightly weakened.
Intensely weathered	Discoloration or oxidation throughout. Feldspar and Fe-Mg minerals altered to clay to some extent. All fracture surfaces are discolored or oxidized and friable.	Rock texture altered by chemical disintegration. Can usually be broken with moderate to heavy manual pressure or by light hammer blow . Body of rock is significantly weakened.
Decomposed	Discoloration or oxidation throughout but resistant minerals such as quartz may be unaltered. All feldspar and Fe-Mg minerals are completely altered to clay.	Resembles a soil; partial or complete remnant rock structure may be preserved. Can be granulated by hand. Resistant minerals may present as stringers or dikes.

FRACTURE DENSITY

Description	Observed Fracture Density
Unfractured	No fractures
Very slightly fractured	Core lengths greater than 3 ft.
Slightly fractured	Core lengths mostly from 1 ft. to 3 ft.
Moderately fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely fractured	Core lengths mostly from 1 in. to 4 in.
Very intensely fractured	Mostly chips and fragments

Note: Fracture density is based on the fracture spacing in recovered core, measured along the core axis (excluding mechanical breaks).

Attachment C

Test Pit Logs

Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-101

WSE Project: ENG23-3281

CONTRACTOR:	**Ricciardi Bros, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**November 6, 2024**
OPERATOR:	**C. Brown**	PLAN DIMENSIONS:	**Length: 11.2 ft. , Width: 8.2 ft.**	DATE FINISH:	**November 6, 2024**
LOGGED BY:	**N. King**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**475.5 ± (NAVD88)**
CHECKED BY:	**J. MacGregor, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**4.5 ft.**
EQUIPMENT:	**Hydraulic Excavator, Medium**	BACKFILL MATERIAL:	**Excavated Soil & Asphalt Patch**	GRID COORDS:	**N:2919351 ± / E:573748 ±**
BUCKET TYPE:	**Toothed, 36-in. (10.6 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

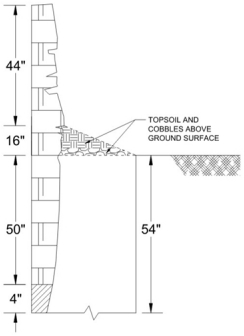
DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Asphalt- 3 inches thick.		
			Silty sand with gravel (SM) - Brown brown; dry; mostly fine to coarse SAND, little non plastic fines, little fine to coarse gravel; occasional debris (brick, glass, plastic) and cobbles. **[FILL]**		
			Poorly graded sand with silt (SP-SM) - Tan with orange; dry; mostly fine to coarse SAND, few non plastic fines. **[FILL]**		
			Clayey sand (SC) - Brown to gray; dry; mostly fine to coarse SAND, some medium plasticity fines, few fine to coarse gravel; occasional to common debris (glass, wood). **[FILL]**		
			Bottom of retaining wall at 50 inches		Refer to the sketch below for retaining wall dimensions.
				471	**Exploration ended at 4.5 ft.**
5					
				466	



Top View



Side View



Sketch

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Weston & Sampson

South Division Fire House and Emergency Communications Center

25 Madison Street, Worcester, MA

TEST PIT ID: TP-102

WSE Project: ENG23-3281

CONTRACTOR:	**Ricciardi Bros, Inc.**	TEST PIT LOCATION:	**See Attached Figure**	DATE START:	**November 6, 2024**
OPERATOR:	**C. Brown**	PLAN DIMENSIONS:	**Length: 12.5 ft. , Width: 7.9 ft.**	DATE FINISH:	**November 6, 2024**
LOGGED BY:	**N. King**	SEEPAGE REMARKS:	**No Seepage Observed**	GROUND EL:	**475.5 ± (NAVD88)**
CHECKED BY:	**J. MacGregor, PE**	CAVING REMARKS:	**No Caving Observed**	FINAL DEPTH:	**5.2 ft.**
EQUIPMENT:	**Hydraulic Excavator, Medium**	BACKFILL MATERIAL:	**Excavated Soil & Asphalt Patch**	GRID COORDS:	**N:2919217 ± / E:573679 ±**
BUCKET TYPE:	**Toothed, 36-in. (10.6 cubic-ft.)**	OTHER COMMENTS:		GRID SYSTEM:	**NAD83 State Plane (MA)**

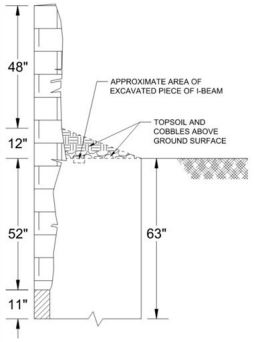
DEPTH BELOW GROUND SURFACE [VERTICAL FT.]	SAMPLE TYPE GRAPHIC	STRATIGRAPHY LOG	STRATUM IDENTIFICATION AND DESCRIPTION	ELEVATION SCALE SHOWN TO NEAREST FT.	REMARKS, OTHER TESTS, AND INSTALLATIONS
			Surface: Asphalt concrete pavement.		Note: Values in brackets preceeding a remark indicate depth below ground surface (in feet) corresponding to the remark.
			Asphalt- 5 inches thick.		160 inch long piece of I-beam observed at ground surface.
			Silty sand with gravel (SM) - Brown; dry; mostly fine to coarse SAND, little non plastic fines, little fine to coarse gravel; occasional debris (brick, glass, plastic) and cobbles. **[FILL]**		
			Poorly graded sand with silt (SP-SM) - Tan with orange; dry; mostly fine to coarse SAND, few non plastic fines. **[FILL]**		
			Silty sand with gravel (SM) - Brown; dry; mostly fine to coarse SAND, little non plastic fines, little fine to coarse gravel. **[FILL]**		
			Clayey sand (SC) - Gray; dry; mostly fine to coarse SAND, some medium plasticity fines, few fine to coarse gravel; common cobbles. **[FILL]**		
			Bottom of retaining wall at 52 inches	471	Refer to the sketch below for retaining wall dimensions.
5					**Exploration ended at 5.2 ft.**
				466	



Top View



Side View

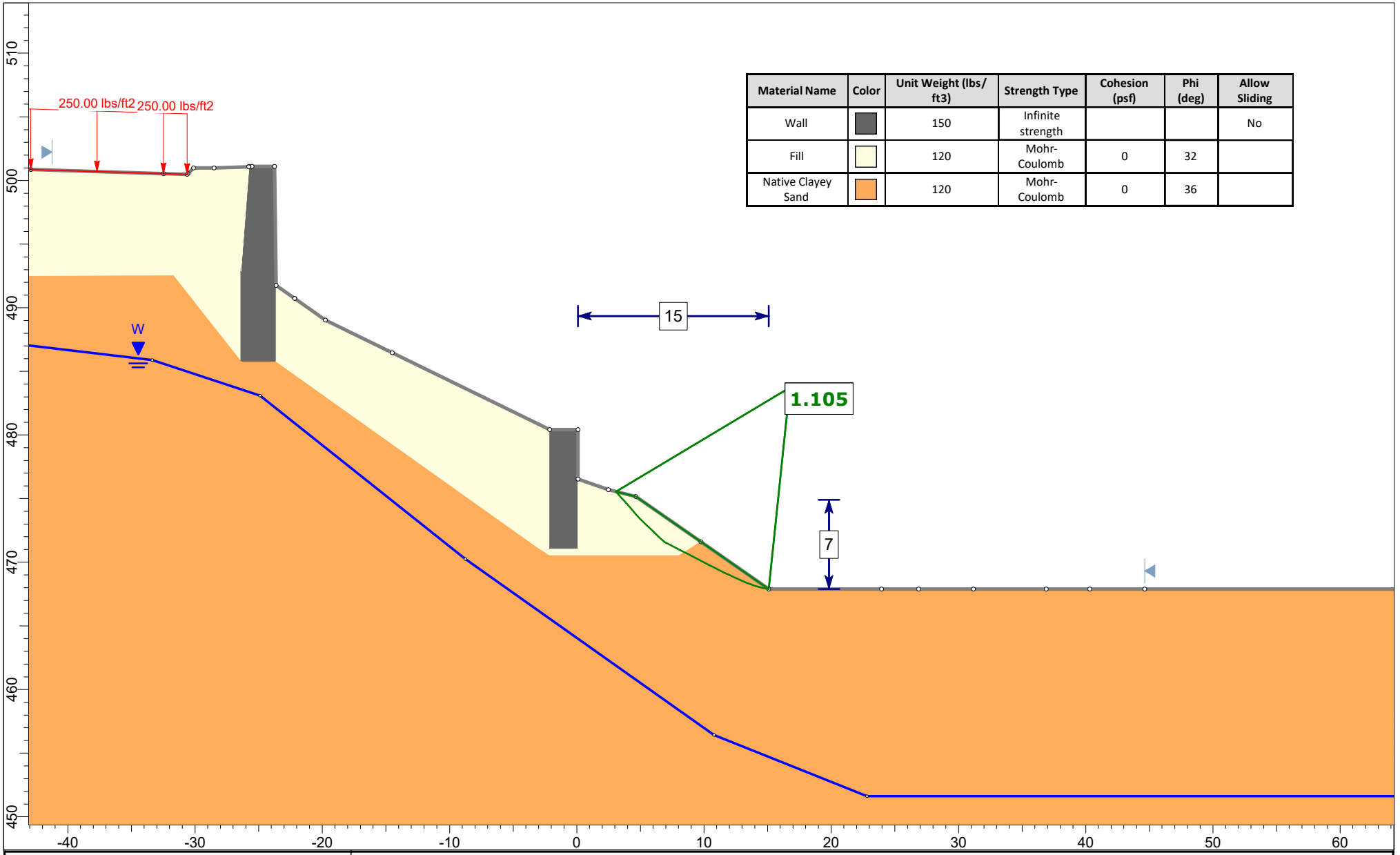


Sketch

Refer to the attached index sheets for important information about this log including general notes, legends, and guidance on description methods and procedures.

Attachment D

Slope Stability Results



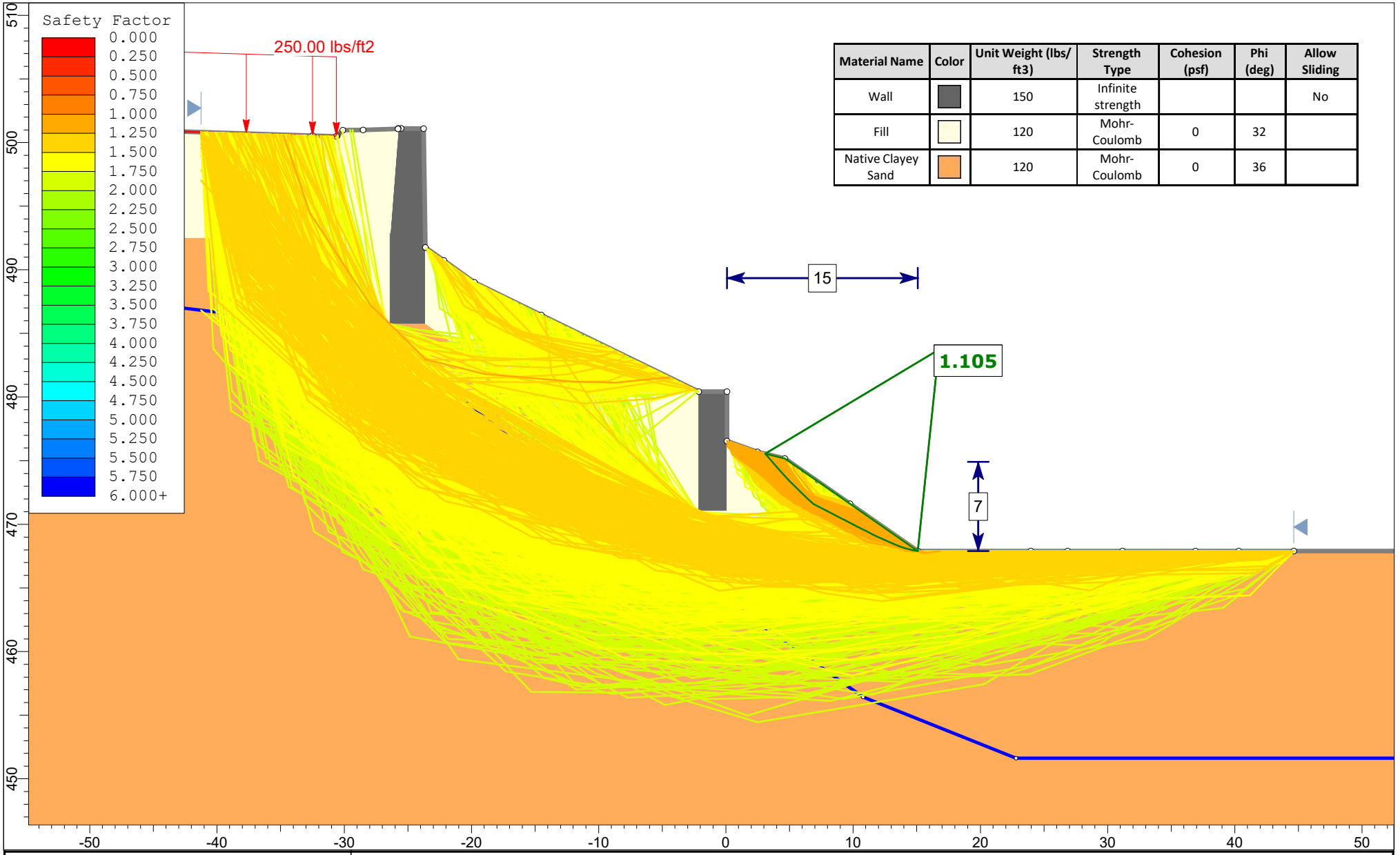
Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding
Wall		150	Infinite strength			No
Fill		120	Mohr-Coulomb	0	32	
Native Clayey Sand		120	Mohr-Coulomb	0	36	

Weston & Sampson SM

SLIDEINTERPRET 9.019

SOUTH DIVISION FIREHOUSE AND EMERGENCY COMMUNICATIONS CENTER - WORCESTER, MA

Analysis Description	Construction conditions for two wall and slope system		
Drawn By	VS	*Company*	Weston & Sampson Engineers, Inc.
Date	12/23/2024	*File Name*	WSDFH.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Allow Sliding
Wall		150	Infinite strength			No
Fill		120	Mohr-Coulomb	0	32	
Native Clayey Sand		120	Mohr-Coulomb	0	36	

Weston & Sampson SM

SOUTH DIVISION FIREHOUSE AND EMERGENCY COMMUNICATIONS CENTER - WORCESTER, MA

Analysis Description	Construction conditions for two wall and slope system - FOS below 2		
Drawn By	VS	*Company*	Weston & Sampson Engineers, Inc.
Date	12/23/2024	*File Name*	WSDFH.slmd

SLIDEINTERPRET 9.019

SECTION 00 52 23

OWNER-CM AGREEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 00 and 01.

B. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related shall be bound to this agreement and all of its related documents.

C. Attachment: OWNER-CM AGREEMENT which includes but is not limited to;
1. General Conditions
2. Supplemental General Conditions)also reference Document 007225 CM Supplemental Conditions)
3. M/WBE
4. Insurance Requirements (also reference Document 007225 CM Supplemental Conditions)
5. Statutory Requirements
6. Certifications
7. Procedures
8. Audits
9. Prevailing Wages

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

[NOT USED]

END OF SECTION 00 52 23

City of Worcester
Owner - Construction Manager Agreement

Awarding Authority: City of Worcester

This agreement ("Contract") is made as of the 25 day of September, 20 25, by and between the City of Worcester acting by and through the Awarding Authority identified above with a principal place of business at 455 Main St. Worcester MA. 01608, and W.T. Rich Company, a Massachusetts Business Corporation with a principal place of business at 1075 Worcester Street, Suite 310, Natick, Massachusetts 01760 hereinafter called the "Construction Manager or CM".

The terms used in this Owner - Construction Manager Agreement, which are defined in the General Conditions of the Contract shall have the meanings designated therein.

Preliminary Statement:

- Pursuant to M.G.L. c. 149A the City of Worcester is undertaking the multi-phased construction of a New Worcester South Division Fire Station Project in Worcester ("the Project").
- The Construction Manager shall be liable to the City of Worcester for all of the obligations, responsibilities and liabilities of the Construction Manager under this Contract.
- The City of Worcester has engaged Perkins and Will, Inc., Inc. (the "Designer") under a separate agreement to provide design services for the Project.

NOW, THEREFORE, in consideration of the mutual agreements and obligations of the parties set forth below, the City of Worcester and the Construction Manager do hereby agree as follows:

ARTICLE 1. The Work

1.1. The Construction Manager's Responsibilities: The CM shall perform the Work as required by the construction documents for the New Worcester South Division Fire Station totaling approximately 30,000 square feet at 25 Madison Street Worcester, MA 01605.

1.2. **Site:** The Site is defined in Section 9, CSI Division – 000000 – CM@Risk General Conditions Article I of the RFP.

1.2.1. Site Inspection: By executing this Agreement, the CM acknowledges that it has visited the Site and has learned as much about the Site as may reasonably learned from such an inspection. No information which would reasonably have been obtained by such a site inspection may serve as the basis for any change order proposal or claim for additional costs and/or additional time.

1.2.2. **Site Conditions:** Information about soil and other subsurface conditions at the Site are provided in Specifications of the Request for Proposals of this Agreement. Neither the City of Worcester nor the Designer represents that such information is complete, accurate, or an approximate indication of subsurface conditions. No change order proposal or claim for additional costs and/or additional time resulting from the CM's reliance on such information shall be allowed except as expressly provided in the Contract Documents.

1.2.3. **Site Testing By CM:** Prior to the commencement of the deep and/or shallow foundation portions of the Work, the CM, if directed by the City of Worcester, or if it elects at its own discretion, shall conduct further testing of the subsurface conditions at the Site. If such testing is performed at the direction of the City of Worcester, or to the extent that the CM demonstrates to the City of Worcester that further testing as proposed by the CM is likely to significantly reduce differing site condition and other costs for which the City of Worcester may be responsible under the Contract, and the City of Worcester approves such testing, the costs of such testing shall be paid by the City of Worcester.

ARTICLE 2. The Contract Documents

2.1. **Contract Documents:** The following documents form the Contract, are incorporated by reference herein, and are referred to as the "Contract Documents:"

- The Request for Proposals for Construction Management Services for the New Worcester South Division Fire Station -The Construction Manager's Proposal.
- The Owner – Construction Manager Agreement including amendments and negotiated terms.
- The General Conditions of the Contract.
- The Supplementary General Conditions of the Contract.
- The Plans and Specifications prepared by the Designer, including Addenda.
- All Approved Change Orders/Contract Modifications issued after execution of this Owner - Construction Manager Agreement.

ARTICLE 3. Relationship of the Parties

3.1. **CM's Obligation:** The CM accepts the relationship of trust and confidence between the City of Worcester and the CM established by this Agreement and covenants with the City of Worcester to cooperate at all times with the City of Worcester, the Designer and any other consultants or project representatives engaged or employed by the City of Worcester, and to utilize the CM's best skill, efforts and judgment in furthering the interests of the City of Worcester to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and, consistent with the requirements of the Contract Documents, to perform the Work in the best way and most expeditious and economical manner consistent with the interests of the City of Worcester and to make every effort to achieve time savings and construction efficiencies with respect to the Work. The CM, in performing its services under this Agreement, is an independent contractor and is not an agent or employee of, or a joint venture with, the City of Worcester. The CM shall endeavor to promote harmony and cooperation among the City of Worcester, the Designer, the CM, Subcontractors, separate contractors and other persons or entities engaged by the City of Worcester or otherwise employed in connection with the Project, as well as other public agencies having jurisdiction with respect to the Project. The City of Worcester agrees to use its best efforts to enable the CM to perform the Work in an expeditious manner by furnishing on a timely basis information required by the CM and making payments to the CM in accordance with the requirements of the Contract Documents.

3.2. **Standard of Performance:** The CM represents that it is experienced and skilled in construction of projects of the type, magnitude and complexity described in the Contract Documents, that it is familiar with the special problems and requirements of construction of the type required for the Project and in the location of the Site, and that it will furnish a complete and fully operable Project as indicated by and reasonably inferable from the Contract Documents.

ARTICLE 4. Contract Time

4.1. **Commencement Date:** The CM shall begin preconstruction and construction phase services pursuant to the terms and conditions included in written Notices to Proceed ("NTP") issued by the City of Worcester.

4.1.1. **Preconstruction Services:** The NTP for preconstruction services shall be issued within a reasonable time following execution of the Contract. It may, in the City of Worcester's discretion, instruct the CM to begin only certain portions of the preconstruction services.

4.1.2. **Construction Services:** The NTP for construction services shall be issued within a reasonable time following the execution of the GMP Amendment as defined in Section 6.7.2 of the Owner/Construction Manager Agreement, provided that, in the City of Worcester's discretion, it may elect to issue such NTP prior to the execution of the GMP Amendment. If the NTP is issued prior to the execution of the GMP Amendment, the City of Worcester may, in its discretion, limit the scope of the NTP in whatever manner it deems appropriate until the execution of the GMP Amendment or a reasonable period following such execution, at which time, such limitations, if any, shall be rescinded.

4.2. **Substantial and Final Completion:** The CM shall achieve Substantial Completion no later than April 9, 2027, subject to any adjustments in the Contract Time approved by the City of Worcester in accordance with the Contract Documents (the "Substantial Completion Date") and made ready for occupancy no later than June 1, 2027, subject to any adjustments in the Contract Time approved by the City of Worcester in accordance with the Contract Documents. The overall project duration is 15 months, March 30, 2026 through April 9, 2027. The CM shall achieve Final Completion of the Work, no later than 45 days after substantial completion, subject to adjustments of the Contract Time approved by the City of Worcester in accordance with the Contract Documents (the "Final Completion Date").

4.3. **Time is of the Essence:** The CM acknowledges that the times of Substantial Completion of the Work, Final Completion of the Work, any other milestones for completion of portions of construction, times for submitting proposals for contract modifications, and other times set forth in the Contract Documents are essential conditions of this Agreement.

4.4. Liquidated Damages.

4.4.1. If the CM shall neglect, fail or refuse to achieve Substantial Completion of the Work within the Contract Time, as adjusted in accordance with the provisions of the Contract Documents, the CM and the CM's surety agree, as a part of the consideration for the execution of this Contract by the City of Worcester to pay the City of Worcester the amounts set forth in this Subsection 4.4.1 below, not as a penalty, but as liquidated damages to cover certain losses, expenses and damages of the City of Worcester for such breach of contract as herein set forth. The CM acknowledges that delay in Substantial Completion of the Project will cause disruption of the City of Worcester's

operations. Such disruptions include without limitation, loss of productivity and efficiency and duplication of effort. The City of Worcester will incur loss of revenue from scheduled events should such a delay occur. Delay in Substantial Completion will also require the City of Worcester to incur additional costs for compensation to the Designer and other consultants or contractors for extended or additional work on the Project. In light of the costs, damages, losses, risks and liabilities described above, the parties have agreed upon the liquidated damages stated below. Such damages have been fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages by the City of Worcester would in such event sustain, and said amounts may be retained by the City of Worcester on or after the scheduled date of Substantial Completion from current progress payments or any other amounts owing to the CM. The agreed liquidated damages amounts are $2,000 per day of delay in achieving Substantial Completion.

4.4.2. Except as otherwise expressly provided, none of the following shall constitute a waiver of the CM's or its surety's obligations to pay liquidated damages or any portion thereof:

(a.) Acceptance of any portion of the Work or payment to the CM or its surety therefor;

(b.) Completion of a portion of the Work or the use or occupancy thereof by the City of Worcester or others;

(c.) The City of Worcester's requiring or allowing the CM or its surety to complete the Work.

4.4.3. **Substantial Completion:** As used in this Owner/Construction Manager Agreement Article, the term Substantial Completion shall mean Substantial Completion as defined in the General Conditions of the Contract.

ARTICLE 5. Construction Manager's Services

5.1. **Preconstruction Services:** Commencing upon the date of this Agreement, unless otherwise directed in a notice to proceed issued by the City of Worcester, the CM shall perform preconstruction services as provided in this Owner/Construction Manager Agreement Article and elsewhere in the Contract Documents.

5.1.1. **Construction Planning:** The CM shall attend regular Project meetings with the City of Worcester and the Designer. If requested by the City of Worcester, the CM shall schedule and lead such meetings and keep minutes of such meetings. The CM shall consult with the City of Worcester and the Designer concerning planning for construction of the Project. The CM shall make recommendations as to the purchase and assist in expediting the procurement of long lead items, which are required for the Project to ensure their delivery by the required dates. The CM shall review and, if appropriate, make recommendations with respect to the phasing of the Work, and shall otherwise advise and assist the City of Worcester and the Designer with respect to the division of the Work to facilitate the development of bid and proposal packages, bidding and awarding of subcontracts, allowing for scheduled sequential bid and proposal packages and taking into consideration such factors as economies, time of performance, availability of labor and materials, and provisions for temporary facilities.

5.2. **Preconstruction and Construction Services:** The CM shall perform its preconstruction and construction services, responsibilities and obligations concurrently as necessary during the term of this Agreement as directed by the City of Worcester.

5.2.1. **Design Review:** The CM shall review, on a continuous basis, development of the Drawings, Specifications and other design documents produced by the Designer. The design reviews shall be performed with a group of Architects and Engineers, who are either employees of the CM or independent consultants under contract with the CM. Review of the documents is to discover inconsistencies, errors and omissions between and within design disciplines. The CM shall consult with the City of Worcester and the Designer regarding the selection of materials, building systems and equipment, and shall recommend alternative solutions whenever design details affect construction feasibility, schedules, cost or quality (without, however, assuming the Designer's responsibility for design) and shall provide other value engineering services to the City of Worcester. Without limitation, the CM shall review the design documents for clarity, consistency, constructability, maintainability/operability and coordination among the trades, coordination between the specifications and drawings, compliance with M.G.L. c.149A for procurement, installation and construction, and sequence of construction, including recommendations designed to minimize adverse effects of labor or material shortages. The CM reviews shall be performed by the project team members as approved by the City of Worcester. The reviews shall be provided in writing with detailed notations on the drawings and specifications and coordinated with a detailed spreadsheet of the notations and recommended solutions in order to track the issues to final resolution. The CM shall attend meetings as necessary with the Designer and the City of Worcester in order to discuss and resolve all issues.

5.2.2. **Master Development Schedule:** The CM shall assist the City of Worcester to meet any scheduling responsibilities assigned by the City of Worcester. The CM shall also coordinate and integrate its Project schedules with the services and activities of the City of Worcester and other parties. The requirements provided herein are in addition to and not in limitation of the CM's obligation to prepare and maintain the Baseline Critical Path Method (CPM) Schedule and other schedules as provided in the Contract Documents.

5.2.3. Cost Estimates

(a.) Schematic Design Documents have been prepared by the Designer and approved by the City of Worcester or otherwise directed by the City of Worcester. The CM shall prepare for the review of the Designer and approval of the City of Worcester, a detailed estimate of the Construction Cost (hereafter defined) with supporting data including but not limited to unit costs of all materials, equipment and labor hours required to complete the work of all sections of the specification. As used herein, "Construction Cost" shall mean the total cost or, to the extent the Project is not completed, the total estimated cost of constructing the Project, including the Hard Cost of the Work, the General Conditions Payment, and the CM Fee. The Construction Cost does not include costs of land acquisition, existing building demolition costs, financing costs, or design fees. The CM shall provide value engineering analysis and recommendations during design and construction as directed and in order to meet the requirements of the project budget. The CM shall provide a minimum of two (2) complete, detailed estimates for this project, including 100% Design Development documents and 90% Construction Documents as indicated in Section 3.2.J.f.

(b.) The City of Worcester may, but shall not be required to, arrange for periodic estimates of Construction Cost to be performed by other consultants or staff of the City of Worcester. The CM shall work in good faith and in cooperation and coordination with the Designer, and any other consultants or staff of the City of Worcester involved in preparing estimates of Construction Cost, in order to reconcile any differences between cost estimates prepared by the CM and such parties, to clarify assumptions upon which cost estimates are based, and otherwise to address any concerns or questions with respect to such cost estimates raised by the Designer, the City of Worcester or such other consultants. If in any case the agreed-upon, reconciled estimate of Construction Cost exceeds the Construction Budget established by the City of Worcester, the CM shall advise and cooperate with the City of Worcester and the Designer in identifying, specifying and recommending changes in, or additional specification of materials, equipment, component systems and types of construction, or other adjustments in the scope or quality of the Project (collectively, "Cost Reduction Alternatives"), including contingencies or alternative bid items, so as to facilitate revision of the design of the Project to reduce the Construction Cost so as to comply with the Construction Budget. Implementation of any Cost Reduction Alternative shall be subject to the approval of the City of Worcester, and the City

of Worcester shall have the right, in its sole discretion, to choose which of the Cost Reduction Alternatives developed by the parties shall be implemented, provided, however, that the Designer shall not be required to incorporate Cost Reduction Alternatives into the design of the Project if doing so would result in a violation of Applicable Laws.

(c.) The process and responsibilities of the CM described in this Section 5 shall also apply to any separate cost limits within the Construction Budget that have been established by the City of Worcester for certain phases, components or elements of the Work.

5.2.4. **Permits and Approval:** Consistent with the General Conditions, the CM shall assist the City of Worcester and the Designer in identifying all governmental permits, user fees, approvals and licenses of any kind which must be obtained and be met in connection with the construction, use and occupancy of the Project ("Permits and Approvals"). The CM shall be responsible for obtaining all Permits and Approvals. The CM shall perform the Work in accordance with all conditions, mitigation measures and other requirements of all Permits and Approvals. Unless specified elsewhere, the CM shall obtain all permits, inspections, and certificates of occupancy for the Project. The CM shall NOT be responsible for the cost of the Building Permit. All applications, requests, appeals, filings and other documents, materials and information prepared by the CM to be submitted to governmental authorities in connection with the Permits and Approvals shall be subject to the prior approval of the City of Worcester, and shall be delivered to the City of Worcester sufficiently in advance of the time of their proposed filing or submission so as to permit a reasonable period for the review and comment of the City of Worcester and its consultants. If requested by the City of Worcester at any time, any such documents or materials to be used in connection with the Permits and Approvals may be prepared by the City of Worcester or other persons designated by the City of Worcester, and the City of Worcester or other persons designated by the City of Worcester may appear on behalf of the City of Worcester at any hearing, presentation or conference. In addition, the CM shall promptly complete and provide such other documentation as may be required by the City of Worcester, or such other parties as the City of Worcester may indicate, provided that if the CM believes in any instance that compliance with such requirement materially modifies, enlarges or abridges the CM's duties, obligations or rights under the Contract Documents, the CM may submit a proposal for an increase in the Contract Price and/or the Contract Time in accordance with the applicable provisions of the Contract Documents.

5.2.5. **Monthly Progress Reports:** On the fifth (5^{th}) day of each month, or on such other day established by the City of Worcester, the CM shall submit to the City of Worcester the documents listed in this section for the preceding month, in form and substance acceptable to the City of Worcester, containing, without limitation, the following information:

(a.) Project status overview including, without limitation, (1) Progress report by division of work or area, (2) Quality control/quality assurance report, (3) Safety and loss control report, and (4) MBE/WBE and workforce participation status.

(b.) Procurement status report, including, without limitation, a status of MBE/WBE participation; In addition to Monthly reporting, the CM shall provide a dedicated Compliance Officer to submit weekly status updates on the MBE/WBE and minority and women workforce utilization goals.

(c.) Project schedule update including, without limitation, a Summary Schedule (progress bar chart) from the CPM.

(d.) Project cost update, including, without limitation, (1) Cost summary, (2) Cash flow update, (3) List of outstanding Change Orders and Change Directives, and (4) Lists of potential changes and outstanding Change Proposal requests and CM Change Requests.

(e.) Such other reports: logs or documents as the City of Worcester may reasonably require for the management of the Project.

5.2.6. **Executive Summary Progress Report:** On the fifteenth (15th) day of each month, or such other day established by the City of Worcester, the CM shall submit to the City of Worcester an Executive Summary Progress Report in form and content satisfactory to the City of Worcester. Such Report shall include but not be limited to a summary of the important information from the submittals listed in Section 5.2.5 and a discussion of the important issues facing the Project as of the date of the Report's submittal.

5.2.7. **Subcontracts:** Unless otherwise specifically approved by the City of Worcester, all Work shall be performed by the CM pursuant to Subcontracts awarded by the CM in accordance with the General Conditions of the Contract, Appendix C: Procedures for Award of Subcontracts.

(a.) The CM shall consult with the City of Worcester with respect to proposed bidding and proposal forms and procedures for all subcontracts. The CM understands and agrees that the City of Worcester may participate in negotiations with subcontractors and that the City of Worcester and its representatives shall have access to any documents submitted by all trade contractors and other subcontractors to the CM, for review as to compliance with bidding and proposal procedures and other requirements of the Contract Documents. No subcontract or other agreement between the CM and any third party for the furnishing or supply of any labor, materials or equipment in the performance of the Work shall be entered into without the City of Worcester's prior written approval. The City of Worcester shall respond promptly to any request for approval of a subcontract. Standard forms of subcontract Appendix D agreement for all Trade contractors and other subcontractors are attached as to the General Conditions of the Contract. No material revisions shall be made to any such Subcontract or other agreement approved by the City of Worcester without the prior approval of the City of Worcester. Copies of all executed Subcontracts shall be provided to the City of Worcester promptly.

(b.) Purchases from Affiliated Entities. Except in the event of an emergency as

provided herein, neither the CM nor any subcontractor shall enter into any subcontract, contract, agreement, purchase order, or other arrangement (collectively, an "Arrangement") for the performance of any portion of the Work or the furnishing of any materials, services or equipment in connection therewith with any party or entity if such party or entity is an Affiliated Entity (as defined below), unless such Arrangement has been approved by the City of Worcester, after full disclosure in writing by the CM and subcontractor, if applicable, to the City of Worcester of such affiliation and all details relating to the proposed Arrangement. The term "Affiliated Entity" means any entity related to or affiliated with the CM and/or any Subcontractor, as applicable, or with respect to which the CM and/or any Subcontractor, as applicable, has direct or indirect ownership or control, including, without limitation, any entity owned in whole or in part by the CM and/or any subcontractor, as applicable; any holder of the issued and outstanding shares of, or the holder of any interest in, the CM and/or Subcontractor, as applicable; any entity in which any officer, director, employee, partner or shareholder (or member of the family of any of the foregoing persons) of the CM and/or any subcontractor, as applicable, has a direct or indirect interest which interest includes, but is not limited to, that of a partner, employee, agent or shareholder.

5.3. **Construction Services:** Commencing upon the date of the Notice to Proceed with Construction, unless otherwise directed by the City of Worcester, the CM shall perform Construction Services as provided in these sections and elsewhere in the Contract Documents.

5.3.1. **Construction Cost Monitoring:** The CM shall provide a system of Project cost monitoring and reporting and shall develop cash flow reports and forecasts in such format as approved by the City of Worcester to coordinate with the cost loaded CPM. The CM shall identify variances between actual costs and its estimated costs and shall immediately advise the City of Worcester whenever projected costs exceed previous reports. Such reports and other information shall be included in the Monthly Progress Reports to be submitted to the City of Worcester.

5.3.2. **Prevailing Wage:** Work under this project is subject to the prevailing wage laws M.G.L.c. 149, s.26-27 H. The Schedules for the Example wages are included in the RFP and must be completed and signed by each Offeror.

5.3.3. **CM Responsibility for Managing Construction:** The CM shall be responsible for managing, coordinating, and supervising all aspects of the Work as described in this Agreement, the General Conditions, and all other Contract Documents.

5.4. General Requirements for Preconstruction and Construction Services

5.4.1. **Design Related:** The recommendations and advice of the CM concerning design modifications or alternatives shall be subject to the review and approval of the City of Worcester. If the CM recognizes or discovers that any portion of the Drawings and Specifications is at variance with Applicable Laws, the CM shall promptly notify the

Designer and the City of Worcester in writing, and if the CM fails to promptly so notify the Designer and the City of Worcester, having recognized or discovered such variance, the CM shall be liable for an equitable portion of any loss, cost or damage sustained by the City of Worcester on account of such variance.

5.4.2. **CM's Organization and Staff:** The CM shall establish an organization and lines of communication required to carry out the requirements of this Agreement in order to organize and direct the complete construction of the Project. A listing of the CM's key staff as set forth in Section 3.2.G, Qualifications of Personnel, of the RFP. All key staff shall be available for and actively participate in the performance of the services provided under the Contract Documents unless such failure is for good cause beyond the control of the CM. No substitution of any assigned and approved key staff shall be made by the CM without the prior written consent of the City of Worcester in its sole discretion. Before any such substitution is made, the CM shall submit to the City of Worcester the qualifications of any proposed replacement. The removal or replacement, without City of Worcester's consent, of any of the key staff listed in Section 3.2.G of the RFP, other than as a result of retirement, disability, death or bona fide termination of employment, shall constitute a material breach of this Agreement and the City of Worcester reserves the right to terminate the contract and assess damages. Within thirty (30) days after execution of this Agreement, the CM shall furnish to the City of Worcester a detailed organizational chart (the "Organizational Chart") for approval by the City of Worcester. Such chart shall reflect the same persons as set forth in the Proposal unless otherwise approved by the City of Worcester. The Organization Chart shall expand upon and update the General Conditions Cost Administrative Breakdown set forth in Exhibit GC of the RFP, and shall identify each staff position, the anticipated start date and end date for each identified staff person and the estimated personnel cost on account of each such staff person. Upon approval by the City of Worcester, which approval shall not be unreasonably withheld, the Organizational Chart shall supersede and replace the General Conditions Cost Administrative Breakdown set forth on Exhibit GC. The CM's management and field supervisory staffing shall be in accordance with the approved Organizational Chart. All modifications to the Organizational Chart after initial approval by the City of Worcester must be approved by the City of Worcester, such approval not to be unreasonably withheld. The City of Worcester may require replacement of any member of the CM's staff with or without cause, and may require increased levels of staffing by the CM, at no increase in the Contract Price, if necessary to achieve proper production, management, administration or superintendence, or if otherwise necessary to maintain progress in accordance with the Project Schedule. By executing this Agreement, the CM certifies that the CM and each member of its key staff comply with all licensing, registration and other requirements applicable to the CM and the performance of its services hereunder pursuant to Applicable Laws. Furthermore, the City of Worcester shall have the right to require the CM and any Subcontractor to replace any on-site personnel who it reasonably finds objectionable, with other personnel approved by the City of Worcester.

ARTICLE 6. Contract Price

6.1. Contract Price

6.1.1. The City of Worcester shall pay to the CM in current funds for the CM's proper performance of the Contract and completion of the Work, the "Contract Price" consisting of the General Conditions Payment, as defined in Section 6.2 of this Owner/Construction Manager Agreement, the Hard Cost of the Work, as defined in Article 7 of this Owner/Construction Manager Agreement, and the CM Fee as defined in Section 6.3 of this Owner/Construction Manager Agreement. Notwithstanding anything in the foregoing sentence to the contrary, after the City of Worcester has determined that a payment is owing to the CM, such payment may be disbursed by the City of Worcester on behalf of the City of Worcester. The total payments to the CM (the Contract Price) shall not exceed the Guaranteed Maximum Price agreed to by the Parties, subject to authorized additions and deductions as provided in the Contract Documents

6.1.2. For Change Orders or Contract Modifications authorized by the City of Worcester pursuant to the Contract Documents, the Contract Price shall be adjusted as provided in Section 6.4 below and Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VII of the RFP and not otherwise. After agreement by the City of Worcester and the CM on a guaranteed maximum price for construction of the Work (the "GMP") and execution of the GMP Amendment, as provided in Section 6.7 of this Owner/Construction Manager Agreement, any increase or decrease in the Contract Price approved by the City of Worcester by execution of a Change Order shall increase or decrease the GMP, accordingly.

6.2. General Conditions Payment

6.2.1. In consideration of the performance by the CM of the work described in the Contract Documents the City of Worcester shall pay to the Construction Manager, as full and complete reimbursement to the Construction Manager for all General Conditions costs incurred in the performance of such work an amount equal to the payment specified in Section A of **Fee Proposal Form GC** ("General Conditions Costs") found in the RFP and subject to Subsection, 6.2.5 of this Owner/Construction Manager Agreement below. For purposes of payment the General Conditions Costs shall be divided into Preconstruction General Conditions Costs and Construction General Conditions Costs as specified in Section A of **Fee Proposal Form GC**. The total dollar values for Preconstruction and Construction General Condition's Costs set forth in Section A of **Fee Proposal Form GC** represent the maximum amount to be paid to the CM for all Preconstruction and Construction General Conditions Costs. The provisions in the Contract Documents concerning the anticipated schedule for the Project and the durations of the Preconstruction Period, and Construction Period, are not for the purpose of describing the compensation for General Conditions Costs and do not extend or authorize any extension of the Contract Substantial Completion date and/or the Final Completion date. The CM may make a claim for extension of the Contract Substantial Completion date and/or the Final Completion date only as provided in, and subject to the limitations specified in, the Contract Documents.

6.2.2. **Preconstruction:** From the commencement of the Preconstruction Period through the end of the Preconstruction Period, monthly payments on account of the General Conditions Costs shall be made. The amount of the monthly payments shall be determined by applying the percentage of completion of the Preconstruction General Conditions work set forth in **Fee Proposal Form GC** as approved by the City of Worcester on the Schedule of Values, and deducting from such value any amounts previously paid to the CM on account of Preconstruction General Conditions Costs. For each month or partial month during the period from the commencement of the Preconstruction Period, through the period when Preconstruction services end, the CM shall submit a monthly invoice to the City of Worcester requesting payment of the Preconstruction General Conditions Costs. Payment shall be processed in accordance with Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VIII of the RFP.

6.2.3. **Construction:** During the Construction Period monthly payments to the CM on account of General Conditions Costs shall be made. The amount of the monthly payments shall be determined by applying the percentage of the Hard Cost of the Work approved for payment by the City of Worcester to the total amount of the Construction Period General Conditions Costs set forth in Exhibit GC, and deducting from such value any amounts previously paid to the CM on account of Construction Period General Conditions Costs. For each month or partial month during the period from the commencement of the Construction Period, through Final Completion, the CM shall submit a monthly invoice to City of Worcester requesting payment of the Construction Period General Conditions Costs. Payment shall be processed in accordance with the provisions of Section 9, CSI Division – 000000 – CM@Risk General Conditions, Article VIII of the RFP.

6.2.4. Either the City of Worcester, or the Construction Manager, subject to the approval of the City of Worcester, may request that one or more specific items included in General Conditions Costs be included in a Subcontract bid or proposal package or otherwise separately procured. Whether included in a Trade Contractor bid package or Subcontractor proposal or otherwise separately procured, each such item shall be bid as an alternate and, if accepted by the City of Worcester, the cost of such item shall be considered part of the Hard Cost of the Work, and the amount of the General Conditions Payment due hereunder shall be reduced by the total cost of such item.

6.2.5. If the Construction Manager performs additional work of the type described in **Fee Proposal Form GC** under a Change Order approved by the City of Worcester, compensation, if any, due to the Construction Manager shall be computed in accordance with Section 6.4 of this Owner/Construction Manager Agreement, below, and Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VII of the RFP; otherwise, the City of Worcester shall have no obligation to reimburse the Construction Manager on account of the cost of the work for any amounts exceeding the total payments as set forth in Section A in **Exhibit GC.**

6.2.6. The General Conditions Costs for payment bond, performance bond and builders risk Insurance that appear in Section C.4 of **Fee Proposal Form GC** shall be adjusted up

or down by change order, based on the difference between the GMP and the estimated Project amount carried in **Fee Proposal Form GC**. There will be no CM Fee attributable to any such adjustment.

6.3. Construction Manager's Fee

6.3.1. **Preconstruction:** In further consideration of the performance of the Contract by the CM, the City of Worcester shall pay to the CM a fee associated with preconstruction services as identified in Section A of **Fee Proposal Form GC** (the "CM Preconstruction Fee") in monthly payments. The amount of the monthly payments shall be determined by applying the percentage of completion of the Preconstruction General Conditions work as approved by the City of Worcester on the Schedule of Values, and deducting from such value any amounts previously paid to the CM on account of the CM Preconstruction Fee. For each month or partial month during the period from the commencement of the Preconstruction Period, through the end of the period when preconstruction services end, the CM shall submit a monthly invoice to the City of Worcester requesting payment of the CM Preconstruction Fee. Payment shall be processed in accordance with Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VIII of the RFP.

6.3.2. **Construction:** In further consideration of the performance of the Contract by the CM, the City of Worcester shall pay to the CM a fee associated with construction services in monthly payments. The amount of the monthly payments shall be determined by applying the percentage of the Hard Cost of the Work approved for payment by the City of Worcester, to the total amount of the CM Construction Fee and deducting from such value any amounts previously paid to the CM on account of the CM Construction Fee.

6.4. **Changes in the Work:** The City of Worcester may make changes in the Work when the City of Worcester considers it to be necessary or desirable, as further provided in Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VII of the RFP.

6.5. Intentionally Omitted

6.6. **Retainage:** The City of Worcester shall retain five percent (5%) from the amount approved for payment in the monthly Applications for Payment, as provided in the General Conditions of the Contract. Such retainage shall be applied with respect to all amounts payable under the Application for Payment, including the Hard Cost of the Work, the CM Fee and the General Conditions Payment. Retainage shall be paid as provided in the General Conditions.

6.7. **Guaranteed Maximum Price**

6.7.1. On the date agreed upon by the City of Worcester and the CM, or, if no such date is agreed upon, on the date established by the City of Worcester by written notice to the CM, which date shall be at least 20 days after the date of such written notice, the CM shall submit to the City of Worcester a proposed GMP, which shall be the sum of the estimated total Hard Cost of the Work, the Construction Contingency (hereafter

defined), total payment for General Conditions Costs, and the CM Fee. The CM shall include with the GMP proposal a written statement of its basis in form and substance satisfactory to the City of Worcester, which shall include at least:

(a.) a list of the Project design documents upon which the GMP proposal is based.

(b.) a list of allowances and a statement of their basis.

(c.) a list of any assumptions, qualifications and clarifications made by the CM in the preparation of the GMP proposal to supplement the information contained in the Project design documents.

(d.) a statement that the proposed GMP is based on the Baseline CPM Schedule and the Substantial Completion Date specified in this Agreement.

(e.) the proposed GMP, including a detailed statement of the actual and estimated Hard Cost of the Work organized by CSI (Construction Specification Institute) format with quantities, units, and unit rates, Preconstruction and Construction General Conditions Costs, allowances, Construction Contingency, Preconstruction and Construction CM Fee and other items that comprise the GMP;

(f.) a schedule of applicable alternate prices.

(g.) a schedule of applicable unit prices; and

(h.) the time limit for acceptance of the GMP proposal (which shall not be less than 90 days).

6.7.2. The CM shall meet with the City of Worcester and the Designer to review the GMP proposal and the written statement of its basis. In the event that the City of Worcester or the Designer discover any inconsistencies or inaccuracies in the GMP proposal and accompanying information, they shall promptly notify the CM, which shall make appropriate revisions thereto. The City of Worcester may elect in its sole discretion to accept or not to accept the CM's GMP proposal. The CM understands that any agreement on a GMP shall be subject to approval of the City of Worcester. Prior to the City of Worcester's acceptance of the CM's GMP proposal, the CM shall not incur any cost to be reimbursed by the City of Worcester except as provided in this Contract or as the City of Worcester may specifically authorize in writing. If the City of Worcester accepts the CM's GMP proposal, the City of Worcester and CM shall execute and deliver within fifteen (15) days after such acceptance an amendment to this Agreement, in form acceptable to the City of Worcester and the CM, incorporating the items listed in Subsection 6.7.1 of this Owner/Construction Manager Agreement, above, subject to any modifications agreed upon by the parties (the "GMP Amendment"). The CM shall execute and deliver together with the GMP Amendment, performance and payment (labor and materials) bonds in the form provided by the City of Worcester, executed by a surety licensed by the Commonwealth of Massachusetts Division of Insurance. Each

such bond shall be in the amount of the GMP. These bonds shall be substituted for the bonds obtained from the CM at the time of signing the contract, which said bonds shall be returned to the CM by the City of Worcester. If the City of Worcester does not accept the CM's GMP proposal, the City of Worcester may elect to solicit bids or proposals for the construction of the Project from other contractors, using any solicitation method or methods chosen by the City of Worcester, consistent with Applicable Laws and procedures, or, if the City of Worcester determines that it is in its best interest to do so, the City of Worcester may enter into negotiations for a contract with one or more of the offerors that submitted proposals in response to the Request for Proposals for this Contract. If the City of Worcester does not accept the CM's GMP proposal within the time limit for acceptance specified in the GMP proposal, as it may be extended by agreement of the parties, then this Contract shall terminate upon the completion of the CM's performance of the Work then in progress or upon notice from the City of Worcester as provided in the General Conditions.

ARTICLE 7. Hard Cost of the Work

7.1. **Hard Cost of the Work:** The "Hard Cost of the Work" shall mean those costs listed in this Section. Hard Cost of the Work shall not include any item included in the General Conditions Costs.

7.1.1. **Subcontract Costs:** Payments made by the Construction Manager to any Subcontractor in accordance with the requirements of an approved Subcontract.

7.1.2. Costs of Materials and Equipment Incorporated in the Completed Construction

(a.) Costs, including transportation, of materials and equipment incorporated or to be incorporated in the completed construction, less all discounts and rebates.

(b.) Costs of materials described herein which are in excess of those actually installed, but which are required to provide reasonable allowance for waste and spoilage. Unused excess materials, if any, shall be delivered to the City of Worcester at the completion of the Work or, at City of Worcester's option, shall be sold by the Construction Manager. Amounts realized, if any, from such sales shall be credited to the City of Worcester as a deduction from the Hard Cost of the Work.

7.1.3. Intentionally Omitted

7.1.4. Emergencies and Repairs to Damaged or Nonconforming Work

The following costs, incurred by the Construction Manager shall become part of the Hard Cost of the Work:

(a.) In taking action to prevent threatened damage, injury or loss in case of an emergency affecting the safety of persons and property, as provided in the General Conditions.

(b.) In repairing damaged Work, provided that such damage did not result from the fault or negligence of the Construction Manager or the Construction Manager's personnel or any Subcontractor, and only to the extent that the cost of such repairs is not recoverable by the Construction Manager from others or the Construction Manager is not compensated therefor by insurance or otherwise.

(c.) In correcting defective or nonconforming Work, provided that such defective or nonconforming Work did not result from the fault or negligence of the Construction Manager or the Construction Manager's personnel or any Subcontractor or material supplier, and only to the extent that the cost of correcting the defective or nonconforming Work is not recoverable by the Construction Manager from third parties or the Construction Manager is not compensated by insurance or otherwise.

Any costs incurred by the CM which would otherwise be within the scope of this

Subsection but are excluded because such costs result from the fault or negligence of the CM, the CM's personnel, any Subcontractor or any other party for whom the CM is responsible may be charged against the Construction Contingency to the extent permitted by and in accordance with the provisions of Section 7.2.1 of this Owner/Construction Manager Agreement, and any such costs incurred after the Construction Contingency has been exhausted shall not be reimbursable as a Hard Cost of the Work.

7.1.5. Miscellaneous Hard Costs

The following costs shall be included in the Hard Cost of the Work:

(a.) Subcontractor Bond premiums.

(b.) Royalties and license fees paid for the use of a particular design, process or product required by the Contract Documents in accordance with the General Conditions.

(c.) Other costs incurred in the performance of the Work if and to the extent approved in advance in writing by the City of Worcester as Hard Costs of the Work.

7.2. Construction Contingency

7.2.1. The term "Construction Contingency" shall mean the line item included by the CM in the GMP and the Schedule of Values that is available to cover the net amount of any additional costs resulting from unforeseen conditions and events not evidenced at the time that the CM awards a Subcontract or the parties execute the GMP Amendment, as applicable, to the extent that such conditions or events do not result in or constitute a change in the Work but which are reasonably inferable from the GMP documents. Any claim against the construction contingency shall be submitted in accordance with Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VII of the RFP. Examples of such unforeseen conditions and events include, but are not limited to, the following:

(a.) Unanticipated cost overruns on the CM's procurement of Subcontracts or other purchases of materials or labor costs, provided that the same are not caused by the fault, negligence, or breach of contract of the CM or any Subcontractor.

(b.) Expediting or acceleration costs required to meet the Baseline CPM Schedule, as long as the same are not made necessary by the fault or negligence of the CM or any Subcontractor; and

(c.) Such other unforeseen events and conditions as may be specified in the Contract Documents as chargeable to the Construction Contingency.

After execution of the GMP Amendment, if the contract price of any subcontract as awarded is less than the amount carried for such subcontract in the GMP breakdown, the Construction Contingency referenced in this section shall be increased by the amount of such savings.

7.2.2. Costs authorized to be reimbursed from the Construction Contingency by Section 7.2.1 of this Owner/Construction Manager Agreement shall be paid to the CM as Hard Cost of the Work only if and to the extent reasonably approved by the City of Worcester. The Construction Contingency shall be reduced by the net amount of the additional Hard Cost of the Work resulting from the use of the Construction Contingency as authorized by Section 7.2.1 of this Owner/Construction Manager Agreement. The CM shall not receive any CM Fee in connection with any use of the Construction Contingency.

7.2.3. **Contingency Balance:** If, at the time the City of Worcester issues the final payment to the CM pursuant to Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VIII of the RFP, there is a balance in the Construction Contingency, it shall be retained by the City of Worcester.

7.3. **Non-Compensable Costs:** Neither the Hard Cost of the Work nor the General Conditions Costs shall include any of the items set forth below:

(a.) Salaries, bonuses and other compensation of the Construction Manager's personnel stationed at the Construction Manager's principal offices, or other offices, except the site office for this project.

(b.) Expenses of the Construction Manager's principal offices, site office or other offices, except the site office for this project (including, without limitation, in-house computer costs, and other costs of doing business, services, and related expenses to maintain such offices).

(c.) Overhead and general expenses of any kind, including but not limited to office or fabrication shop overhead and drafting and printing costs.

(d.) The CM's capital expenses, including interest on the CM's capital employed for the Work.

(e.) Costs of machinery and equipment owned or rented by the CM.

(f.) Costs incurred due to the fault, negligence or breach of contract of the CM, Subcontractors, anyone directly or indirectly employed by any of them, or for whose acts any of them may be liable, including, but not limited to, death or injury to person or damage to property, the correction of damaged, defective or nonconforming Work, disposal and replacement of materials and equipment incorrectly ordered or supplied, unanticipated cost overruns incurred by the CM in the procurement of Subcontracts, materials or labor, and making good damage to property not forming part of the Work, except: (i) to the extent reimbursement is received through the recovery of insurance proceeds, or (ii) to the extent such items may be charged to the Construction Contingency pursuant to Section 7.2.1 of this Owner/Construction Manager Agreement.

(g.) Cost for purchase and maintenance of tools, materials, supplies and facilities not

consumed during construction or incorporated into the Work.

(h.) Penalties, fines or costs imposed by governmental authorities in connection with, or resulting from any violation of, or noncompliance with Applicable Laws by the Construction Manager or any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable.

(i.) Any legal fees incurred by the Construction Manager, unless the same are incurred at the written direction, or with the prior written approval, of City of Worcester.

(j.) Travel or meal expenses and personnel relocation expenses.

(k.) General Conditions Costs in excess of the total of all General Conditions costs.

(l.) Any cost incurred by the CM as a result of knowing violation of or failure to comply with this Agreement or the other Contract Documents by the CM.

(m.) Costs which would cause the GMP to be exceeded.

(n.) Costs incurred by the CM after final payment; provided, however, that to the extent there is Contingency remaining at final payment, such Contingency shall be available to pay costs incurred during the one year period after final payment, but only if Contingency would be available, subject to reasonable approval by the City of Worcester, to pay such costs had such costs been incurred prior to final payment.

7.4. **Discounts, Rebates, Refunds and Expenses:** Cash discounts obtained on payments made by the CM shall accrue to the City of Worcester if (a) before making the payments the CM included them in an Application for Payment and received payment therefore from the City of Worcester, or (b) the City of Worcester has deposited funds with the CM with which to make payments; otherwise, cash discounts shall accrue to the CM. The CM shall notify the City of Worcester of the availability of any cash discounts so that the City of Worcester may elect to pay or deposit such funds with the CM in order to obtain such cash discount. Such cash discounts and any other trade discounts, rebates, refunds and other amounts received from sales of surplus materials and equipment shall be credited to the Hard Cost of the Work, and the CM shall make provisions so that they can be secured and credited accordingly. The City of Worcester anticipates an energy rebate for this Project. CM shall apply for the rebate; however, the full amount of the rebate shall be paid to the City of Worcester.

7.5. Accounting Records

7.5.1. The Construction Manager shall check all materials, equipment and labor entering into the Work, and shall keep such full and detailed accounts and exercise such controls as may be necessary for proper accounting and financial management under this Agreement. All books and records shall be maintained in accordance with generally accepted accounting principles, consistently applied. Without limitation, the CM shall

comply with the requirements set forth in Section 9, CSI Division – 000000 – CM@Risk General Conditions Article XI of the RFP. The City of Worcester and its authorized representatives shall, upon request by the City of Worcester, be afforded copies of, and at all times shall be afforded access to, all of the Construction Manager's records, books, correspondence, instructions, drawings, receipts, invoices, vouchers, memoranda, estimates, budgets, breakdowns, accounting data, bid proposals, cost control information and any other documents and data relating to this Agreement, including data in electronic media or any other media (collectively, "records") and the Construction Manager shall preserve all such records for a period of six years, or for such longer period as may be required by law, after Final Payment. With respect to work performed by the CM's own forces on a lump sum basis, the CM shall only be required to maintain certified payrolls, documentation required by the Supplementary Conditions for Equal Employment Opportunity, Non-Discrimination and Affirmative Action, and such other records as are required by Applicable Laws or the terms of the Contract Documents.

7.5.2. Without limitation of the foregoing, the City of Worcester shall have the right, at any time and from time to time, upon notice to the Construction Manager, to audit the Construction Manager's records in connection with the Work at the Construction Manager's offices. The Construction Manager shall facilitate any such audit by making necessary facilities available to the City of Worcester and its accountants or other representatives.

7.5.3. Subcontractors shall have the same obligations to maintain books and records and to permit audits by the Construction Manager or the City of Worcester as are applicable to the Construction Manager under the Contract Documents.

7.5.4. If any inspection of the Construction Manager's or any Subcontractor's books, records or other documents reveals an overcharge, the Construction Manager shall pay the City of Worcester or, at the City of Worcester's election, the City of Worcester may reimburse itself by taking as a credit against future payments due the Construction Manager, an amount equal to the overcharge. If one or more overcharges is equal to or greater than $200,000 in the aggregate, the CM shall also pay all administrative and auditing expenses up to an aggregate of $40,000 incurred by the City of Worcester in determining the existence and amount of the overcharge. Nothing contained in this provision is intended as a limitation of any other rights or remedies which may be available to the City of Worcester, be they civil or criminal.

ARTICLE 8. Payments to Construction Manager

8.1. Based upon Applications for Payment submitted by the CM, the City of Worcester shall make payments to the CM on account of the Contract Price as provided in Section 9, CSI Division – 000000 – CM@Risk General Conditions Article VIII of the RFP, and elsewhere in the Contract Documents. Notwithstanding anything in the foregoing sentence to the contrary, after the City of Worcester has determined that a payment is owing to the CM, such payment may be disbursed by the City of Worcester on behalf of the City of Worcester

ARTICLE 9. Equal Employment Opportunity, Non-Discrimination and Affirmative Action

9.1. The CM and all of its Subcontractors shall comply at all times and in all respects with Applicable Laws affecting or regulating employment of persons in connection with the Work, and with the Supplementary Conditions and all other provisions in the Contract Documents relating to Equal Employment Opportunity, Non-discrimination and Affirmative Action Program.

ARTICLE 10. Miscellaneous Provisions

10.1. **Successors and Assigns:** The City of Worcester and the CM bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither the CM nor any partner of the CM shall assign or transfer the Contract or sublet or subcontract it (other than subcontracting portions of the Work as expressly permitted by and in accordance with the Contract Documents), or otherwise transfer or assign any of its or their rights or obligations under all or any portion of the Contract Documents without the prior written consent of the City of Worcester, which consent may be withheld by the City of Worcester in its sole discretion, nor shall the CM or any partner of the CM assign any moneys due or to become due to it hereunder, without such prior written consent of the City of Worcester. Any assignment of the Contract or any interest therein by the CM or any partner of the CM shall be void, and the assignee in such case shall acquire no rights in the Contract or in such moneys. The City of Worcester may assign the Contract to any successor or assignee of City of Worcester's interests, provided that the City of Worcester demonstrates to the reasonable satisfaction of the CM that such successor or assignee has the capability of fulfilling the City of Worcester's obligations under the Contract.

10.2. **Additional Information:** Recognizing that the City of Worcester may find it necessary during the progress of the Work to establish the current status of performance under the Contract Documents, the CM shall, without limitation of any other requirements of the Contract Documents, promptly provide upon request statements, documents or information to the City of Worcester or others regarding the status of the Work, compliance of the Work with the Contract Documents, compliance by the CM or any Subcontractor with the Contract Documents, the names of Subcontractors or suppliers, amounts due or to become due or amounts previously paid to Subcontractors or suppliers, estimates of the portion of the Work completed and the cost of completing the Work, and such other matters within the scope of the CM's performance under the Contract Documents as the City of Worcester may reasonably require.

10.3. **Information Confidential:** The CM shall treat as confidential any information relating to the Project that is specifically designated or identified by the City of Worcester as confidential or proprietary and shall not permit release of such information to other parties without the City of Worcester's prior express written authorization.

10.4. **Governing Law:** The Contract shall be governed by the laws of the Commonwealth of Massachusetts.

10.5. No Personal Liability; Consequential Damages.

10.5.1. No member, officer, consultant, volunteer participant, employee, agent or representative of the City of Worcester or the Designer shall be personally liable to the CM under any term or provision of this Contract for City of Worcester's payment obligations or otherwise, or because of any breach hereof, the CM agreeing to look solely to the assets of the City of Worcester or the Designer entities for the satisfaction

of any liability hereunder.

10.5.2. In no event shall the City of Worcester or the Designer be liable to the CM except for obligations expressly assumed by the City of Worcester or the Designer under the Contract Documents, nor shall the City of Worcester or the Designer ever be liable to the CM for indirect, special or consequential damages.

10.6. **Conflict of Interest**: The CM shall familiarize its employees assigned to perform services under this Agreement with the provisions of Chapter 268A of the Massachusetts General Laws (the Massachusetts conflict-of-interest statute). Accordingly, the CM, its employees and agents shall not offer or provide any employee of the City of Worcester any gift, gratuity, favor, meal, entertainment, loan or other item of monetary value. The CM warrants and represents that it currently has no interest and shall not acquire any interest, direct or indirect, which would be adverse to or conflict in any manner with the performance of its services under this Agreement or with the interest of the City of Worcester or the Project. The CM further agrees that in the performance of this Agreement no person or entity having any such adverse or conflicting interest shall be employed or granted a subcontract. Except with the City of Worcester's knowledge and express consent, the CM shall not engage in any activity, or accept any employment, interest or contribution that would reasonably appear to be adverse to the interests of the City of Worcester or to compromise the CM's professional judgment with respect to the Project. The CM has a continuing obligation to divulge to the City of Worcester all circumstances of its relationships with third parties, as well as any other interests that may have an effect on the City of Worcester or the Project at the time of execution of this Agreement or during its effectiveness. If the City of Worcester believes that there is or has been a conflict of interest, or the appearance of a conflict of interest, it will so notify the CM. The CM shall make full disclosure of all material facts and shall have a period of thirty (30) days after receipt of such notice to cure the conflict of interest or the appearance of conflict of interest, including the right to request a meeting with the City of Worcester board to explain its position. If the conflict of interest or appearance of conflict of interest is not cured to the satisfaction of the City of Worcester or the controversy otherwise resolved prior to expiration of such thirty (30) days period, the CM shall be deemed to be in default of this Agreement and the City of Worcester may exercise any remedies available to it under this Agreement or applicable law.

10.7. **Termination of Contract:** The Contract may be terminated as provided in Section 9, CSI Division – 000000 – CM@Risk General Conditions Article XVII of the RFP.

10.8. Additional Information – TBD

ARTICLE 13. Minority Business Enterprise and Women Business Enterprise Participation Goals and Minority/Women and Workforce Utilization Percentages

The applicable goals for minority business enterprise and woman business enterprise participation established for this Contract are as follows:

- **MBE: 10 % of the GMP. WBE: 15 % of the GMP.**
- **The applicable minority workforce utilization percentage is 38%.**
- **The applicable women workforce utilization percentage is 10%.**

CITY OF WORCESTER

Recommended:
Department of Public Facilities

By: J.M.Bell
Name: James Bedard
Title: Chief of Public Facilities
Date: 9/22/2025

Approved as to Form:

By: Alexandra Kalkounis
Name: Alexandra Kalkounis
Title: City Solicitor
Date: 9/24/2025

CERTIFICATION OF FUNDING
I certify that an appropriation of funds in the amount of this Contract is contained in account number 40-1464. TMP PRJ-100000 KS 9/24/25

By: Robert V. Stearns
Robert V. Stearns
City Auditor

APPROVED:

By: E. D. Batista
Name: Eric D. Batista
Title: City Manager
Date: 9/26/25

W.T. RICH COMPANY

By:
Name: Brian Santos
Title: Principal in Charge
Date: 9/17/25

EXHIBIT A. to OWNER CONSTRUCTION MANAGER AGREEMENT

ADDITIONAL INSURANCE PROVISIONS:

- NOT APPLICABLE.

SECTION 00 72 25

CONSTRUCTION MANAGER SUPPLEMENTAL CONDITIONS

PART 1 - GENERAL REQUIREMENTS

1.1 MANDATORY COMPLIANCE WITH THESE CONDITIONS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 00 and 01.

B. The intention of these Construction Manager Supplemental Conditions is to amend, highlight, and clarify the required scope of work for all bidders and to specify the inclusion and / or exclusion of certain work items. Any work that is not specifically mentioned as included or excluded below but is defined as part of the scope of work within the specification section(s) being bid upon, is to be included within the bidder's scope of work.

C. The requirements defined herein are **mandatory contractual requirements** for each contractor on the project.

D. There are many instances when the Supplemental Conditions defined herein modify or alter the requirements defined within the project specifications. **IF THERE IS A CONFLICT BETWEEN THESE CM SUPPLEMENTAL CONDITIONS AND OTHER PARTS OF THE CONTRACT DOCUMENTS, THE HIGHER STANDARD OR BEST QUALITY SHALL GOVERN.** Where there is no such conflict or modification, all terms and requirements of the full contract documents shall remain in effect and be binding upon all Contractors.

E. All of the conditions, provisions and requirements stated herein are to be provided by each contractor as part of their base bid price submission. No additional compensation will be considered for the provision of such requirements.

F. The Construction Manager will be utilizing LEAN Construction practices including the Last Planner System (LPS). All Contractors, including sub-tier contractors will be required to participate. Refer to SECTION 011300, CM PROJECT SCHEDULE.

1.2 DEFINITIONS

A. The terms "CM," "Construction Manager" or "General Contractor" refer to the W.T. Rich Company.

B. Unless noted otherwise, the terms of these Supplemental Conditions apply equally and fully to all Trade Contractors and Subcontractors.

C. "MEP" or "Mechanical Electrical Plumbing" is used broadly in this section to refer to Fire Protection, Plumbing, HVAC, Electrical, Fire Alarm, Communications, Low Voltage, and Electronic Safety and Security disciplines.

D. The term "Contractor" refers to both "Trade Contractors" and "Subcontractors".

E. The term "Provide" shall mean furnish and install complete with all material, labor and equipment to complete the item.

1.3 CRITICAL ADMINISTRATIVE SUBMISSION TIME REQUIREMENTS

A. All Trade Contractors and Subcontractors must meet the following requirements from the time of receiving a written Notice of Award:
   1. Provide insurance certificates, endorsements and bonds within 5 calendar days.
   2. Provide signed contract within 7 calendar days from receipt of contract.
   3. Provide a complete list of all submittals within 7 calendar days.
   4. Attend a project kickoff meeting within 7 calendar days.
   5. Provide a schedule of values within 14 calendar days.
   6. Provide lead time requirements for all materials within 14 calendar days.
   7. Provide wage rate sheets for all categories of prospective workers with 21 calendar days.
   8. Provide submittals to meet overall schedule requirements, allowing suitable review period and based on accurate understanding of required fabrication and lead time. In no case shall shop drawing or submittal submission exceed the following time requirements:

Item Description	**Submission Requirement**
Material and equipment to be installed within 6 months of Notice of Award	Submit no later than 28 calendar days from Notice of Award
Material and equipment to be installed after 6 months of Notice of Award	Submit no later than 42 calendar days from Notice of Award
Resubmission of submittals after being returned for correction	Resubmit no later than 7 calendar days from receipt of returned sub-mittal
Samples, color charts or similar items requiring architect selection for finish, style, material or color	Submit no later than 42 calendar days from Notice of Award

   9. The table above defines the **latest acceptable timeframes** for submittal submission. **If schedule and lead time require earlier submission, adjust accordingly to ensure the project schedule can be maintained.**

B. The Construction Manager intends to issue Notice of Awards via email. Notice of Awards so issued will serve as official and binding Notice of Awards for the purposes of any contractual requirements where timing is based upon the Notice of Award date.

The Construction Manager will issue all contracts utilizing Box Sign™. Box Sign™ shall serve as the exclusive and binding method of contract execution unless otherwise specified in writing by the Construction Manager. Signatures executed

through Box Sign™ shall be deemed legally binding and equivalent to handwritten signatures, in accordance with applicable electronic signature laws and regulations. Signed documents shall be stored electronically within the Box platform and maintained as official records.

C. **A contractor's failure to provide bonds, insurance and signed contracts within the required time frame noted above may result in withdrawal of the Notice of Award without compensation to the contractor.**

D. The Construction Manager intends to utilize the Kaster™ platform to facilitate the collection and tracking of contract documents such as insurance certificates, wage rate approval forms, etc. Refer to specification section 007228 Contract Forms & Supplemental Information for a complete list of required documents to be uploaded.
   1. Along with the Notice of Award, the Construction Manager will issue the Contractor an invitation and instruction on how to gain access and utilize Kaster™.
   2. The Contractor is required to utilize the Kaster platform for the submission of all specified contract documents.

E. **For items 1.3.A.1 to 1.3.A.9 above, liquidated damages in the amount of $100 per day per item will be assessed against each Trade Contractor and Subcontractor who fails to meet the defined deadlines.**

1.4 GENERAL PROVISIONS

All Trade Contractors and Subcontractors Must:

A. Review, understand and comply with all applicable requirements set forth in the Bidding Requirements, Conditions of the Contract (i.e., Division 00), and General Requirements (i.e., Division 01) of the contract documents. Each Trade Contractor and Subcontractor will be bound to the Construction Manager by the terms and requirements defined in the above documents and will assume to the Construction Manager all the obligations and responsibilities that the Construction Manager assumes by those same documents to the Owner.

B. Conduct a complete and comprehensive review of contract drawings and specifications. Bids are assumed to include all labor, materials, equipment, services and fees to deliver a complete scope of work and an operational and functional system in compliance with the contract documents.

C. Review job conditions a minimum of ten working days prior to starting work. Any unacceptable or adverse conditions need to be immediately reported to the Construction Manager. Failure to report such conditions prior to work commencement will represent an acceptance of the conditions by the Contractor.

D. Meet prevailing wage rate requirements as defined in the project specifications. Mass General Laws c. 149, §27, as amended on August 8, 2008 requires annual updates to prevailing wage schedules for all public construction projects lasting longer than one year. All Trade Contractors and Subcontractors are required to obtain the wage schedules from the awarding authority, and to pay no less than these rates to covered

workers. **All Trade Contractors and Subcontractors are required to anticipate such annual updated prevailing wage schedules and shall not be entitled to claim additional compensation for base contract work due to updated prevailing wage schedules.**

E. Include the cost of all customary fees, incidental costs, notifications, permits, inspections and other charges indicated in the Contract Documents and as may be necessary to complete the work. Trade Contractors and Subcontractors are responsible to file for and obtain required permits and call for inspections. All other permits and fees are in force and are the responsibility of the applicable Trade Contractors and Subcontractors.

F. Include the cost of all escalation costs in bid price.

G. Have project manager and/or project foreman attend weekly project management meetings whenever a contractor will have an active workforce on site within the next two weeks or when requested by the Construction Manager 48 hours in advance. Failure to attend weekly meetings may result in an assessment of $100 per missed meeting, issued at the Construction Manager's discretion. Persons attending the meeting shall have the authority to make commitments on behalf of the organization they represent at the meeting.

H. The Construction Manager reserves the right to remove from the project any employee, including the project foreman, who is not satisfactory to the Construction Manager's management team.

I. Attend all planning, startup, coordination, ad hoc and special meetings relevant to respective scope of work.

J. All pricing for change order work must be submitted to the Construction Manager within 7 calendar days of proposal request document. The construction manager or owner will have the option to accept the change in work as a no cost change for any contractors that did not submit a cost proposal by the deadline. Change order price proposals must include detailed and transparent breakdown of labor costs (hours, wages, benefits), materials, equipment, insurance and taxes, overhead and profit, and all other costs allowed by contract.

1.5 CERTIFIED PAYROLLS

A. The Construction Manager has two options for Certified Payroll administration software. They may elect to utilize either solution at their discretion.

B. The use of **LCPtracker™** OR **Kaster™** to submit certified payrolls is **MANDATORY**. No exceptions will be allowed. Failure to use the LCPtracker/Kaster™ Software (for example, submitting via other means such as mail or email) will result in a $200 administrative handling fee per non-compliant submission.

C. Contractors will be responsible for all their own staff and internal costs associated with system setup, training and data entry.

D. The LCPtracker/Kaster™ service is a paperless, online system of entering Certified Payroll Reports. Payroll data may be entered directly into the system or uploaded from major construction accounting and payroll programs. This service eliminates

the need for contractors to submit paper prevailing wage documents and forms while providing an online database of all certified payroll reports.

E. Once a contract is awarded, an email with instructions to set up a username and password, and to activate an account will be sent to contractors once they are assigned a contract in LCPtracker/Kaster™.

F. On-line training is provided at no cost. Contractors may access the training after activating their accounts. Training options include computer-based training courses (pre-recorded videos) and web-based training sessions (online training sessions facilitated by LCPtracker/Kaster™ support staff and requiring a computer with internet access, an email address and access to a telephone.)

G. There is a software charge associated with LCPtracker/Kaster. Refer to section 1.14 for the technology fees to be borne by Contractors.

H. This requirement will be "flowed down" to every lower-tier subcontractor required to provide labor and/or workforce diversity compliance documentation.

1.6 ADMINISTRATIVE PROVISIONS

A. The project is **sales tax exempt**. Tax exempt number and certificate will be provided after contract award.

B. Trade Contractors and Subcontractors that are signatory to the Carpenters' union shall be responsible for employing the full-time carpenter steward whenever that Contractor's on-site carpentry workforce is the largest of currently active contractors. This requirement applies to both Trade and non-Trade Contractors.

C. Trade Contractors and Subcontractors that are signatory to the Laborers' union shall be responsible for employing the full-time labor steward whenever that Contractor's on-site laborer workforce is the largest of currently active contractors. This requirement applies to both Trade and non-Trade Contractors.

D. Theft or vandalism of tools, equipment, materials, etc. is not the responsibility of the Construction Manager or the Owner.

E. All contractual warrantees will commence upon substantial completion of the project or phase of work, or beneficial use by the Owner, whichever comes first. Unless noted otherwise in the contract documents, all warrantees shall continue for a period of one year from the date of warranty commencement or substantial completion, whichever is greater. The Trade Contractors and Subcontractors shall provide all necessary extended warrantees to account for the time period from the completion of their work through substantial completion or beneficial use by owner. This shall include any warranty gaps for manufacturer warranties that may have commenced upon fabrication completion, delivery of material, startup, etc. This shall also include any required warranty extensions if warranty requirements defined in the specifications are beyond a manufacturer's standard warranty, in which case the contractor shall either purchase the extended warranty coverage from the manufacturer or provide the warranty coverage as the contractor's responsibility.

F. The Construction Manager will utilize **Procore** project management software for this project. Contractors will be responsible for basic interaction, posting and updates using this system. Procore is a web-based management software, as such all

Foreman will be required to have a laptop/tablet technology device to access Procore while onsite. Contractors shall ensure such devices are equipped with cellular service as Internet/WiFi connections will not be available throughout the site throughout construction. Contractors shall be required to perform the following activities using the Procore platform, including but not limited to:

1. Submit schedule of values.
2. Respond to change order request and submit change order proposals.
3. Submit monthly requisitions.
4. Reviewing and responding to Work to Complete List and Punchlist items

G. This project is utilizing **SiteForm**, a mobile application to complete project orientation, schedule deliveries, digitally submit Pre-Task Plans, Daily Reports, Field Permits, Toolbox Talks, and communicate changing site conditions. This contractor shall provide at least one member of your crew with a mobile device, Android, iPhone, or iPad, that has cellular service included. All sub-tier contractors hired by this subcontractor, i.e. second-tier or sub-of-a-sub, shall also provide a mobile device to one member of their crew. It is the responsibility of this contractor to populate project-specific information prior to mobilizing and workers arriving onsite. This includes but is not limited to uploading all craft workers and craft worker certifications and trainings, Job Hazard Analysis (JHAs) and ensuring all workers complete W.T. Rich's Orientation prior to arriving onsite.

H. This Project will use **OpenSpace** (Capture and Tracker), a platform that will transform raw video data into Google Streetview style 360 degree mapping of the project site. It will be able to marry video images and still photos to a virtual project blueprint that can be accessed via computer and mobile device. This will be used to track project production as well as document visual in place progress at a given location and given time (allowing for a virtual walk-thru of the project site). This will be available to all subcontractors and training can be provided as required. OpenSpace will be used as a tool by the CM to assess pertinent production matrices as well as transmit photo and video documentation to the subcontractors, OPM and Architect/design team as required.

I. All Trade Contractors and Subcontractors are to work in harmony on the project and advise the CM of any issues as they arise.

J. Contractor Safety Assessment Program: All contractors with a total contract value of $50,000 or greater, are required to enroll in the Contractor Safety Assessment Program (CSAP) administered by Highwire. To enroll in CSAP, log into the application at: https://www.highwire.com/. Create an account and enter the required safety information. Each contractor will be required to pay the enrollment fee, payable to Highwire Inc. upon contract award. Upon enrollment, each contractor will receive detailed feedback on the results of their safety program. Any areas of deficiency noted in the contractor's profile will need to be addressed prior to mobilization.

K. Schedule of Values:

1. Contractor will submit, for approval by the Construction Manager and Owner, a schedule of values for the scope of work of the Contractor. No single line item value is to be greater than $25,000, unless specific request is made and approved by the Construction Manager and Owner.
2. The following minimum values are to be specifically allocated:
   a. Submittals – 1% of contract value

b. Contractor Daily Clean Up – 2% of contract value
c. Closeout – 2% of contract value
d. Red-Line Asbuilts – 2% of contract value (for MEP/FP, Site Work and Structural Steel only)
e. Overall Project Cleanup – Refer to Section 3.5

L. Wage Rate Sheets: Contractor shall submit for approval wage rate sheets for all relevant categories of workers for purposes of potential change order pricing. Wage rate sheets shall include a detailed breakdown of wages, benefits, insurance, taxes and other reimbursable labor costs in a format provided by the Construction Manager. Contractor change orders will not be approved until wage rates have been approved. Delays to the project owing to a Contractor's failure to submit properly documented wage rates on a timely basis will be the responsibility of that Contractor.

M. Allowances: If any allowances are defined for a given contractor's scope of work, then the dollar value of such defined allowances are to be included within the contractor's lump sum, base contract price. Work performed under such allowances shall be at the direction of the CM only. Actual cost of such work will be tracked on a time and material basis or by other means as mutually agreed between the CM and the contractor. Whenever actual costs are more than or less than defined allowance amounts, the Contract Sum shall be adjusted accordingly by a corresponding add or deduct change order.

N. All punch list items are to be completed within 21 calendar days from the date the items are communicated to contractors. Punch list items not corrected within this time period will be subject to **liquidated damages equal to $75 per calendar day per uncompleted punch list item**. If a contractor wishes to dispute ownership of a punch list item or to request an extension for completion of an item, written notification must be submitted to the Construction Manager within 5 calendar days from the date the item was communicated to the contractor. Any request for time extension that does not include a reasonable justification of the need for an extension or a firm date by when the item will be completed will be rejected.
1. The construction manager shall generate a Work to Complete (WTC) list – prior to and independent of the architect's punch list.
2. All contractors must address all WTC items within five workdays of the notice of such items.

O. The work-to-complete (WTC) list and the punchlist will be generated by the CM, Architect/Consultants and Owner/OPM utilizing Procore. Each contractor will need to assign one person as their designated Punchlist Manager. The Punchlist Manager shall be responsible for the following:
1. Reviewing all WTC/punchlist items assigned to your company.
2. Making the CM aware when WTC/punchlist items have been addressed, including changing the status in Procore from "Open" to "Ready to Review" once the item has been addressed.
3. Changing the status in Procore from "Open" to "Disputed" and providing an accompanying reason why the selected item is being disputed.

P. WTC/Punch list items will not be considered warranty items unless it is agreed to by the CM, Owner and/or OPM. If a material, fixture, or piece of equipment has not been demonstrated to be in working order upon install and/or at substantial completion

then that item will be a valid WTC/punchlist item and subject to punch list item rules for completion.

Q. Liquidated damages, as defined in the Contract Documents, shall apply to the completion of each phase of work as defined in the contract documents, including final completion requirements and the failure to complete WTC/punch list per above requirement.

1.7 SUBMITTALS

A. All submittals and shop drawings shall be submitted electronically to the Construction Manager via email.

B. Electronic submittals shall be computer-generated PDF files (not scanned in copies) to ensure clarity of information being transmitted.

C. When submitting multiple items as a single submittal package, submit as a single PDF file inclusive of the transmittal letter and all items contained within the submittal package.

D. Ensure proper orientation of all pages within the submittal.

E. A proper transmittal letter for each submittal or submittal package is required and must clearly identify each item included with the submittal. For each item being submitted, include clear reference to Specification Section number, paragraph number and item number.

F. For items requiring physical submission (e.g., samples, color charts), submit transmittal letter electronically via email (with scanned copies or photos of the physical item or identifying label, if possible), and submit the physical item separately by next day delivery service directly to the designer or the designer's designated representative.

G. If submittal has any deviation from the contract drawings and/or specification, these deviations must be clearly identified by highlight, flagging or written notice.

H. Any requests for substitutions must be accompanied by a properly and fully completed substitution request form. Due to the fast track nature of the project, failure to submit proper substitution request form with the original submittal will result in forfeiture of a contractor's right to pursue that substitution further.

I. Any submittals returned marked "Rejected" or "Revise and Re-submit" are to be revised and re-submitted **no later than seven calendar days** after receipt. If greater than seven days is required, contractor is to provide written explanation of why the seven-day deadline cannot be met, and the date by when re-submittal shall occur; such written notice to be provided to the CM within three days after receipt of the returned submittal. Even with written explanation, in no case shall re-submittal be later than fourteen days after receipt of the returned submittal. **Failure to re-submit by the required deadline (i.e., seven days if no written explanation is provided or fourteen days if a written explanation is provided) will result**

in an assessment of $100 per day per overdue submittal, issued at the Construction Manager's discretion.

J. Upon receipt of Approved as Noted shop drawings, the contractor shall re-submit to the Construction Manager "For Construction" drawings that incorporate all stated revisions. Such re-submission is to occur no later than two weeks after receipt of the Approved as Noted submittal. Contractor shall ensure that the "For Construction" drawings are issued to appropriate field staff for proper compliance and implementation in the field.

K. Upon receipt of a returned submittal marked "Approved as Noted" or "Revise and Resubmit", if the contractor believes that any submittal comments or requirements would alter their contract work in such a manner that would require additional compensation, the contractor shall notify the Construction Manager of this perceived impact in writing within one week of receipt of the returned submittal. Absence of such notification within this one-week time frame will be treated as acceptance of all written comments at no additional compensation to their contract.

L. For all physical samples to be submitted, contractor shall provide a minimum of THREE samples for each type of sample to be provided.

M. Certain work requires coordination and / or sharing of information between trades via the submittal process. All submittals are available to all contractors via Procore. Each contractor shall be responsible for identifying and obtaining via Procore other contractors' submittals as necessary to obtain information and details necessary for proper performance and / or coordination of the first contractor's work. If the necessary submittal is not available on Procore in a timely fashion, the contractor shall notify the Construction Manager of the information required at least four weeks prior to the deadline of needing such information.

1.8 REQUEST FOR INFORMATION (RFI'S)

A. All RFI's must be submitted electronically to the Construction Manager via email.

B. Electronic RFI's should be computer-generated PDF, CADD or JPG files (not scanned in copies) to ensure clarity of information being transmitted.

C. All RFI's must clearly reference a specification section number, paragraph number, drawing and/or specific plan detail.

D. Ensure proper orientation of all pages within the RFI.

E. Verbal RFI's will not be accepted.

1.9 MINORITY-OWNED AND WOMEN-OWNED BUSINESS ENTERPRISE REQUIREMENTS (MBE/WBE) & WORKFORCE DIVERSITY REQUIREMENTS

A. Refer to specification section 007225 for additional diversity, equity and inclusion information.

B. M/WBE REQUIREMENTS:

1. The overall project contains a combined **25% M/WBE** (**10% MBE** and **15% WBE**) participation goal.
2. The MBE/WBE participation goals for individual subcontractors are defined below.
   a. Site Work: Combined M/WBE of 10%
   b. Cast-in-Place Concrete: Combined M/WBE of 10%
   c. Masonry (Trade Contractor): Combined M/WBE of 10%
   d. Structural Steel: Combined M/WBE of 20%
   e. Roofing & Flashing (Trade Contractor): Combined M/WBE of 5%
   f. Drywall & Framing: Combined M/WBE of 10%
   g. Plumbing (Trade Contractor): Combined M/WBE of 10%
   h. HVAC (Trade Contractor): Combined M/WBE of 10%
   i. Electrical (Trade Contractor): Combined M/WBE of 10%
3. **Supply contracts receive 100% credit toward MBE or WBE** contribution unless otherwise noted by the Awarding Authority.
4. The apparent low bidder within each Trade Contract category must submit required MBE/WBE supporting documentation (schedule of MBE/WBE participation along with accompanying Letters of Intent) within five business days of the bid due date. No waivers, reductions or extensions will be considered after receipt of Trade Contractor bids. Failure to submit proper supporting documentation within this time frame may result in disqualification of the bidder.
5. MBE/WBE compliance and procedures shall adhere to all requirements defined within the project specifications.

C. WORKFORCE DIVERSITY REQUIREMENTS:

1. The project includes the following goals for workforce diversity requirements, expressed as a percentage of total work force hours.
   a. Minority workforce hours: **38%**
   b. Women workforce hours: **10%**
2. All Trade Contractors and Subcontractors shall implement a program to meet these workforce diversity goals for their scope of work. Within four weeks of award, contractors shall develop and submit a workforce diversity plan that outlines the contractor's program and specific plan of action for achieving the goals. This program shall include a commitment of effort, resources and intentions to achieve the goals.
3. Recruitment efforts – If any contractor or sub-contractor cannot meet the goals due to lack of appropriate employees, said Contractor will be required to diligently exercise each of the following procedures:
   a. Newspaper advertisement.
   b. Assistance from local hiring agency.
   c. Union hall contact / response.
   d. Radio ad notices.
   e. Documentable recruitment efforts.
4. In the event that the contractor work is progressing, and the goals are not being met, any or all of the following may occur, at the discretion of the Construction Manager or Owner:
   a. Written notification from CM to contractor of areas of shortcomings.
   b. Weekly on-site meeting attended by contractor project team and senior management to review plan implementation and areas for improvement.

c. Withholding of payment due to contractor equal to 10% of total outstanding payment due.

5. Failure to meet goals may result in sanctions by the Awarding Authority.
6. In the case of blatant disregard of these goals, Contractor may subject to contract termination and associated damages for breach of contract. A reduction of the goals may be allowed, but only after good faith efforts have been demonstrated that the maximum achievable outcome is being realized.

1.10 PROJECT SPECIFIC HEALTH & SAFETY REQUIREMENTS

A. All Trade Contractors and Subcontractors shall review and comply with the Construction Manager's general safety requirements and site-specific safety plan, a copy of which is provided within the contract documents (Section 007300 - Construction Manager Project Specific Site Safety Plan). The site-specific safety plan includes, but is not limited to:
   1. Mandatory attendance at safety orientation sessions for all workers (session is approximately 30 minutes in duration).
   2. Daily pre-task planning including review of all potential safety hazards and preventative provisions.
   3. Verification of OSHA 10-Hour Training Course for all workers.
   4. It will be a requirement on this project that class 2 safety vests, safety glasses, cut resistant level 3 gloves, and hard hats are to be worn at all times by all workers on the job. All such items are to be provided by each contractor for their own work force and at their own expense.
   5. Standards of proper dress, language and behavior will be upheld at all times while workers are on or near the project site.
   6. No radios, iPods or any similar devices involving headphones are allowed on the project site at any time.
   7. No smoking will be allowed inside the building or anywhere on the project site, except for designated smoking areas.
   8. Safety violations will be met with strict disciplinary action including temporary or permanent removal of a worker from the project and/or administrative fines or penalties being assessed against the worker's firm.
   9. In the event a contractor is cited for safety violations from OSHA, the contractor shall be responsible for all penalties assessed against the violating contractor. In the event the Construction Manager is assessed penalties due to the contractor's actions, any and all penalties shall be deducted from the subcontract amount.

B. SiteForm Safety Program
   1. SiteForm® is a construction software platform that provides safety and project management solutions.
   2. The project will utilize SiteForm for specific safety tasks as described below.
   3. There is a software charge associated with SiteForm. Refer to section 1.14 for the technology fees to be borne by Contractors.
   4. The foreman or his/her designee is required to use SiteForm to:
      a. Complete daily pre-task plans
      b. Complete daily reports including work hours on-site
      c. Plan and schedule deliveries.
      d. Post Job Hazard Analysis (JHA's)

e. Conduct toolbox talks
f. Manage safety orientations
g. Complete field permits
h. Communicate with team members
i. Manage workers licenses and certifications

5. The above SiteForm fee includes one session of training for use of the application. Additional sessions cost $200 per training.

1.11 LEAN and TOUCHPLAN REQUIREMENTS

A. **LEAN Practices and Touchplan are applicable to the project.**

B. All Trade Contractors and Subcontractors shall coordinate and execute their scheduling efforts including phase planning, make ready planning, weekly planning, PPC tracking, daily planning and commitments, etc. through Touchplan® software.

C. All subcontractors are responsible for attending at least one 2 hour training session for proper use of the Touchplan® software per CM direction. It is the subcontractor's responsibility to request and attend additional training sessions in order to fully understand the proper use of the program.

D. Subcontractor foremen and project managers will be required to use the software. Each subcontractor shall designate minimum one competent person to attend all planning sessions while on site and period planning sessions prior to mobilization. This competent person in attendance should have knowledge of the schedule and project details to effectively plan their work in coordination with the project team members. Each subcontractor shall supply a tablet (i.e. iPad) or laptop with access to Touchplan® via web browser or application to the competent person for use at each meeting. All subcontractors are responsible for detailed scheduling efforts through Touchplan® for their subtier contractors. This may include the subtier contractors utilizing Touchplan® directly, as the CM will allow access for all subcontractors and subtier subcontractors.

1.12 3D COORDINATION REQUIREMENTS

A. All Trade Contractors and Subcontractors shall review and comply with the Construction Manager's BIM implementation plan, a copy of which is provided within the contract documents (Section 013111 – 3D COORDINATION REQUIREMENTS / BIM EXECUTION).

B. The project will utilize 3D modeling for coordination and planning of MEP/FP systems and structural items. The latest AutoCad / AutoDesk Software will be utilized, and contractors must utilize software that is compatible with AutoCad / AutoDesk products.

C. The Construction Manager, together with the Architect's Base Model, shall prepare and distribute a **3D Base Building Model** that will locate structural and architectural elements that are relevant to the MEP Coordination process. This will include (based on the architect's drawings):

1. Floor slabs

2. Structural columns, beams and framing
3. MEP chases
4. Wall partitions
5. Ceiling grids
6. Hard ceilings
7. Windows (profiles only)
8. Stair systems (for diagrammatic purposes only)
9. High-Profile Areas
10. NOTE: Casework, appliances and elevator equipment will not be profiled within the model.

D. The Structural Steel Contractor shall provide updated models for structural steel items that affect the coordination process, including, at a minimum, steel framing of the new building.

E. After Trade Contract awards, the Construction Manager shall distribute the 3D Base Building Model to all MEP/FP contractors.

F. It shall be the full responsibility of each MEP/FP Contractor to develop detailed three-dimensional models for their respective scopes of work. Such models to include, but not be limited to, locations, dimensions and other pertinent information for:
1. All vertical and horizontal ductwork, plumbing pipe, mechanical and sprinkler pipe
2. Electrical conduit and cable tray where applicable
3. Light fixtures
4. All ceiling hung mechanical equipment
5. Mechanical rooms: all equipment, piping, ductwork and other elements relevant to coordination
6. Under slab piping inclusive of scope within 10'-0’ of the building perimeter
7. Details sufficient to allow for proper coordination of the work, including hangers, insulation, flanges, collars, etc.
8. Requirements related to service access and any code mandated clearances
9. Separate penetration drawings are required for ALL structural penetrations. These drawings must be submitted before any penetrations are made. This shall include but not limited to structural slabs, foundation walls, exterior/interior walls, structural beams, and roof structure.
10. Duct riser drawings are required to be submitted by the sheet metal contractor.
11. In all high-visibility / high-profile areas such as areas with exposed steel or wood structure (in non mechanical room/storage rooms areas) or any other area as defined by the CM, special 3D coordination modeling is to be performed by the MEP/FP contractors for review and approval by the CM and Design Team.

G. Where equipment dimensions are not yet finalized, contractors shall use conservative, approximate dimensions in their models so as to not impede the progress of the MEP coordination process. Once final dimensions are confirmed, models are to be updated accordingly and coordination re-confirmed.

H. Contractors shall provide a **full-time, dedicated MEP coordination** resource to develop models, attend coordination meetings, resolve conflicts and make changes in compliance with the project schedule.

I. Contractors shall work collaboratively with CM and other MEP/FP contractors to identify and resolve all conflicts and collisions.

J. MEP/FP Contractors responsible for 3D model development and coordination will include:
   1. Fire Protection
   2. Plumbing
   3. Mechanical
   4. Electrical (including all low voltage security, tel/data, fire alarm, etc.)

K. MEP/FP Contractors shall be responsible for developing 3D models of their respective work items:
   1. Work is to proceed in sequence for each MEP/FP discipline (or as determined by CM).
   2. Models are to adhere to CM-defined conventions and standards for data exchange.

L. The Construction Manager shall provide a MEP Manager/Coordinator to oversee the process for developing fully completed and detailed MEP/FP coordination models. The MEP Manager/Coordinator will be responsible for inserting contractor-supplied models into the overall BIM model, running collision-detection software, and facilitating MEP/FP Coordination meetings. The MEP Manager/Coordinator shall not update individual MEP/FP models; this will be the responsibility of each respective MEP Trade Contractor.

M. MEP/FP Contractors shall be responsible for all necessary updates to their respective models until the building and MEP coordination has been completed and finalized.

N. MEP/FP Contractors shall be responsible for setting the elevations for their work.

O. MEP/FP Contractors shall use the layer and file naming convention provided by the CM's MEP Coordinator.

P. MEP/FP Contractors will maintain ultimate responsibility for the proper coordination of their work.

Q. 3D models are not a substitute for each Contractor's shop drawing responsibilities and any field coordination as may be required.

R. <u>As Built drawings</u>: All contractors shall maintain responsibility for As Built drawings for their respective scopes of work. This includes:
   1. Maintaining accurate progress As Built drawings on site throughout the course of the project. As-builts will be reviewed monthly with every pay application. Failure to update as-builts may result in a deduction to the said monthly application for payment.
   2. Submitting final As Built 3D record models and corresponding PDF documents at the end of the project.

1.13 QUALITY CONTROL AND ASSURANCE

A. The Construction Manager maintains a comprehensive and stringent process for ensuring quality control. All Contractors shall comply with the requirements of this program.

B. Compulsory Contractor requirements related to quality control and assurance include:
   1. Prepare for and attend a comprehensive preinstallation meeting a minimum of 15 calendar days before the commencement of work on-site
   2. Notify Construction Manager of the arrival of any first-time materials or equipment such that a first delivery inspection can be conducted the same day of the arrival. Do not install any such materials until a first delivery inspection has been conducted.
   3. Notify Construction Manager of first-time installation work planned such that an initial inspection can be conducted.
   4. Correct any deficient work items (identified as "Observations" within Procore project management system) within three business days of identification (or provide specific schedule for correction within three business days if physical correction is not viable within that time frame.)
   5. Mark "Observations" in Procore as completed / ready for inspection for any corrective work performed.

1.14 TECHNOLOGY PLATFORMS AND FEES

A. The following software platforms will be used throughout this project:
   1. LCPtracker or Kaster for certified payroll reporting (Ref. Section 1.5)
   2. Procore for Project Management (Ref. Section 1.6.F)
   3. Siteform for safety management, field reporting and coordination (Ref. Section 1.6.G)
   4. Openspace (Capture and Tracker) for project documentation and progress tracking (Ref Section 1.6.H)
   5. Touchplan for LEAN implementation (Ref. Section 1.11)

B. All **Trade Contractors and Non-Trade Subcontractors** shall carry the cost of a technology fee as part of their lump sum scope of work. This will be carried as a line item on their schedule of values. This fee will be equal to **0.4%** of their contract value. The Construction Manager will pay the costs of all of the above technology platforms, and then recover the costs from contractors via a credit change order in the amount of **0.4%** of each contractor's contract value. This fee and the associated credit change order will not be applicable to contracts under $50,000.00.

C. The technology fee **does not include** the cost of Highwire, which is to be paid directly by the contractor to Highwire.

1.15 CHANGE ORDER REQUIREMENTS AND AUTHORIZATION PROTOCOLS

A. The following change order authorization protocols are established for the project.

B. The following roles will have varying levels of authority to authorize change order work and to direct work to proceed on a time and materials basis:
   1. Project Executive (PX)
   2. Senior Project Manager (SPM)
   3. Project Manager (PM)
   4. Superintendent (SUPT)
   5. Assist Project Manager (APM)
   6. Accounting (ACCT)

C. Acceptance of Lump Sum Contract Changes and Allowance Spending: The CM will honor the acceptance of contract changes or allowance spending only when such acceptance is issued in writing by an authorized representative of the CM. Email shall be an acceptable means of such written communication. Individuals authorized to issue such acceptance shall be limited to PX, SPM, PM and APM, and must include the PX, SPM and ACCT as CC recipients. Failure to receive a written acceptance of change order or allowance spending shall be grounds for nullifying or modifying the approval.

D. Directive to Proceed on T&M Work: Directives to proceed with work to be performed on a Time & Material basis must be issued in writing by the CM prior to the work proceeding. Email shall be an acceptable means of such written communication. Individuals authorized to issue such directives shall be limited to PX, SPM, PM, SUPT and APM, and must include the PX, SPM, SUPT and ACCT as CC recipients. The Contract Manager will not be bound to honor any T&M work for which written directives were not issued. NOTE WELL: Contractors shall be bound to proceed expediently with any change order work when directed in writing by the Construction Manager to proceed with such work on a Time & Materials basis. This requirement will not be relieved if there are other issues, disputes or unresolved change orders associated with the Contractor. If a Contractor refuses to proceed with change order work when so directed, the Contractor shall be assessed liquidated damages of $500 per day.

E. Change Order Administrative Procedures: The Change Order proposal requests and T&M directives shall include a "tracking number" for reference purposes (generally a PCO # or Allowance #). The "tracking number" is to be included on any T&M field slips, change order correspondence, change order proposals, and T&M invoices. Approval of change order pricing will include the tracking number, and this number must be referenced on the contractor's requisition for the line item corresponding to the change.

F. Unauthorized Scopes of Work: The above listed individuals are only authorized to approve and direct work that is directly related to the performance of the contracted work on the referenced project. Any non-project related expenditures are expressly prohibited. No reimbursement will be made for expenses not directly related to the project.

G. Timely Change Order Submissions: Contractors failing to provide Change Order Requests within a seven work day period will bear the risk of having to perform the change order as a no cost change.

H. Disputed Work: When there is a dispute regarding the scope of work owned by contract, the Construction Manager shall have the right to direct the affected

Contractor in writing to proceed with the work. The Contractor shall have the option of accepting the work without seeking additional compensation or proceeding with the work under protest. In the latter case, the Contractor shall inform the Construction Manager in writing of their intent to proceed under protest, in which case all associated work must be tracked on a Time & Materials basis. It is NOT an option for the Contractor to refuse to perform the work. If a Contractor refuses to proceed with directed work, the Contractor shall be assessed liquidated damages of $500 per day AND will be responsible for any subsequent delays caused by their refusal to proceed as directed.

I. Contractor Change Order Logs: Each contractor shall maintain a log of all change orders and potential change orders to which it believes it is entitled. This change order log is to be completed on a form provided and maintained by the Construction Manager. The contractor shall update and submit this log monthly. Failure to submit the log will result in a 25% withholding of any payments due to the contractor. Failure to list a change order or potential change order for two consecutive months after the work associated with that change order was first performed shall result in the contractor forfeiting its rights for additional compensation for the change order(s) in question.

1.16 CHANGE ORDER CAPACITY REQUIREMENTS

A. It is a goal of the project to minimize change orders. Nonetheless, change orders might be required for a variety of reasons. All contractors shall maintain or have access to suitable manpower capacity to accommodate a reasonable quantity of change orders without the need for owner-paid premium time or for a schedule extension.

B. A reasonable quantity of change orders shall be defined as follows for each contractor:
   1. The total quantity of change order labor hours for a given contract shall be less than or equal to 15% of the total quantity of contract labor hours for that contractor for the project as a whole.
   2. The total quantity of change order labor hours for a given contract in a given month shall be less than or equal to 30% of the total quantity of contract labor hours for that contractor for that month.

C. Contract labor hours will be defined initially based on mutually agreed estimates. If deemed necessary by either party, these hours shall be verified after work has been completed using certified payroll.

D. No owner-paid premium time for change order work or schedule extensions due to change order labor availability will be considered for change orders that fall within the above parameters. Exceeding the above parameters does not automatically assure owner-paid premium time will be authorized or a scheduled extension will be granted. The contractor will still be required to substantiate such a request under the terms defined within the general conditions of the contract.

E. An exception to the above will be made in the event that the change order work includes scope that by the nature of the work, cannot be completed during normal

business hours due to factors other than the contractor's manpower. Some circumstances may include building shutdowns, disruption of service, etc. and shall be at the discretion of the CM.

1.17 CONTRACT EXECUTION

A. All Trade Contractors and Subcontractors shall honor their bids for a period of 60 days from bid submission.

B. Contracts may be issued, signed and executed digitally via a secure electronic signature platform such as DocuSign™, BoxSign™ or other.

C. Selected contractors will be required to execute a contract with the CM for their respective scope of work. Contracts for non-Trade Contractors will be in the form of Section 005216 - Non-trade Contractor Agreement Form. This contract is to be executed by both parties without substantive changes or qualifications.

D. **Each Trade Contractor and Subcontractor is required to proceed expediently and fully with all project requirements, submittals and other time-sensitive items immediately after receipt of a Notice of Award from the Construction Manager. Such Notice of Award can be issued by email at the CM's discretion.** After issuing a formal Notice of Award, the Construction Manager will be bound to execute a contract with the contractor consistent with the contract documents herein and the contractor's submitted proposal provided the contractor has:
   1. Returned to the CM a signed, unmodified copy of the contract
   2. Provided 100% performance and payment bonds (if required by contract)
   3. Provided insurance certificate(s) and endorsements as required by contract
   4. If a contract cannot be executed because of a contractor's unwillingness or inability to provide any of the above three items, the CM reserves the right to rescind the Notice of Award and the contractor will not be entitled to any compensation for any costs incurred as a result of work performed to date.

E. Trade Contractors and Subcontractors are required to provide bonds, insurance certificates and a signed copy of the contract within five business days of receipt of Notice of Award. Failure to do so will be grounds for disqualification.

F. Contracts will be executed within five business days of delivery of compliant bond and insurance documentation to the Construction Manager.

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

3.1 PROJECT TIME AND SCHEDULE

A. **The project is a TIME CRITICAL project with a number of critical and challenging schedule requirements and deadlines. Time is of the essence. Trade Contractors and Subcontractors shall expedite and facilitate all contractual obligations such that activities are performed at their earliest possible opportunity.**

B. Schedule requirements are presented within the contract documents. Section 011300 CM Project Schedule defines a number of major milestones and other schedule requirements for the project.

C. The schedule requirements defined within the contract documents and Section 011300 are binding upon all contractors. Failure to meet the deadlines of individual phases or for the project as a whole can result in liquidated damages being assessed against the contractor or contactors responsible for the delay. Trade Contractors and Subcontractors are to accommodate all requirements associated with proper planning, lead time management, scheduling and work sequencing to ensure schedule requirements are met. Failure to meet the deadlines of individual phases or for the project as a whole can result in liquidated damages being assessed against the Trade Contractors and/or Subcontractors responsible for the delay.

D. Work sequence, production leveling and work crew continuity will not be assured and will not be an acceptable reason for not properly staffing the work on hand. No additional compensation will be considered for out-of-sequence work or work volume variability. Contractor acknowledges that multiple mobilizations will be required and are included as part of the subcontract agreement. The contractor shall include all provisions for additional crew, expedited materials, phasing, and schedule acceleration as would be reasonably anticipated for a highly complex and fast track project of this nature.

E. All Trade Contractors and Subcontractors shall provide detailed schedule information for their scope of work including, but not limited to, a definition of the discrete work activities that comprise their complete scope of work (including construction administrative activities such as submittals, coordination, mock-ups, lead-times, permitting, testing, closeout). For each such activity identified, each Trade Contractor and Subcontractor is to provide estimated activity duration, resource requirement (in man hours), dollar value for requisitioning purposes, and sequencing information (predecessor and successor relationships with activities within their own trade and with the work of other trades).

For shutdown of any services that affect adjacent properties:

1. Obtain written permission, through the CM, from the Owner, Municipality or other governing authority.
2. Minimum 72-hour advance notice is required.
3. If shutdowns are to be performed on weekends, holidays or off-hours, these shall be accommodated without additional compensation.

3.2 SCHEDULE FULFILLMENT, SHIFT WORK, AND OVERTIME

A. Many aspects of the schedule may require extensive amounts of work within limited time periods.

B. Each Trade Contractor and Subcontractor has the responsibility to provide the necessary workforce to meet the requirements of the schedule.

C. Trade Contractors and Subcontractors shall provide multiple work crews to work in multiple work areas simultaneously.

D. **If any Trade Contractor or Subcontractor does not fulfill the defined schedule requirements, the contractor must perform its work on Saturdays, extended work shifts and/or second shifts to fulfill the requirements of the schedule, at no added cost to the project.**

E. In planning and fulfilling the requirements of the schedule, each Trade Contractor and Subcontractor must allow for reasonable and fair durations for the work of other contractors.

F. All Trade Contractors and Subcontractors must allow for work that is required to be performed off-hours as necessitated to minimize disruption to local residents and utility services. This may include night work, Saturday work and Sunday work. The cost of such reasonably anticipated off-hour work is to be carried in the cost of their base contract.

3.3 SITE LOGISTICS

A. Given the confined and residential nature of the site, the work area is constrained in terms of available lay down areas, on-site parking, storage trailers and office trailers.

B. Contractors must plan and perform their work under the assumption that there will be space and logistical constraints throughout the course of the project.

C. Onsite storage of materials and equipment will not be allowed unless noted otherwise or specifically approved by the Construction Manager.

D. **Refer to Section 007320 Site Utilization for additional details on the project's site utilization and logistical requirements.**

3.4 SUPPORTING AND INCIDENTAL WORK REQUIREMENTS

A. **All contractors shall provide the following items related to or required for the performance of their own scope of work:**

1. All necessary unloading, hoisting, rigging, staging, scaffolding and lifts. **NOTE: THIS REQUIREMENT APPLIES TO ALL TRADE CONTRACTORS AND NON-TRADE SUBCONTRACTORS REGARDLESS OF HEIGHT.** The Construction Manager will not be responsible for furnishing or installing any lifts, staging, hoisting, rigging or scaffolding on this project, unless specifically noted otherwise within the contract documents.
2. All necessary fire watches required to complete the work. Burning permits will be required for all hot work inside of the building. Contractors must adhere to all Local and Construction Manager's Hot Work permitting requirements.
3. Dust control and noise control in accordance with Supplemental General Conditions.
4. Penetration fire stopping, fire sealing and/or fire safing through rated assemblies shall be by the contractor requiring the penetration.
5. Penetration smoke resistance sealing, insulation or caulking through non-rated partitions shall be by the contractor requiring the penetration.
6. Task lighting or additional lighting required to perform their work beyond conventional temporary construction lighting.
7. Any special power requirements required by their work.
8. Fall protection associated with contractor's work that meets OSHA standards.
9. Water hoses up to 1,000 feet in length.
10. Precautionary measures necessary to protect Owner's and Abutter's property, existing construction, new construction and stocked materials. Repairs of damage and replacement of materials will be paid for by the party that caused the damage.
11. The contractor is required to provide engineering and layout for one's own work. Control points and benchmarks will be provided by the Construction Manager. It is the contractor's responsibility to perform due diligence when utilizing control point and benchmarks and bring any issues or discrepancies to the attention of the Construction Manager. On occasion, a contractor may elect to transfer a benchmark for use in their scope. No contractor is to use another contractor's transferred benchmarks. If a contractor does use another contractor's transferred benchmarks, any and all issues resulting from this usage will be the full responsibility of the contractor utilizing the transferred benchmark.
12. Contractors are responsible for field measuring and dimension verification prior to fabrication of materials. It is the responsibility of the contractor to verify all conditions prior to fabrication/installation. Within 30 calendar days of award, all contractors whose work requires field measuring shall provide a schedule of items requiring such field measuring. This list shall include a description of each item, the location(s), and the predecessor work required to enable field measuring.
13. All materials and equipment shall be stored off site until needed for installation, unless noted otherwise herein or explicitly authorized by the Construction Manager at least 48 hours prior to material arrival on site. In the event that on-site storage is authorized, the contractor shall:
    a. Assume full responsibility for the safeguarding and protection of such stored materials.

b. Relocate materials as necessary if their stored materials inhibit the work of other trades.

14. All contractors working above completed roofing systems shall provide proper protection of that roofing system as necessary to avoid damage to installed roofing. Nature and extent of protection should accommodate the nature for the work being performed near, on or above the roof.
15. "Furnish" shall mean deliver to the jobsite FOB and provide all necessary submittals, O&M manuals, warrantees and training.
16. "Install" shall mean receiving, inspecting, accepting, unloading, storing, protecting, distributing, rigging, installing, testing, commissioning and starting up.
17. For work to be furnished and installed by different contractors, all contractors involved shall provide all necessary coordination to facilitate a complete and proper installation.

3.5 CONSTRUCTION CLEANUP AND DISPOSAL

A. All Trade Contractors and Subcontractors are responsible for cleanup of their own work to a CM-provided dumpster on a daily basis. Contractors will remove all construction debris by the end of the work shift and leave work areas in a broom-clean condition.

B. Daily cleanup will be strictly enforced by the Construction Manager. The Contractor acknowledges that the Construction Manager and Owner expect a high degree of jobsite cleanliness as defined in this section.

C. Contractors shall place all construction waste in on-site dumpsters provided by the Construction Manager.

D. CM-provided dumpsters are for construction waste and debris only. The following trades are responsible for their own dumpsters / off-site waste disposal and shall meet the requirements of Section 3.7.
   1. The Demolition Contractor is responsible for the off-site disposal of all demolition waste.
   2. The Abatement Contractor is responsible for all off-site hazmat disposal to a certified waste management facility. Manifests are to be provided to the construction manager.
   3. The Masonry Trade Contractor is responsible for off-site disposal of all masonry construction waste.
   4. The Roofing Trade Contractor is responsible for off-site disposal of all roof construction and demolition waste.

E. Means of egress, pathways and construction access areas must be free of debris and clutter at all times.

F. If a contractor discovers an untidy, cluttered or dirty work area, he shall notify the Construction Manager prior to beginning work in that area. Failure to notify the Construction Manager will result in that contractor being responsible for restoring the work area to a clean and orderly condition after completion of his work in that area or at the end of his work shift.

G. In the event of cleaning shortcomings and upon written notice, the Construction Manager shall have the right to perform cleaning on behalf of the responsible Trade Contractor or Subcontractor and back charge the contractor for the cost of such cleaning. Repeat offenders will be subject to additional administrative charges for the provision of such cleaning services by the Construction Manager.

H. **Overall Project Cleanup Requirement:** Contractors shall provide a specified allotment of labor hours per week to be dedicated to overall project clean up at the direction of the Construction Manager:
   1. Each contractor shall provide ONE labor hour for overall project cleanup for every 80 labor hours as reported in the Contractor's certified payroll.
   2. **This allotment shall be in addition to the time required to satisfy the Contractor's requirement to perform daily cleanup of their own work as described elsewhere in this section.**
   3. Overall Project Cleanup time will be performed at the direction of the Construction Manager and shall be tracked on a weekly basis.
   4. Unused hours shall be carried forward to the next week and vice versa. Any unused hours at the end of the project shall be credited back to the project.
   5. Contractors with a contract value of less than $100,000 shall be exempt from the Overall Project Cleanup allocation requirement defined in this paragraph, but not exempt from the requirement to perform daily cleanup of their own.

3.6 PROTECTION OF WORK

A. All contractors are responsible for proper protection of their finished work until final acceptance of the work. Specific protection of finished work is required to consist of the following products:
   1. Casework/Cabinetry: Proper cardboard protection
   2. Flooring: Ramboard or equal – Kraft paper is not allowed/considered as proper protection

B. In the event of damage to finished surfaces when proper protection was NOT provided, the installing contractor will provide repair or replacement at no additional cost.

C. In the event of damage to finished surfaces when proper protection WAS provided, the damaging contractor will be held responsible for costs associated with repair or replacement.

D. After removal of protection, all exposed surfaces shall be cleaned and left in "turn-over" condition by the installing contractor.

3.7 CLARIFICATION OF WORK RESPONSIBILITES

A. CUTTING, CORING AND PATCHING: Contractors shall be responsible for all necessary cutting, coring, removals and patching of existing and new construction as defined in the table below. All layout for a penetration shall be by the trade requiring the penetration regardless of who is performing the cutting work:

CUTTING AND PATCHING RESPONSIBILITIES				
Material	**Work Scope**	**Dimension**	**Responsibility**	
			Cutting, Coring or Removal	**Patching or Infill**
New & Existing Masonry	Openings shown on drawings	All dimensions	**Masonry Trade Contractor**	**Masonry Trade Contractor.**
	Penetrations and openings not shown on drawings	All dimensions	**By the trade requiring the penetration**	**Masonry Trade Contractor.**
New & Existing Masonry	Coring for pipe, conduit, ductwork or other items requiring penetration or opening	Item requiring opening (excluding insulation, flanges, etc.) is **less than or equal to 12"** across each dimension	**By the trade requiring the penetration**	**By the trade requiring the penetration**
		Item requiring opening (excluding insulation, flanges, etc.) is **greater than 12"** in any one dimension	**Masonry Trade Contractor**	**Masonry Trade Contractor**
Concrete slabs and slab on deck, including roof deck	Cutting, coring and removals for pipe, conduit, ductwork or other items requiring penetration or opening	All dimensions	**By the trade requiring the penetration**	**By the trade requiring the penetration**
Steel Decking	Openings shown on drawings	All dimensions	**Structural Steel Contractor**	**Structural Steel Contractor (if required)**
Steel Decking	Penetrations and openings not shown on drawings	All dimensions	**By the trade requiring the penetration**	**By the trade requiring the penetration**
Existing or new steel beams, channels or plates	Coring for pipe, conduit, ductwork or other items requiring penetration or opening	All dimensions	**Structural Steel Contractor**	**Generally not applicable, but if required by Structural Steel Contractor**

Existing or New Roofing	All roof cuts, openings, penetrations and associated patching and flashing	All dimensions	**Roofing Trade Contractor**	**Roofing Trade Contractor**
All other existing construction	All cuts, openings and removals and associated patching	All dimensions	**Trade requiring the penetration or opening**	**Contractor responsible for the material adjacent to the opening**
All other new construction	Cutting and coring of new construction shall be avoided by properly sequencing work.	All dimensions	If cutting or coring is required, it shall be the responsibility of the contractor that failed to coordinate the work properly	**Contractor responsible for the material adjacent to the opening**

1. The cutting and coring contractor is responsible to provide all safety protections for hazards caused by said operations not limited to falling debris and sparks caused by the operation. This includes protections in the immediate area as well as adjoining areas that could possibly impacted by the cut/core operation.
2. Coring is required for all penetrations for round items that are less than 12” in outside diameter.
3. All cores, cuts and removals are to be performed in a neat and professional manner with proper cutting tools. The cutting contractor shall be held responsible for the added cost associated with patching penetrations or openings that were not cut in a neat and professional manner. The cutting contractor is responsible for removing all cores/slugs to the dumpster. Disposal of cores/slugs into WTR provides trach cans is not an acceptable means of disposal. The cutting contractor is responsible for controlling and total cleaning of any and all slurry generated from the cutting coring operation.
4. The contractor responsible for patching an opening or penetration is also responsible for proper fire stopping, fire sealing, smoke sealing or acoustical sealing of the opening, as required by the contract documents.
5. All contractors are to coordinate locations of cutting and coring with Construction Manager prior to proceeding with the work. [Add “Access Door Schedule” here, if desired]
6. The Roofing Trade Contractor is required to provide appropriate water-tight / weather-tight temporary protection at all roof cuts, penetrations and openings on a daily basis and include all night terminations.

B. WOOD BLOCKING: Contractors shall be responsible for required wood blocking as defined in the table below:

Wood Blocking Application or Location	Responsibility
In-wall Blocking: Plywood sheathing attached to metal stud framing (if applicable, or otherwise noted to be completed by others)	Section 092110 – Gypsum Boards
Parapet Walls/Roof Edge Blocking	Section 092110 – Gypsum Boards
Misc. Roof Blocking for building areas, including but not limited to: - Roof sleepers, Nailers, curbs, cants and supports, etc. - Roofing Accessories - MEP roof penetrations (including new Roof Top Units, Penetrations, etc.) - MEP supports and curbs All plywood that is indicated on the drawings as an integral part of roof work (if applicable, Vented insulated Nailer)	Section 092110 – Gypsum Boards
Wood Blocking at all window / openings (including noted exterior grade plywood)	Section 092110 – Gypsum Boards
Wood Blocking at trusses for truss support and stabilization	Installing truss contractor
Supplemental wood blocking for installation of equipment to trusses. Work to be coordinated with Truss Installer and manufacturer	Trade installing equipment
All other wood blocking and rough carpentry including but not limited to plywood sheathing for electrical panels and other equipment, etc. unless otherwise noted.	Section 092110 – Gypsum Boards

C. FLASHING: Contractors shall be responsible for required flashing as defined in the table below:

Flashing Application or Location	Responsibility
AVB Flashing at Openings, i.e. Windows, Doors, Etc.	Section 070000 – WDC Trade Contractor (Furnished and installed)
Metal Flashing/Drip Edge at Masonry	Section 040000 – Masonry Trade Contractor (Furnished and installed)
All other Flashing when not assigned to a responsible contractor	Section 070001 – Roofing and Flashing Trade Contractor (Furnished and installed)

3.8 CLOSEOUT TRAINING – OWNER TRAINING VIDEOS

A. Videography for all trainings will be by the Contractor responsible for holding the training.

END OF SECTION

SECTION 00 72 26

DEI REQUIREMENTS

PART 1 - GENERAL

1.1 MANDATORY COMPLIANCE

A. MASSACHUSETTS GENERAL LAW (MGL) COMPLIANCE REQUIREMENTS AND W.T. RICH'S COMMITMENT TO DIVERSITY ON THE PROJECT.

B. All contractors and subcontractors performing work on the above referenced project must follow the statutory requirements of Chapter 149 of the Massachusetts General Law, M.G.L.c.149, § 44A(g). The workforce participation goals for this project shall be 38% minorities and 10% women. Contractors shall maintain on this project not less than 38% ratio of minority employees and 10% ratio of women employees work hours in each category including, but not limited to, bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "class of work" enumerated in M.G.L.c.149, § 44F. This pro-ject includes the separate MBE and WBE goals and as stated in this contract. The separate Minority Business Enterprise and Women Business Enterprise (MBE/WBE) participation goals for this contract is 4.2% (MBE) and 8.8% (WBE) of total contract value. This project will be monitored by and W.T. Rich's Diversity, Equity,
and Inclusion Department to ensure that the Commonwealth 's equal opportunity, non-discrimination, affirmative action program requirements are met.

3.2 Pre-Construction

A. Kickoff Meeting:
1. The Project Team will cover the following communications:
2. MBE/WBE goals on the project.
3. Minority and Female Workforce utilization requirements.
4. Review/emphasize importance of workforce diversity requirements.
5. Workforce plan be submitted within four weeks prior to working onsite.

B. Workforce Diversity Compliance Meeting:
1. The WTR DEI Manager (4 to 8 weeks after the kickoff meeting) will arrange a dedicated Workforce Diversity Compliance meeting with the contractor's project team before working onsite.
2. During this meeting the DEI Manager will review the contractor's scope of work, duration on the project and workforce labor hours. Other discussions will consist of the following:
3. Communicate the compliance goal requirements and guidelines.
4. Review diversity strategies and workforce plans. (Pre-con Questionnaire)
5. Provide feedback.
6. Request revisions / additional information, as necessary.
7. Performance follow-up on contractors' plan implementation

8. Emphasizes "core team" philosophy and approach.
9. Connect the contractor with appropriate organizations, community groups training entities, which can assist in finding staff.
10. Confirm immediate action steps and follow-up timeframe(s).
11. Sign a "Commitment to Diversity" accountability agreement. (Uniquely United)
12. Provide communication on enforced diversity efforts for the duration of the contractor on the project.
13. Inform the contractor of set up and weekly reporting instructions will be provided using the LCPtracker.

C. Pre-installation Meeting:
1. Review/emphasize importance of workforce diversity requirements.
2. Check on proposed makeup of the core team.

3.3 Construction

A. Monitoring/Tracking Compliance Diversity Goals:
1. Your office is required to submit weekly certified payroll reporting using the LCP Tracker
2. (An online compliance tracking system www.lcptracker.net). The workforce diversity hiring goals will be tracked by using this application. You will be asked to indicate the diversity demographics of the employees and wages and benefits.

B. Other tracking methods (if applicable) as followed:
1. Diversity data of employees onsite. (Ex; minority, female, resident goals)
2. Supplemental data onsite. (Ex; Daily reports, # of females hired etc...)
3. Site visits conducted on a regular basis

C. Best Faith Effort:
1. Ensuring minorities and women are getting fair opportunities to work in the trades is a shared responsibility amongst WTR, our subcontractors, Union Halls, advocacy groups, etc. There are a myriad number of ways to demonstrate commitment to these principles, including commitments to hire from pre-apprenticeship programs, commitments to retain apprentices on the entire job from beginning to end, mentoring high school students interested in the trades, speaking to vocational schools, training, or mentoring persons on the bench, etc.
2. All best faith efforts must be documented. Phone calls must be documented! If you choose to call WTR to explain your situation, you are still responsible for documenting your efforts and/or challenges. Failure to provide satisfactory documentation is considered a failure to comply with the requirements of this specification.
3. Best faith effort documentation should be submitted no more than weekly, but no less than monthly, whenever you are falling short of the goals on a cumulative basis. Therefore, it is important to start work with the right crew composition!
4. Best Source:
   a. Workforce Request Form to Union Hall with all applicable sections completed.

b. Workforce Request Form with the request completed and your email to the Union notifying them of the request. If the Union does not respond, your documentation will stand on its own.

5. Workforce request or communication documentation with community organization or other open-shop industry associations.

D. Other acceptable documentation:
1. Signed letter on your letterhead, specifically explaining actual activities or efforts related to increasing your workforce percentages for the period noted.

E. Content of Best Faith Effort Letter:
1. At minimum, your written documentation should include the following:
a. Your scope for the period.
b. The composition of your work crew for that period (can be done on a week-to-week basis if helpful to you).
c. Names, actual date of hire for the project, category (M/F) and specific trade of new hires.
d. The actual Union BA or other association leaders to whom you reached out.
e. Indicate how often you have reached out to that BA or other associations.
f. What regular activities, meetings were held internally to discuss workforce issues.
g. When do you expect your workforce to increase and how do you plan to staff that increase.
h. If not increasing or slowing down, commitment to maintain Minorities and Females until project completion.

F. Corrective Action Meetings:
1. Failure to meet diversity goals will result in a Corrective Action meeting with the contractor.
2. WTR DEI office will review the contractor's results in LCP Tracker and perform the following escalation process, (if applicable):
a. Identify compliance issues and perform contractor-specific corrective action.
b. Initiate immediate communication (email as a starting point)
c. Phone call from DEI manager to contractor PM
d. Phone call and/or email from WTR PM to contractor PM
e. On-site meeting * / game planning / support / connection to community groups
f. Escalate to executive level (WTR CEO/President contract Contractor ownership)
g. Payment withholdings up to 10% of total completed and stored value of the contract for contractors failing to comply with the provisions of this section.
h. Sanctions to be issued at the end of the project as defined by the Awarding Authority.

G. *Corrective action(s) meeting discussions will consist of:
1. Evidence of contacting the trade unions in writing to find staff.
2. Discourage "checkerboarding."
3. Provide recommendations with diversity workforce strategies and plans.

4. Connections with community organizations and training entities.
5. Sanctions and payment withholdings (If applicable).

3.4 The W.T. Rich DEI department will be available to assist all subcontractors, but only for assistance. Contractors remain 100% responsible for all required efforts to reach the participation goals of the project.

A. Implementation of the above guidelines will help to make this project a success.

B. Special Note: By submitting a bid on this project, a bidder is not only acknowledging their understanding and acceptance of the resident and diversity goals, but also confirming their firm's capability and commitment to complying fully with it.

END OF SECTION

Contract Compliance and DEI Tracking

Email Etiquette / project tracking

(Project Year) (bid #) (project name) subject of email

Ex. 2026 8451-W6 Hydro Power plant Upgrade - Missing weekly certified payroll

I. Initial Minority/ Women owned Business Participation records

Some forms also need to be completed by subs as well so please review the forms and email me with any questions.

1. E00-101 Affidavit of Acknowledgement and Certificate of Compliance
2. E00-103 Minority/Women Business Enterprise Program and Workforce Diversity Goals
3. E00-104 Subcontractor's Certificate of Intent to Participate
4. REO- 101 Initial Statement add Certification of Compliance with the Responsible Employer Ordinance **For Projects above $150,000**
5. Excell**: M-WBE & V Project Table** this replaces E00-105 Quarterly table report and is only provided at the beginning of a project and updated at project completion for any changes.

II. Payroll Record Keeping

Payroll is to be submitted weekly and reviewed for accuracy if payroll falls behind it can stop or delay release of payments.

Payroll Submittals: for GC and Subs

1. File Format**: PDF (3 digits payroll #). (4 digit contract Year) (Bid #) Company information** (** Last payroll should note Final at the end)

Ex. 001. 2025 8155-W5 Diversified Const. Services, LLC.
002. 2025 8155-W5 Diversified Const. Services, LLC.

2. **A**. All projects over $150,000 Include: **REO-102 Weekly Statement** and Certification with Responsible Employer Ordinance

   B. All projects below $150,000 include: **Weekly Statement of Compliance (07/23)**

3. Submit to: Certifiedpayrollrecords@worcesterma.gov

III. **Work Force Utilization Tracking**

Submit **Weekly Workforce Utilization Form (v2)** excel spread sheet
File Format**: PDF (3 digits payroll #).WF (4 digit contract Year) (Bid #) Company information**

Ex. 001.WF 2025 8155-W5 Diversified Const. Services, LLC
Submit to: Certifiedpayrollrecords@worcesterma.gov along with weekly payroll.

Stated Site Metrics:

Osha 10 card provided before worker allowed on job site

Daily sign in sheet and sign out sheet

M\W&V BE Project Table

PROJECT	REQ	Bid #	GENERAL CONTRACTOR	VALUE	SUBCONTRACTOR	CLASSIFICATION	Non	Sub Value	%	MBE	$ Value	%	WBE	$Value	%	Vet	$value	%
				$ -				$0.00	#DIV/0!		$0.00	#DIV/0!		$0.00	#DIV/0!		$0.00	#DIV/0!
								$0.00	#DIV/0!		$0.00	#DIV/0!		$0.00	#DIV/0!		$0.00	#DIV/0!
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							Totals	$ -	#DIV/0!		$0.00	#DIV/0!		$0.00	#DIV/0!		**$0.00**	**#DIV/0!**
					ADD: GC Balance to Correct Type	$ -		**$0.00**	#DIV/0!		**$0.00**	#DIV/0!	yes	**$0.00**	#DIV/0!		**$0.00**	#DIV/0!
			Final total	$ -			**Non**	**$ -**	**#DIV/0!**	**MBE**	**$0.00**	**#DIV/0!**	**WBE**	**$ -**	**#DIV/0!**	**VET**	**$0.00**	**#DIV/0!**

This form is available for contractor use on the Purchasing Division website.

Please go to http://www.worcesterma.gov/finance/purchasing-bids

Weekly Workforce Utilization Report Form (v2)

Nov-25

Project Name:			Contract		Contract Value:		
Name of Gen. Contractor:			Address				
Name of Cont. filing Rpt:			Address:				
Week Ending:			Tel. No.				
Report by:		Start Date:		Final Report?:	Y	N	Date Completed:
Title:		Reporting Date:		Report No.:			

Job Category	total # of Emp	Number of Employees Who Are			Total Hours	Total Weekly Workforce Hours			Weekly % Workforce Hours			
		P.O.C.	Women	Vet		P.O.C.	Women	Vet	P.O.C	Women	Vet	
frank		1	2	1	160	12	15	16	8%	9%	10%	
									0%	0%	0%	
									0%	0%	0%	
									0%	0%	0%	
									0%	0%	0%	
									0%	0%	0%	
Totals	-	1	2		160	12	15	16	8%	9%	10%	-

	Hours	P.O.C.	Women	vet
Total Previous Pay Period	0	0	0	0
	%	P.O.C.	Women	vet
	NA	0	0	0
Year To Date Totals	Hours	P.O.C.	Women	vet
	160	12	15	16
	%	P.O.C.	Women	vet
	NA	7.50%	9.38%	10.00%

Notes:

** Only complete the colored portion of the form

*** Each week enter the Previous Year to Date Totals into the Total Previos Pay Period (manually)

SECTION 00 72 27

INSURANCE REQUIREMENTS

PART 1 - GENERAL

1.1 MANDATORY COMPLIANCE WITH THESE CONDITIONS

A. The Contractor, their Subcontractors & Sub-Subcontractors (of every tier) shall at all times during the period in which their contracts are in force and effect, purchase and maintain insurance of the following types of coverage and limits of liability. Fully executed contracts, Certificates of Insurance and supporting Policy forms should be in hand, reviewed and deemed acceptable prior to the commencement of any work on the project.

B. Provide Certificate of Insurance within five (5) days of Notice of Award evidencing required coverages are in place. Insurance coverage as defined by the requirements of Articles XIV and XV of the General Conditions and: The certificate will include the following language, without deviation or qualification:

> "Worcester South Division Fire Station, Worcester, MA, City of Worcester, Colliers Project Leaders, Perkins and Will, and W.T. Rich Company, Inc., are named as additional insured on a primary and non-contributory basis for ongoing and completed operations."

Where noted throughout Section 007227, "Insured Parties" shall mean: W.T. Rich Company, Inc. City of Worcester, Colliers Project Leaders, and Perkins & Will.

A waiver of subrogation shall be provided for the benefit of these parties on all liability policies.

C. General Liability:
1. With limits of Insurance of not less than $1,000,000 each occurrence and limit $2,000,000 General Aggregate Limit and $2,000,000 Products- completed operations limit. The General Aggregate Limit shall be amended to apply separately to each project and location.
2. Coverage shall be written on ISO Occurrence form CG 00 01 12/07 or a substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, employees as insured's, products-completed operations, contractual liability, personal and advertising injury.
3. The "Insured Parties" shall be included as Additional Insured's, using ISO Additional Insured Endorsement CG 2010 (10/01) in combination with CG 2037 (10/01) or their equivalents. This insurance for the Additional Insured's shall be as broad as the coverage provided for the Named Insured subcontractor. It shall apply on a Primary and Non-contributory basis before any other insurance or self-insurance, including any deductible, maintained by, or provided to, the Additional Insured.
4. Contractor & all Subcontractors shall maintain this coverage for itself and all Additional Insured's for the duration of the project and maintain extended

Completed Operations coverage for itself and each Additional Insured for the State's statute of repose. Massachusetts is six years.

D. Automobile Liability:
   1. With limits of at least $1,000,000 Combined Single Limit for Bodily Injury and Property Damage.
   2. Auto coverage must include coverage for liability arising out of all owned, leased, borrowed, hired & non-owned automobiles.
   3. The "Insured Parties" shall be included as Additional Insured's on a Primary & Non-contributory basis.

E. Workers Compensation and Employers Liability:
   1. Statutory coverage shall apply for All-States and, Other States Insurance and Employers Liability Insurance limits of at least $1,000,000 each accident, $1,000,000 for bodily injury by accident, and $1,000,000 each employee for injury by disease.
   2. Where applicable, U.S. Longshore and Harbor workers Compensation Act & Maritime Liability Endorsements are to be included.
   3. Each Contractor shall provide and pay for Workers Compensation insurance for their own workforce.

F. Umbrella/Excess Liability:
   1. Provide insurance coverage as defined by the requirements of the Owner – Construction Manager (CM) Agreement.
      a. Umbrella or excess liability coverage amount shall be provided in the minimum amounts defined below:
         1) Contractors with a contract value in excess of $10 million: $25,000,000
         2) Contractors with a contract value between $5 million and $10 million, inclusive: $10,000,000
         3) Contractors with a contract value between $1 million and $5 million, inclusive: $5,000,000
         4) Contractors with contract value less than $1,000,000: $2,000,000
   2. The General Aggregate Limit shall apply separately to each project.
   3. Umbrella/Excess coverage must include as insureds all entities that are included as Additional Insured's on the primary insurance. The insurance for the Additional Insured shall be as broad as the coverage provided in the primary policies.
   4. Umbrella/Excess coverage for such Additional Insured's shall apply on a Primary & Non-contributory basis.

G. Cancellation Clause:
   1. In addition to standard cancellation verbiage, please add:
      a. "The certificate shall contain a provision that coverage afforded under the policies will not be cancelled or allowed to expire until at least 30 days prior to written notice has been given to the Certificate Holder and to the Construction Manager, except 10 days prior written notice of cancellation due to nonpayment of premium."

H. Waiver of Subrogation & Additional Insured's:

1. Contractor, Subcontractors (of every tier) shall waive all rights against Owner, Contractor, Construction Manager, Architect and their agents, officers, directors and employees for recovery of damages, to the extent these damages are covered by General Liability, Excess/Umbrella Liability, Automobile Liability & Workers Compensation and Employers Liability maintained per requirements outlined. Included with each certificate of insurance shall be a copies of the Additional Insured and Waiver of Subrogation Endorsement forms. Per Project Aggregate endorsement
2. All certificates of insurance and the insurance policies shall also contain 30 day cancellation, material change & non-renewal provisions.

I. Worker's Compensation. (Reference: M.G.L. c.149 §34A). Before commencing performance of the Contract, the Construction Managers and all sub-contractors shall provide by insurance for the payment of compensation and the furnishing of other benefits under M.G.L. c. 152 to all persons under their respective employment, and shall continue such insurance in full force and effect during the term of the Contract. Sufficient proof of compliance with this paragraph must be furnished at the time of execution of this Contract.

J. Additional Insurance Provisions
1. Insurance Rating. Any insurance carrier utilized to fulfill the insurance requirements of this Contract shall have a minimum A.M. Best rating of A-.
2. Premiums. All contractors must provide the required insurance at their own expense. Failure to provide and continue in force shall be deemed a material breach of the Contract and shall operate as an immediate termination thereof.
3. Notice of Occurrence. Notice of occurrence shall be given to the Construction Manager and, at the option of the CM, to any other Insured Parties officially permitted by law to receive notice.
4. Coverage Period. Each insurance policy must cover the entire contract period and beyond as specified in the following sections.
5. Policies and Limits. The insurance required shall include all major division of coverage and shall be on a comprehensive commercial general form basis including Premise and Operations (including X- C-U), bodily injury (including death); broad form property damage (including completed operations) including injury to, or destruction of tangible property, including loss of use therefrom; personal injury;Products and Completed Operations, and Owned, Non-owned, Leased, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or the following limits, whichever are greater:

Commercial General Liability	
General Aggregate - per project	$2 Million Products
Completed Operations	
Aggregate – per project	$1 Million
Personal Injury and Advertising Limit	$1 Million
Each Occurrence	$1 Million

This policy shall include contractual liability coverage insuring the contractor's indemnity obligations under this Contract. The contractual and completed

operations coverage shall be maintained on the Insured Parties and Indemnitees' behalf for a period of two (2) years after final completion and acceptance by the Insured Parties. If the Work includes work to be performed within 50 feet of a railroad, any exclusion for liability assumed under contract for work within 50 feet of a railroad shall be deleted.

6. This policy shall include the Insured Parties and any other party at interest requested by the Insured Parties as an additional insured with endorsements equivalent to ISO CG 20 10 for ongoing operations and to ISO CG 20 37 for completed operations. This policy shall be primary and non-contributory with respect to any other insurance available to an additional insured. The policy shall include endorsement equivalent to ISO CG 24 04, a Waiver of Subrogation in favor of the Insured Parties. The policy shall include endorsement CG 24 10, Coverage for injury to leased workers.
7. Railroad Protective Liability (if required by an abutter, permittee or other, in the following amounts, or such higher limits as required by abutter or permittee)

Each Occurrence	$2 Million
Aggregate	$6 Million
Automobile Liability-for all owned,	
non-owned, hired and leased vehicles	
Combined single limit	$1 Million
or	
Bodily injury-each person	$100,000
each accident	$1 Million
Property damage-each occurrence	$1 Million

8. If hauling contaminants and/or pollutants, the policy shall include a CA 99 48 Broadened Pollution Endorsement. must adhere to Sections 29 and 30 of the Motor Carrier Act of 1980, which shall contain coverage Form MCS-90. The policy shall name the Insured Parties as an additional insured. The policy shall contain a Waiver of Subrogation in favor of the Insured Parties.
9. Each contractor shall maintain insurance on offsite stored material designated to be incorporated in the Work against fire, theft or other hazards, while stored at an offsite location.
10. The policy or policies shall specifically state they shall include the interests of the Insured Parties.
11. Coverage shall include any costs for work performed by the Designer or any consultant as the result of a loss experienced during the term of this Contract.
12. Coverage shall include any costs for work performed by the Designer or any consultant as the result of a loss experienced during the term of this Contract.
13. Coverage shall include permission for temporary occupancy.
14. Coverage shall be maintained until final completion and acceptance by the Owner of the Work and final payment has been made.
15. Contractor's Pollution Liability is required. Coverage as defined by the requirements of the Owner – Construction Manager (CM) Agreement.

a. Combined single limit- per occurrence $5 Million
b. Annual aggregate $5 Million

16. The CM shall purchase and maintain coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as mold, fungi, or bacteria abatement, asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. The insurance policy shall cover the liability of the CM during the processes of identification, removal, storage, transport and disposal of hazardous waste, lead, contaminated soil and/or asbestos abatement. The policy shall include coverage for on-Site and off-Site bodily injury and loss of, damage to, or loss of use of property, directly or indirectly arising out of the discharge, dispersal, release or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gas, waste materials or other irritants, contaminants or pollutants into or upon the land, the atmosphere or any water course or body of water, whether it be gradual or sudden and accidental. The policy shall also include defense and clean-up costs. The Insured Parties shall be named as an additional insured and coverage must be on an occurrence basis.
17. Occurrence Basis.
    a. All insurance shall be written on an occurrence basis, unless the Insured Parties approves in writing coverage on a claims-made basis. Coverage's whether written on an occurrence or a claims-made basis shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment.
18. Endorsements.
    a. The Contractor shall furnish to the Insured Parties copies of any endorsements that are subsequently issued amending limits of coverage.

K. Builder's Risk
1. The CM at Risk Firm / Owner shall purchase and maintain builder risk coverage against loss or damage on all Work included in this Contract in an amount equal to the Initial Contract Sum, plus the value of subsequent contract modifications and the cost of materials supplied or installed by others, comprising the total value for the entire Project on the site on a replacement cost basis without optional deductibles. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, terrorism, collapse, earthquake, flood, windstorm, false work, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses and the Owner's loss of use in a mutually agreed amount, required as a result of an insured loss. This policy and/or installation floater shall include transportation and stored materials coverage in an amount equal to the value of the stored materials at the project site only as required below.
2. The policy shall include the owner, construction manager, contractors and sub-contractors at all tiers as Named or Additional Insureds. The deductible shall be $25,000. In the event of a claim, the deductible will be the responsibility of the party or parties that bore liability for the claim. In the event that there are not liable parties, the deductible shall be paid out of GMP Contingency.

END OF SECTION

SECTION 00 72 28

CONTRACT FORMS & SUPPLEMENTAL INFORMATION

PART 1 - GENERAL

1.1 MANDATORY COMPLIANCE WITH THESE CONDITIONS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 00 and 01.

B. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related shall be bound to these forms and supplemental information and all of its related documents.

1.2 DEFINITIONS

A. The terms "CM," "Construction Manager" or "General Contractor" refer to the W.T. Rich Company.

B. Unless noted otherwise, the terms of these Supplemental Conditions apply equally and fully to all Trade Contractors and Subcontractors.

C. "MEP" or "Mechanical Electrical Plumbing" is used broadly in this section to refer to Fire Protection, Plumbing, HVAC, Electrical, Fire Alarm, Communications, Low Voltage, and Electronic Safety and Security disciplines.

D. The term "Contractor" refers to both "Trade Contractors" and "Subcontractors".

1.3 CONTRACT FORMS & SUPPLEMENTAL INFORMATION

A. Attachment: FORMS AND SUPPLMENTAL INFORMATION which includes but is not limited to;

1. Contract Forms & Supplemental Checklist
2. Contract Form 1 - Massachusetts Department of Revenue Contractor's Sales Tax Exemption Certificate
3. Contract Form 2 - Subcontractor Final Release Form
4. Contract Form 3 - Contractor Contact Information Form
5. Contract Form 4 - Change Order Protocol Authorization Form
6. Contract Form 5 - Wage Rate Approval Form – Change Order Pricing Rates
7. Contract Form 6 - Material and Equipment Lead Time Management Form
8. Contract Form 7 - Schedule for Participation M/WBE
9. Contract Form 8 - Letter of Intent M/WBE
10. Contract Form 9 - Automated Clearing House Form (ACH Form)
11. Contract Form 10 – Safety Assessment Enrollment Letter

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

[NOT USED]

END OF SECTION

W.T. RICH COMPANY

CONTRACT FORMS & SUPPLEMENTAL INFORMATION

WORCESTER SOUTH DIVISION FIRE STATION

Below are important documents associated with the Barnstable Fire Station project. Many of these exhibits/forms require action by your firm. Please review the exhibits/forms and complete the required action, if necessary, by the "Action Required By" timeframe. Please reach out to Bridgette Petillo or your Project Manager if you have any questions.

EXHIBIT NUMBER	EXHIBIT TITLE	CONTRACTOR ACTION	ACTION REQUIRED BY
2	List of Contract Documents – This list includes ALL of the project's specification section headings, all of the project's construction drawings and a list of addenda	Review list of drawings, specifications and addenda to ensure that exhibit includes all information that your proposal was based upon.	None

CONTRACT FORMS	FORM TITLE	CONTRACTOR ACTION	ACTION REQUIRED BY
1	Massachusetts Department of Revenue Contractor's Sales Tax Exemption Certificate	To be used for specified purposes.	None
2	Subcontractor Final Release Form	For contractor review. To be executed upon completion of contract work.	At the completion of the project
3	Contractor Contact Information Form	Review, complete and return to WTR Contract Administrator	1 wk from award
4	Change Order Protocol Authorization Form	Review, complete and return to WTR Contract Administrator	1 wk from award
5	Wage Rate Approval Form – Change Order Pricing Rates	Review, complete and return to WTR Project Manager. This form must be completed, submitted and approved prior to the submission of any change order proposals.	2 wks from award
6	Material and Equipment Lead Time Management Form	Review, complete and return to WTR Project Manager	1 wk from award
7	Schedule for Participation M/WBE	Review, complete and return to WTR Contract Administrator	2 wks from award
8	Letter of Intent M/WBE	Review, complete and return to WTR Contract Administrator	1 wk from award
9	Automated Clearing House Form (ACH Form)	Review, complete and return to WTR Contract Administrator	2 wks from award
10	Safety Assessment Instructions	For contractor review. Enrollment to be completed prior to mobilization on site.	1 wk from award
11	CORI Request Form	Review, complete and return to WTR Project Manager	2 wks from award

The above referenced documents are available in MS Word or MS Excel formats and can be made available at the contractor's request.

W.T. RICH COMPANY

SUBCONTRACTOR FINAL RELEASE, CERTIFICATION, INDEMNIFICATION, AND WAIVER OF LIENS

PROJECT: Worcester South Division Fire Station Project, Worcester, MA

OWNER: City of Worcester

SURETY: [Surety Company]

IN CONSIDERATION of the sum of **$**_____paid _____("SUBCONTRACTOR") by W.T. Rich Company, Inc. ("WT RICH") and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, SUBCONTRACTOR for itself, its agents, employees, officers, shareholders, directors, attorneys, independent contractors, sureties, insurers, heirs, executors, administrators, successors and assigns, hereby:

1. REMISES, releases and forever discharges WT RICH, OWNER and SURETY, their agents, employees, officers, shareholders, directors, attorneys, independent contractors, sureties, insurers, heirs, executors, administrators, successors and assigns ("the Releasees") of and from all claims, debts, demands, suits, causes of action, accounts, covenants, contracts, agreements, damages and liabilities whatsoever, of every name and nature, both in law and in equity, which against the Releasees SUBCONTRACTOR now has, ever had or may ever have in connection with or in any way relating to labor, materials, services, machinery, equipment, insurance or other work (collectively, "Work") furnished to or performed on the PROJECT;

2. CERTIFIES to WT RICH, OWNER and SURETY that all trade subcontractors, materialmen, suppliers, and all other persons who have furnished Work to or through SUBCONTRACTOR on the above-referenced PROJECT have been duly paid in full for all Work, and further certifies that all taxes and bills of any other descriptive title in connection with the Work furnished for or through the undersigned have been duly paid in full;

3. WAIVES, relinquishes, and dissolves all rights to any lien upon the property, real estate, buildings, or improvements comprising the above-referenced PROJECT or upon which any Work was performed or material and equipment supplied by or through the undersigned; and,

4. AGREES to indemnify and save harmless WT RICH, OWNER and SURETY, and their successors and assigns, from all liens (including without limitation, Mechanics Liens, and Internal Revenue Service Liens), claims and demands, and all expenses incurred, including attorneys' fees and costs of defense for or on account of or in any way growing out of claims: (1) for payment of any Work and any Work furnished to or through SUBCONTRACTOR in connection with the above-referenced PROJECT; and (2) resulting from any breach of the certification and representations hereunder.

This Subcontractor Final Release, Certification, Indemnification, and Waiver of Liens is made by the undersigned for purpose of inducing WT RICH, OWNER and SURETY to make payment for the Work furnished by, for or through the undersigned for the PROJECT.

SIGNED AND SEALED as of this _____ day of _____, 2025.

For and on behalf of (Name of Subcontractor).

_____	_____
Signature	Witness Signature
_____	_____
Print Name and Title	Print Witness Name

WORCESTER SOUTH DIVISION FIRE STATION
Contractor Contact Information Form

W.T. RICH COMPANY

Construction Manager:	W. T. Rich Company, Inc.
Contractor Name:	
Scope of Work	

Company Contact Information for all Project Correspondence

Telephone:	
Fax number:	
Mailing Address for UPS Deliveries (No P.O. Boxes):	
Address Line 1	
Address Line 2	
City	
State	
Zip Code	

Individual Contact Information

Role/Position	Name	Title	Office Telephone	Ext.	Cell Phone	Email Address
24/7 Emergency Contact						
Owner/Principal-in-Charge						
Project Executive						
Project Manager						
Field Foreman						
Administration						
Accounting / Bookkeeping						
List any other relevant company or project personnel:						

Sub-Tier Sub-Contractor Information

Work Description	Sub Name	Contact Name	Office Telephone	Ext.	Cell Phone	Email Address

W.T. RICH COMPANY

Change Order Authorization Protocol

Worcester South Division Fire Station
Worcester, MA

The undersigned contractor has entered into a contract with W.T. Rich Company, Inc. for the provision of labor, material and/or construction services. This document defines the standards, protocols and procedures related to authorization, approval and payment of change order work, extras and allowance usage associated with the performance of their contracted work.

Project Roles

Project Executive (PX)	Evan Moore	emoore@wtrich.com
Project Manager (PM)	Rob Mallett	rmallett@wtrich.com
Assistant Project Manager (APM)	Scott Mutch	smutch@wtrich.com
Superintendent (SUPT)	Greg Keegan	gkkegan@wtrich.com
Accounting (CFO)	Michael Young	myoung@wtrich.com

Protocols and Authorities

- **Acceptance of Lump Sum Contract Changes and Allowance Spending** – W.T. Rich will honor the acceptance of contract changes or allowance spending only when such acceptance is issued in writing by W.T. Rich. Email shall be an acceptable means of such written communication. Individuals authorized to issue such acceptance shall be limited to PX, SPM and PM, and must include the PX, SPM, APM, GS, SUPT and CFO as CC recipients. Failure to receive a written acceptance of change order or allowance spending shall be grounds for nullifying or modifying the approval.
- **Directive to Proceed on T&M Work** – Directives to proceed with work to be performed on a Time & Materials must be issued in writing by W.T. Rich prior to the work proceeding. Email shall be an acceptable means of such written communication. Individuals authorized to issue such directives shall be limited to PX, SPM, PM, APM, GS and SUPT, and must include the PX, SPM, APM, GS, SUPT and CFO as CC recipients. W.T. Rich will not be bound to honor any T&M work for which written directives were not issued.
- **Change Order Administrative Procedures** – The Change Order proposal requests and T&M directives shall include a "tracking number" for reference purposes (generally a PCO # or Allowance #). The "tracking number" is to be included on any T&M field slips, change order correspondence, change order proposals, and T&M invoices. Approval of change order pricing will include the tracking number, and this number must be referenced on the contractor's requisition for the line item corresponding to the change.
- **Unauthorized Scopes of Work** – The above listed individuals are only authorized to approve and direct work that is directly related to the performance of the contracted work on the referenced project. Any non-project related expenditures, personal favors, side deals, kick backs, and the like are strictly prohibited. No reimbursement will be made for expenses not directly related to the project.

By signing below, the Contractor acknowledges their understanding of the above protocols and agrees to be bound by them.

Signature	Date
Printed Name and Title	Company Name

W.T. RICH CO - WAGE RATE APPROVAL FORM

CM AT RISK ONLY

PROJECT NAME | **Worcester South Division Fire Station** | **PROJECT NO.** | **202507** | CM: | **W.T Rich Company**

REQUEST FOR APPROVAL OF WAGES AND RATES FOR CHANGE ORDER PRICING

NAME OF SUBCONTRACTOR:

WAGE RATES VALID THROUGH:

This form must be completed, submitted and approved prior to the submission of any change order price proposals. Complete the below for every Trade and Classification that is likely to work on the project. If any contractor seeks to utilize a total hourly wage rate (wages plus benefits) for change order pricing that is in excess of the applicable published prevailing wage rate, then this form must be completed, submitted (with backup documentation - i.e. union agreement) and approved prior to the submission of any change order price proposals. The information supplied below must be consistent with certified payroll submissions.

DIRECT LABOR COSTS

A	B	C	SUBCONTRACTOR PROPOSED RATES FOR APPROVAL					
			D	E	F	G	H	J
Trade Description (e.g, Carpenter, Pipefitter, Electrician, etc.)	Classification (Foreman, Journeyman, Apprentice)	Prevailing Wage Rate (Per Contract Specifications)	Hourly Base Wage Rate	Health & Welfare	Pension Annuity	Supple-mental Unemp	Other Allowable Benefits	Total Hourly Labor Cost
								$ -
								$ -
								$ -
								$ -
								$ -
								$ -
								$ -

INSURANCE AND TAXES RATES

Item Description	Rate Per Base Wage Cost
Workmen's Compensation Insurance	
State Unemployment	
Federal FICA	
General Liability Insurance	

	L	
Proposed Insurance and Taxes Rate		**0.00%**
	Default Rate	**30.00%**

APPROVAL

OWNER Auhorized Representative

WTR Authorized Representative

NOTES:

- Contractor may utilize a rate of 30% for insurance/taxes without providing doucmentation. If a rate in excess of 30% is requested, documentation must be provided and only the four items listed above may be included.'

- Attach all relevant supporting documentation such as union wage rate sheets, insurance carrier verification letters, workers compensation rate tables, etc.

- Excess fringes are those fringes required to be paid per union contract which exceed the contract prevailing wage. The Owner will reimburse these costs, once approved, as cost only (i.e., no markups allowed). Not all excess fringe benefits are reimbursable. If any dollar value is claimed under column H, provide all necessary supporting documentation. Note that the following benefits are explicitly not allowed: Union Dues, Vacation Funds, Uniforms.

MATERIAL AND EQUIPMENT LEAD TIME MANAGEMENT

Project Name: WORCESTER SOUTH DIVISION FIRE STATION

Sub-Contractor Name:

W.T. RICH COMPANY

Section No.	Item Description and Identification:	Supplier:	Est. Lead Time in Weeks		Comments:
			Best Case	Worst Case	

SCHEDULE FOR PARTICIPATION
BY MINORITY/WOMEN BUSINESS ENTERPRISES
DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE
FOR CONSTRUCTION MANAGER AT RISK PROJECTS
FOR USE BY SUBCONTRACTORS TO CM

DCAMM Project Number_____ Project Location_____

Project Name _____

.

Construction Manager _____

Subcontractor's Scope(s) of Work, include Spec Sections _____

Subcontractors, including Trade Subcontractors utilizing MBE/WBE firms, and MBE/WBE Subcontractors – submitting a Bid/Proposal, attach to Bid/Proposal Forms.

CERTIFICATION:

The Bidder/Proposer agrees that if awarded the contract it will expend at least the amount of the contract set forth below for MBE/WBE participation. For purposes of this commitment, the MBE and WBE designation means that a business has been certified by SDO either an MBE, WBE or M/WBE, see Article XIII of the Contract. The Bidder/Proposer must indicate the MBE/WBE firms it intends to utilize on the project as follows (attach additional sheets if necessary):

MBE/WBE Company Name & Address	MBE or WBE	Describe MBE/WBE Scopes of Work ("Labor Only", "Material Only" or "Labor and Material")	If MBE/WBE is under direct contract with the Subcontractor indicate "direct", if not identify name of the sub-subcontractor MBE/WBE is working under	If Supplier, Indicate Total Value of Supplies **(15%** of total counts toward Participation)	Total Dollar Value of Participation
1.					
2.					
3.					
4.					

Total Dollar Value of Subcontractor's Contract with Construction Manager $_____

MBE Goal: _____% MBE Goal: $_____ Total Dollar Value of MBE Commitment: $_____

WBE Goal: _____% WBE Goal: $_____ Total Dollar Value of WBE Commitment: $_____

The undersigned hereby certifies that he/she has read the terms and conditions of the contract regarding MBE/WBE participation and is authorized to bind the undersigned firm to the commitment set forth above.

SUBCONTRACTOR Firm_____ Authorized Signature_____

Business Address_____ Print Name_____

Email_____ Title_____

Phone Nos. Office._____ Mobile _____ Date _____

LETTER OF INTENT

MINORITY/WOMEN BUSINESS ENTERPRISES PARTICIPATION
DIVISION OF CAPITAL ASSET MANAGEMENT MAINTENANCE
For Construction-Manager Projects

(To be completed by MBE/WBE, and submitted by the Construction Manager or Subcontractor to DCAMM)

DCAMM Project Number_____ Indicate SDO Certification:

Project Name _____ ____ MBE

Project Location_____ ____ WBE

To_____ ____ M/WBE

Name of Construction Manager/ Subcontractor

1. This firm intends to perform work in connection with the above referenced project with its own workforce and understands it will be responsible for providing all required project weekly workforce reports, including, but not limited to, certified payrolls and workforce composition reports, certain of which are submitted electronically.

2. This firm is currently certified by the Massachusetts Supplier Diversity Office ("SDO") to perform the work identified below, and has not changed its minority/women ownership, control, or management without notifying SDO within thirty (30) days of such a change.

3. This firm understands that if the Construction Manager/Subcontractor referenced above is awarded the contract, the Construction Manager/Subcontractor intends to enter into an agreement with this firm to perform the activity described below for the prices indicated. This firm also understands that the above-referenced firm, as Construction Manager/Subcontractor, will make substitutions only as allowed by Article XIII of the Contract.

4. This firm understands that under the terms of Article XIII of the contract, only work actually performed by an MBE/WBE will be credited toward MBE/WBE participation goals, and this firm cannot assign or subcontract out any of its work without prior written approval of the DCAMM Compliance Office, and that any such assignment or subcontracting will not be credited toward MBE/WBE participation goals.

MBE/WBE PARTICIPATION

Identify Specification Section/Item Number	Describe MBE/WBE Scopes of Work (provide Detail of the work to be performed and clarify "Labor and Material", "Labor Only" or "Material Only")	If Supplier, Indicate Total Value of Supplies (10% of total counts toward Participation)	Dollar Value of Participation

Attach additional sheets if necessary

Total Dollar Value of Work to be Performed by MBE/WBE Firm: $_____

Name of MBE/WBE Firm_____ Authorized Signature_____

Business Address_____ Print Name_____

_____ Title_____

Telephone No_____ Fax No._____ Date_____

W.T. RICH COMPANY

AUTOMATED CLEARING HOUSE FORM (ACH FORM)

◉ New Request ○ Update Request

COMPANY NAME:	Company Name
BANK NAME:	Bank Name
BANK ADDRESS:	Address 1 Address 2 City, State, Zip
NAME ON ACCOUNT:	Name on Account
ROUTING NUMBER:	Routing #
ACCOUNT NUMBER:	Account #
REMITTANCE SENT TO:	Name
TITLE:	Title
PHONE NUMBER:	Phone #
EMAIL ADDRESS:	Email

For the duration of the project and in the event that any of the above information needs to change, the person(s) listed below have the authority to make changes on behalf of the "Company". For security reasons, W.T. Rich Company will only execute requested changes from the people authorized below and only requests utilizing this form.

AUTHORIZED AGENT	TITLE	EMAIL ADDRESS	PHONE NUMBER
Name	Title	Email	Phone #

1075 WORCESTER STREET, SUITE 310 – NATICK, MA 01760
TEL: 617-467-6010 – WEBSITE: WWW.WTRICH.COM

W.T. RICH COMPANY

Safety Assessment Instructions

At W.T. Rich Company, safety is an integral part of our culture on all projects. This email contains very important information regarding our safety assessment program related to this project. W.T. Rich Company, Inc. utilizes a safety prequalification software program by Highwire to assess the strengths and weaknesses of our subcontractors' safety programs. The Highwire program provides us with an objective evaluation of a contractor's safety performance.

As defined in the contract documents within Section 007225, all subcontractors with a total contract value of $50,000 or greater are **required** to enroll in the Contractor Safety Assessment Program (CSAP) administered by Highwire.

In addition to assisting W.T. Rich, the safety assessment results can be highly beneficial to your company. The program reviews your safety information and identifies strengths and weaknesses within your program and provides a report of the findings. Your company can use the assessment results to adjust your safety program for better performance. The information contained in your application can be updated to reflect positive changes to your safety program that may then result in a higher rating. There are no failing scores; however, it is required that subcontractors address any major deficiencies before mobilizing on site and, in general, will make a good faith effort to address other shortcomings and opportunities for improvement.

This is a secure application and all contractor data contained in the application is proprietary. Only key W.T. Rich personnel will have access to the scores and data. Individual contractors will not be able to see other contractors' scores or strengths and weaknesses.

The completion of this process by your firm is a contract requirement. Please be responsive in attending to this requirement. The contract documents require the process to be completed prior to mobilization on site. Please expedite your efforts accordingly.

Enrollment
If you already subscribe to Highwire, please log-in to your account and check the W.T. Rich box on the "*Company Information"* tab. If you are not a current subscriber to Highwire, you can create an account at app2.highwire.com. Then select W.T. Rich as your primary affiliation.

Under the *"Trade Classification"* section, please be sure that you have selected all of the codes that apply. The project teams search for subcontractors by these classifications, so it is important that you select all the work codes that your company can perform.

The information necessary to complete the process includes:

- **Experience Modification Rating (**Previous 3 years)
- **OSHA 300A Summary Log** (Previous 3 years)
- **Lost Workday and Restricted Duty Cases (**Previous 3 years)
- **Recordable Cases** (Previous 3 years)
- **Fatalities** (Previous 3 years)
- **Employee Hours Worked** (Previous 3 years)
- **OSHA Citations** (Previous 3 years)

At W.T. Rich, we realize that one of the keys to overall success is creating strong relationships with qualified contractors and vendors. Your participation in this process is appreciated and will assist us in establishing a high standard of safety on the project.

If you have specific questions about the program, you can contact Highwire representative via their website at: help.highwire.com.

If you have any questions about this requirement or the process, please feel free to contact our Director of Safety, Aaron Calkins via email: acalkins@wtrich.com or phone 617-467-6010.

Very truly yours,
W.T. RICH COMPANY, INC.



Jonathan Rich
Chief Executive Officer

SECTION 00 73 00

CONSTRUCTION MANAGER PROJECT SPECIFIC SITE SAFETY PLAN

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 00 and 01.

B. All Trade Contractors and Subcontractors shall review and comply with the Construction Manager's general safety requirements and site-specific safety plan, a copy of which is provided as an attachment to this section. The site-specific safety plan includes, but is not limited to:
   1. Mandatory attendance at Safety Orientation Sessions for all workers (session is approximately 30 minutes in duration).
   2. Verification of OSHA 10-Hour Training Course for all workers.
   3. It will be a requirement on this project that safety vests, safety glasses and hard hats are to be worn at all times by all workers on the job. All such items are to be provided by each contractor for their own work force and at their own expense.
   4. Standards of proper dress, language and behavior will be upheld at all times while workers are on or near the project site.
   5. No radios, iPods or any similar devices involving headphones are allowed on the project site at any time.
   6. No smoking will be allowed inside the building or anywhere on the project site, except for designated smoking areas.
   7. Safety violations will be met with strict disciplinary action including temporary or permanent removal of a worker from the project and/or administrative fines or penalties being assessed against the worker's firm.

C. Attachment: Site-Specific Safety Plan, Worcester South Division Fire Station.

D. Attachment: Site-Specific NFPA 241 Plan, Worcester South Division Fire Station.

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

[NOT USED]

END OF SECTION

W.T. RICH COMPANY

Site-Specific Safety Plan

Worcester South Dvision Fire Department

Worcester, MA

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Safety Policy

The safety and well-being of all persons associated with W.T. Rich projects is paramount. We are committed to implementing and fostering a positive safety culture throughout our entire organization. We strongly believe no injury is acceptable and working safely is not optional. At W.T. Rich, safety is personal to each of us and is a way of life and we value and respect every worker. We maintain organizational structures, safety and health management systems, procedures, and training plans that support our safety culture and ensure compliance with all relevant laws, regulations and standards.

All injuries are preventable when safety becomes an everyday personal value. Committing to our safety culture is not just the right choice; it's the only choice. We believe that with this approach we can positively influence everyone associated with W.T. Rich projects.

W.T. Rich is committed to the following:

- Each individual employee has a role in contributing to our safety goals. Each person should understand and fulfill his or her safety responsibilities and maintain a positive and proactive commitment to company safety.
- We will conduct all of our activities in a manner that accounts for the impact to the safety and health of our workforce and communities
- We are committed to the prevention of injuries and illnesses and to the continual improvement of our safety and health management and performance
- We will evaluate and comply will all applicable federal, state and local laws and regulations as well as other pertinent requirements at each location where we conduct business.
- We will communicate this policy to all employees, make it available to the public and establish procedures to receive and respond to inquiries from external interested parties.
- We will alert potentially affected individuals and authorities of any safety and health incidents in a timely and effective manner. Thorough investigations will be conducted and corrective and preventative actions shall be implemented and monitored.
- Senior Management shall maintain and periodically review the implementation of the safety and health policy.

W.T. Rich believes that how we care for people today affects both current and future generations. We accept our responsibility for maintaining awareness and minimizing adverse safety and health impacts from our operations.

Jonathan Rich



Chief Executive Officer

Safety Management Program

The purpose of the Site-Specific Safety Plan (SSSP) is to assist project management, supervision, subcontractors and workers in understanding the W.T. Rich safety culture and the safety expectations and requirements for the Worcester South Division Fire Department.

The Project Team is responsible for the implementation and execution of this Site-Specific Safety Plan.

Safety Culture

W.T. Rich is committed to a strong safety culture. Our culture is the shared corporate and individual belief that safety is a value, not compromised by cost or schedule. Everyone has the right to go home safely at the end of the day.

Our safety culture holds three basic premises:

- All incidents and injuries are preventable; no level of incident or injury is acceptable or tolerated.
- Operations without incident are possible in construction; a prevailing mindset and conviction exists to do the right thing and what is necessary to achieve that state.
- Elevate safety awareness daily; a journey of continuous improvement to advance safety and achieve a heightened state of awareness where workers choose to be responsible and accountable for their own safety and the safety of their co-workers.

Responsibility and Accountability

Everyone associated with this project must understand their responsibilities with regards to health and safety on this project. With the responsibilities defined, project management, supervision, subcontractors and workers will be held accountable for their health and safety performance.

- **Project Management** includes Project Executive, Project Manager, Asst PM. **** First-line Supervision** includes Superintendents, Asst Supt's, Field Engineers, General Foremen and Foremen.

Subject	Project Management	First-Line Supervision	Worker	Safety
	Will Ensure That:	Will Ensure That:	Will:	Will:
Safety Management Program:	The SSSP is understood, implemented, and strictly complied with and that W.T. Rich, Subcontractors, vendors, or third party individuals working or having business at this project are in conformance to the SSSP.	The SSSP is fully understood, implemented in work planning and communicated to workers. The project is compliant with the SSSP.	Understand the contents of the SSSP and follow the established rules and procedures.	Understand the contents of the SSSP and follow the established rules and procedures.

Subject	Project Management	First-Line Supervision	Worker	Safety
	Will Ensure That:	Will Ensure That:	Will:	Will:
Work Practices:	First-line supervision is communicating safe work practices to workers.	All work tasks are properly communicated to workers and complied with.	Follow all safe work practices as communicated to them by their supervisor.	Ensure project is compliant with safe work practices and federal, state, local, and company regulations, rules and procedures.
Site-Specific Safety Rules:	The site-specific safety rules and procedures are implemented and enforced.	The site-specific safety rules and procedures are understood and implemented.	Understand and follow the site-specific safety rules and procedures.	Assess project conformance to site-specific safety rules and procedures.
Orientation:	Resources are available to conduct a proper orientation They participate in orientation process	They participate in orientation process and provide trainees with site tour before reporting to work assignment	Attend orientation prior to beginning work. Understand and follow the site-specific safety rules and procedures.	Support project management and first line supervision in the development and administration of the orientation
Training:	Resources are available to implement safety and health training. Training programs are developed and implemented.	They receive a project-specific supervisor safety orientation prior to start of work. All workers under their direction are properly trained in hazard recognition and safe work practices.	Attend required project safety and health training. Understand and follow the work practices and guidelines discussed during the training.	Ensure that project management, first-line supervision and workers have received proper health and safety training. Assist project supervision in training workers on hazard recognition and safe work practices.
Safety Planning:	Pre-qualification system is being properly utilized for contractor selection. All first-line supervision identifies, evaluates, and controls the work site hazards, and provides resources to implement controls.	All hazards are identified, evaluated and controlled and addressed in Daily Pre-Task Plans. Institute a daily assessment program to identify, evaluate and correct work site hazards.	Understand the hazards of the work and follow the safe work practices and controls developed for those hazards.	Assist in evaluating hazards and determining methods of eliminating or reducing the hazard.
Incidents:	All incidents are investigated properly and thoroughly.	They conduct a thorough and proper incident investigation and develop solutions to prevent similar occurrences.	Cooperate and participate in the incident investigation and contribute ideas and solutions.	Assist first-line supervision in investigating incidents. Maintain monthly incident statistics.

Safety Regulations

W.T. Rich and subcontractors shall comply with all applicable government regulations, specific client rules and regulations, and this Site-Specific Safety Plan. If any of these standards, requirements, rules or procedures conflict, the most stringent one will prevail.

Each subcontractor will ensure that every employee to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration at the time the employee begins work. The subcontractor will furnish documentation of successful completion of said course at orientation for each employee.

Notification of Unsafe or Hazardous Conditions

Each worker on this project has the right and responsibility to notify project management or supervision of any unsafe or hazardous condition that may be present without fear of retribution.

Project management or supervision will take immediate action to correct or remove any hazard brought to their attention.

W.T. Rich incorporates a Deviation Ticket System (Appendix Y), which institutes monetary penalties to subcontractors for those at-risk behaviors that are deemed unsafe. The decision to impose a monetary penalty fine rests solely on the W.T. Rich person who believes that the particular at-risk behavior observed deserves a fine attached to it. The amount of the deviation ticket depends on the severity or potential severity of the at-risk behavior not only to the subcontractor's own workers but to all individuals that may be put at risk by the at-risk behavior due to the offending subcontractor's non-compliance. All monetary deviations that are not satisfactorily rectified as described in the remediation section of the deviation ticket will result in a back charge to the offending subcontractor and will come out of their next month's requisition.

Disciplinary Program

At-risk behavior on this project that could contribute to an incident or injury will not be tolerated. Each worker has an individual responsibility to work safely, and each first-line supervisor is responsible to correct at-risk behavior of workers under their direction.

At-risk behaviors considered Immediately Dangerous to Life or Health that may result in immediate termination from the project, include, but are not limited to:

- Failure to follow the Fall Protection Policy
- Failure to follow the Substance Abuse Policy
- Possession of firearms, explosives or dangerous weapons
- Theft and other criminal activity
- Entering or allowing to enter an unprotected trench or excavation
- Failure to follow lockout/tagout procedures
- Fighting, horseplay, or practical joking
- Entering or allowing to enter, a confined space without following procedures
- Unsafe and/or reckless operation of motorized vehicles or equipment

For those acts or practices not considered Immediately Dangerous to Life or Health the following will apply:

- First occurrence: Verbal, written warning, and/or re-training

- Second occurrence: Written warning, re-training, suspension, or termination from the project
- Third occurrence: Termination from the project

Incident and Near Miss Reporting and Investigation

Every incident and near miss will be reported immediately to W.T. Rich and documented using the Incident Notification & Investigation Form (Appendix C). The W.T. Rich Project Team will contact the Safety Dept immediately and use the online reporting system to initiate the formal notification process before the end of the day. The W.T. Rich Project Team will notify the W.T. Rich Safety Department of any incident or near miss and will thoroughly investigate to determine the probable root cause(s). Preventive action will be required to eliminate future occurrences.

An **incident** is defined as any unplanned or undesired event that results in or has the potential to result in a work-related injury/illness, property damage, or disruption of business where the cause was from human errors of omission or commission.

A **near miss** is any situation that has the potential to result in a work-related injury/illness, property damage, serious environmental impact, or disruption of business under slightly different circumstances.

W.T. Rich and/or subcontractor first-line supervision will be involved in the investigation of incidents and near misses. The Incident Notification and Investigation form must be completed and submitted to the W.T. Rich Safety Department within 24 hours of the occurrence. Injured workers shall be accompanied to the medical facility by a supervisor.

Post Incident Review Meeting

Upon completion of the incident investigation or observation of a major nonconformance W.T. Rich may require a post incident review meeting. At this meeting, the W.T. Rich project team and senior project management, supervision, and involved subcontractor(s) will discuss the nonconformance, root causes, and corrective action plans.

Daily Work Site Safety Inspection

Subcontractors will perform visual daily work site safety inspections of their work and the work of subcontractors under their direction. Subcontractors will document and submit to W.T. Rich such inspections at least once per week and may use the Work Site Safety Inspection Form (Appendix M) or an acceptable equivalent.

Substance Abuse Policy

W.T. Rich is committed to providing a safe, drug-free work place for all employees. This policy applies to all W.T. Rich, subcontractor at any tier, vendor and other third party employees, including management working on or visiting this project.

Drug and alcohol abuse on and off the job can contribute both to incidents and to greater risk for all individuals employed on this project, as well as the general public. All work tasks on W.T. Rich projects will be considered safety-sensitive.

The following are prohibited on W.T. Rich projects:

- Being under the influence of any amount of alcohol or illegal drugs

- The use, sale, offer to sell, purchase, transfer, distribution or possession of illegal drugs, drug paraphernalia or alcohol products

Each subcontractor will promote a Drug Free Workplace with their employees and will communicate what constitutes prohibited activities during the safety orientation.

This project may have a comprehensive Substance Abuse Prevention Program under separate cover that would include mandatory drug testing protocol.

Safety Planning

Subcontractor Project Specific Safety Plan

Prior to mobilization, each subcontractor's project management and first-line supervision will develop and submit a written detailed project specific safety plan that will describe how they and their sub-tier subcontractors intend to implement and conform to the project SSSP. The safety plan will:

- Identify each component of the work that the subcontractor is responsible for completing.
- Identify hazards associated with the work and the proper equipment and tools to perform the work.
- Plan adequate and sufficient controls to protect their work crews.

The W.T. Rich project team will review the subcontractor project specific safety plans.

If the project specific safety plan needs revision due to scope of work changes, unanticipated or new hazards, other condition changes, etc., a new project specific safety plan will be completed and submitted.

Crew Daily Pre-Task Planning

A Daily Pre-Task Safety Plan will be completed by each crew performing work on this project. (Appendix F)

Each first-line supervisor will analyze task(s) to be performed by their crew and identify the work sequences, hazards, training, controls and emergency action plans necessary to protect workers from the identified hazards.

- The work will be broken down into individual steps (i.e. all the steps the work crew will have to take in order to complete that task); the known hazards associated with the work; and the hazard controls (tools, safety equipment, safety rules, safe work practices, etc.). This is a time for workers to provide input into the pre-task plan.
- First-line supervisors will review the plan with their respective work crew so that each worker is aware of what work activities will occur during the shift, what hazards to be aware of and how to properly control or eliminate those hazards. Each worker will sign the plan stating that they understand the work activities, hazards and controls. This is also an acknowledgement that each worker agrees to work according to the plan.
- The completed pre-task plan shall be posted in a conspicuous location near the work activity and posted on the Project Pre-Task Plan Board within one (1) hour of reviewing plan with crew.

Those tasks with similar work can use prior pre-task plans, but the plan must still be dated and reviewed with crewmembers at the beginning of the shift. If the scope of work changes or a new hazard appears during the work, the first-line supervisor will stop their crewmembers and revise the pre-task plan.

Orientation, Training and Meetings

To promote a safe work environment, safety training is a requirement for all W.T. Rich and subcontractor workers assigned to this project.

Foreman Orientation

All foremen are recommended to mobilize to the site prior to their crew so they can receive specific training and review the permits, forms, and procedures required by the SSSP as well as project specific information necessary to adequately coordinate their work and prepare their crews.

Employee New Hire Orientation

Prior to the start of work, every worker shall attend a safety orientation conducted by W.T. Rich, which will provide general safety information and project specific work rules and procedures. Subcontractors will only be permitted to bring on new employees the day of a scheduled project orientation session.

Daily and Weekly Safety Meetings

All workers assigned to this project will participate in safety meetings conducted by W.T. Rich or their employer. W.T. Rich reserves the right to remove subcontractor management/supervision personnel who do not regularly attend and/or conduct weekly safety meetings on the project. Safety meetings should communicate any incidents that occur on the project, safety concerns, new work activities, and new and continuing potential hazards.

Safety Training

In addition to the Site-Specific health and safety orientation, OSHA requires that workers receive specific task training. To help comply with OSHA minimum worker training requirements and assist in achieving an Injury Free workplace, a training matrix has been included in this Site-Specific Safety Plan to assist in the identification of applicable training requirements. This is for reference only and shall not be considered all inclusive.

W.T. Rich may evaluate orientations and training periodically to verify they are being properly conducted and that the contents adequately cover the standards, policies, rules, and procedures contained in the Site-Specific Safety Plan or OSHA standards.

Project management or supervision will communicate the health and safety policies, rules, and procedures to all vendors and third party individuals having business on this project.

Appendix D or equivalent shall be used to document safety training on this project

Topic	Who Needs Training	What Training is Needed
Project Specific Safety Orientation	All project management, supervision, and workers entering the project	Safety rules and procedures contained in the Site-Specific Safety Plan (SSSP), site-specific emergency action plan, each worker's responsibilities, disciplinary program.
Hazard Communication	All workers entering the project	Hazard Communication Basic Training (Refer to Hazard Communication Program in this SSSP)
Hazardous Chemical or Substance	Workers exposed to a hazardous chemical or substance	Specific Hazard Communication Training (Refer to Hazard Communication Program in this SSSP)
Respiratory Protection	Workers required to wear respiratory protection, including common dust masks	OSHA 29 CFR 1910.134 & 139 or 1926.103

Fall Protection	Any worker who might be exposed to a fall hazard	• The nature of fall hazards • Procedures for erecting, disassembling, maintaining and inspecting fall protection systems • Use and operation of: guardrail systems, personal fall arrest systems, safety net systems, warning line systems, controlled access zones and other fall protection • Procedures for handling equipment and erection of overhead protection • Fall protection standards • Rescue Plan
PPE	Workers using PPE	Refer to section on PPE or regulatory standards
Forklifts	Operators of powered industrial trucks	• Types of trucks operated • Hazards of the workplace • Hands-on performance evaluation
Confined Spaces	Any worker attending to, supervising, entering or working within a confined space	• Hazards of the space • Duties of entrants, attendants, supervisors • Air monitoring
Permit-Required Confined Spaces	Any worker attending to, supervising, entering or working within a permit-required confined space	• Hazards of the space • Duties of entrants, attendants, supervisors • Measures used to eliminate or control hazards • Air monitoring requirements • Emergency procedures/rescue equipment • Communications • Permitting procedure • PPE
Excavations/ Trenches	Workers entering or working within an excavation/trench	• Hazards of the space (slides, cave-ins, water accumulation, etc.) • Safe means of access/egress • Proper support system procedures (erection, maintenance, disassembly and inspection)
Lockout/Tagout	Workers affected by hazardous energy sources	• Nature of known hazardous energy sources • Project-specific Lockout/Tagout procedures
Gas Welding & Cutting	Workers conducting gas welding and/or cutting	• The safe use of fuel gas
Arc Welding & Cutting	Workers conducting arc welding and/or cutting	• What to do with unattended machines and electrode holders • Operations around water • Shielding arc welding
Hot Work	Workers conducting hot work activities	• Hazards of the area • NFPA Hot Work Certification Card • Permits • Duties of Fire Watch • How to use a fire extinguisher
Scaffolding	Workers working from scaffolding	• The nature of any known hazards • Proper erection, maintenance and disassembly of fall protection systems • Falling object protection • Material/equipment handling from scaffold

		• Maximum load-carrying capacity • Scaffold tagging system • Access and egress
Crane Baskets	Workers working from crane baskets	• Safe work rules • 100% fall protection • Lift plans contents • Emergency procedures

Project Specific Safe Work Requirements

The project specific safe work requirements are the minimum requirements for this project. The purpose of these requirements is to ensure a safety work environment and compliance with standards and regulations. W.T. Rich believes by concentrating on four main areas—personal protective equipment, housekeeping, fall prevention/protection and ladders—incidents and near misses can be reduced.

Concrete Construction

All vertical and horizontal rebar, form stakes, metal and/or plastic conduit, and/or small pipe stub-ups will be protected with approved caps or other industry accepted alternatives to protect against impalement and injury.

Workers that operate vibrators, pump nozzles and concrete buckets will wear appropriate eye and foot protection. It is highly recommended that long sleeve shirts be worn to protect against exposure of concrete to the bare skin and the possibility of concrete burn and contact dermatitis.

Workers engaged in vertical rebar assembly shall comply with the project six-foot fall protection rules. Positioning devices alone are not approved fall protection but can be used in conjunction with personal fall protection equipment.

Walkways along form walls will be constructed in accordance with OSHA scaffold and fall protection standards.

Pre-fabricated forms and form making material will be stacked neatly at all times. When stripping concrete forms, all material will be immediately removed and stacked in an orderly manner. Forming material or debris will not block walkways and aisles. Subcontractor will remove rebar, tie-wire and other debris from the work area daily.

No employee is permitted to ride a concrete bucket.

Ensure that reinforcing steel and forms for walls, piers, columns, stairs and similar vertical structures are adequately supported to prevent overturning and collapse and are designed and installed under the supervision of a qualified person.

Ensure that coiled wire mesh is adequately secured to prevent uncoiling.

Equip buckets with a discharge device that an employee can operate without being exposed to the load. Equip buckets with safety devices to prevent premature or accidental dumping, and ensure that the release is self-closing.

Follow safe rigging practices when handling concrete buckets.

When using bull floats, inspect the area to ensure there is no energized equipment or power lines nearby that the handles could touch.

Concrete buggy handles must not extend beyond the wheels on either side of the buggy.

Rotating-type, powered concrete trowels shall be equipped with dead-man controls that automatically shut down the equipment when the operator's hands are removed from the controls.

Finishers shall wear kneepads and impervious gloves when hand-finishing concrete.

Confined Spaces

Before any work can begin in a confined space a detailed Confined Space Entry Permit (Appendix I or equivalent) and written entry plan must be prepared and submitted to W.T. Rich. This process will help determine whether the space is a “Non Permit Required” confined space or a “Permit Required” confined space. All confined spaces shall be considered “Permit Required” unless the contractor can prove otherwise. Refer to OSHA 29 CFR 1910.146 for further direction.

A confined space is any space large enough and so configured that a person can bodily enter and perform work; has limited openings for entry and exit; and was not designed for continuous human occupancy. This may also be referred to as a “Non Permit Required” Confined Space.

A “Permit Required” space meets the above criteria *and* has a potentially uncontrollable hazard.

“Permit Required” confined spaces may include, but are not limited to:

- Storage tanks
- Excavations and trenches
- Ventilation and exhaust ducts
- Sewers
- Manholes
- Underground vaults and utility tunnels
- Pipelines
- Pits and tubs
- Open top spaces more than four feet in depth

If possible, all confined spaces should be identified and evaluated at the beginning of the project.

Before working in any confined space, a competent person will determine what hazards exist. Any operating system or equipment will be locked out and tagged to prevent accidental operation. Contact the operating facility representative prior to any confined space entry work.

Prior to workers entering a “Permit Required” confined space, the atmosphere must be tested and a permit completed and authorized. The atmosphere will be tested for oxygen deficiency, toxic gases or vapors, and combustible or flammable gases or vapors according to the hazard analysis and/or information provided by the client.

Prior to any worker entering a confined space, he/she will be trained in the following and records submitted to W.T. Rich prior to commencement of the work:

- Contents of the Confined Space Entry Plan
- Known hazards in the confined space
- Emergency procedures in case of an emergency
- Correct use of personal protective equipment when required

- Hot Work Permit, if required
- Atmosphere testing requirements
- Lockout/ Tagout procedures
- Fall protection if required

Cranes and Cribbing

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Section 100 – Scope of Applicable Equipment

This standard applies to power-operated equipment used on W.T. Rich projects that can hoist, lower, and horizontally move a suspended load. The list below is intended to offer a framework of the variety of cranes seen on projects and to provide guidance of the applied scope of this standard. All crane operations shall be in accordance with this W.T. Rich standard and 29 CFR 1926 Subpart CC. The more stringent standard shall apply.

Telescopic Crane – This crane has a boom that consists of number of different fitted tubes that reside inside each other. A hydraulic mechanism is what extends or retracts the tubes to increase or decrease the length of the main boom.

Tower Crane – This crane is fixed to the ground and gives a great combination of height and lifting capacity. It's commonly used in construction to build sky scrapers and other tall buildings. To save space and to provide stability the vertical part of the crane is typically braced directly onto the completed building which is normally the concrete lift shaft located in the center.

Truck Mounted Crane – A crane that is mounted on a rubber tire truck that drives around for maximum portability. When in operation Outriggers extend horizontally then vertically to both level and stabilize the crane for hoisting operations.

Rough Terrain Crane – A crane that is mounted on an undercarriage contains four rubber tires and is designed for pick-up and carry operations. Outriggers extend first horizontally and then vertically to both level and stabilize the crane for hoisting operations.

Lattice Boom Crane – A crane that can be mounted on an undercarriage with tires or tracks. The lattice boom section consists of the boom butt and boom tip. The length of which is increased by adding boom extensions. Boom sections are made of lightweight, thin wall, high strength alloy tubular or angle steel and are designed to take compression loads. Lattice boom manufacturers have set a zero tolerance on rust, bent lacing or cords, cracked welds, and other problems.

Pile Driver Crane – A crane used in combination with a machine for delivering repeated blows to the top of a pile for driving it into the ground; consists of a frame called "leads", which supports and guides a hammer weight, together with a mechanism for raising and dropping the hammer or for driving the hammer by air for steam.

Crawler Crane – An undercarriage mounted crane that also has a set of tracks that provide extra stability and mobility.

Loader Crane – A loader crane is fitted to a trailer or flat body truck chassis and used to unload/load goods onto the trailer/truck or onto a jobsite. It contains many different jointed sections that can be folded into a smaller space when the crane is not being used

Section 200 – Definitions

Term	Definition
NCCCO	National Commission for the Certification of Crane Operations
Qualified Operator	An operator certified as qualified by a nationally recognized certification authority, or having verified and demonstrated knowledge gained through practical experience.
CCO	A crane operation having been certified by the NCCCO
Qualified Rigger	A qualified rigger is one which through possession of a recognized degree, certificate, or professional standing; or by extensive knowledge, training, and experience, successfully demonstrating the ability to solve/resolve problems related to rigging work and related activities.
Qualified Signalman	A "qualified" signal person is one that his/her employer must ensure that the signal person is qualified. This qualification must be done by a qualified evaluator, which may be a third party or an employee of the signal person's employer. The evaluator must demonstrate that he or she can accurately assess whether an individual meets the qualification requirements specified by this final rule for signal persons.
Crane Inspector	Employee having completed a recognized inspector certification, and demonstrated all the requisite knowledge to certify a crane is ready to operate.
Third Party Inspector	A crane inspector as certified by a nationally recognized certification authority and having a resume of demonstrated skills. This inspector cannot have any affiliation with the owner of the crane, sub-contractors, W.T. Rich, or other parties or organization working on the project.
Pre Installation Inspection	A documented inventory and visual integrity inspection of all crane parts prior to a site built crane being assembled.
Post Installation Inspection	A documented annual and/or monthly inspection of all installed crane parts after crane is assembled or delivered to the job site. (refer to Appendices P, Q, or daily)
Rigging Plan	A documented plan detailing types of rigging to be used (slings, chains, links, hooks, spreader bars etc.) and their methods of use to wit; vertical, basket, or choker
PIC	Person In Charge
Helper or Assist Crane	A crane used to erect another crane
Competent Person	A competent person as defined by OSHA [29CFR 1926.32 (f)] means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminated them.
Sequence of Lifts	A documented prescribed sequence of crane movements and lifts specific to the erection sequence of the project.
Crane Prepped Roadway	An adequate access road providing ingress and egress to the project site for the safe delivery and movements of derricks, cranes, trucks, and other necessary equipment to be erected. The ingress/egress must provide a means and method to provide safe vehicular and pedestrian access. The roadway must be stable, properly graded, and provide adequate drainage.
Critical Lift	A lift that (1) exceeds 75 percent of the rated capacity of the crane or derrick, or (2) requires the use of more than one crane or derrick.
Major Lift	Any lift that is unique and would significantly affect job schedule or budge is a major lift. (A lift may be both critical and major)
Crane Pad	A prepared level area for a crane, which can be concrete, stable soil, crushed rock or a combination there of which will support the crane and it's intended load with a safety factor of 5 to 1 built in.

Section 300 – Pre Erection Requirements

1. Geotechnical Requirements

Soil conditions must be fully assessed prior to any crane arriving at the site. Items to consider include travel, slope, and soil loading ability. Prior to the erection of any tower crane a geo-technical evaluation shall be accomplished and incorporated into the foundation design of the engineered system.

2. Foundation Considerations

For mobile cranes, outrigger size and location and soil condition must be considered when planning. Soil bearing capacity is to be determined by a professional engineer and outrigger sizing established prior to the crane arriving on site. Refer to Appendix H for guidelines in determining outrigger configuration.

Tower crane foundations must be a designed system, certified by a professional engineer, taking all loads and soil conditions into consideration.

3. FAA and Other Agency Notifications

The Federal Aviation Administration (FAA) requires a permit on construction cranes any time they will exceed 200 feet in height, OR when they are placed within 20,000 feet (3.79 miles) of an airport regardless of height. The FAA requires FAA Form 7460-1 to be submitted at least 30 days before the following:

- The date the proposed construction is proposed to begin
- The date the application for a construction permit is to be filed
- The FAA requires that 4 copies of the FAA Form 7460-1 be sent to the local/regional FAA Director. In addition to the FAA, other local statutes may require additional notification.

4. Overhead and Underground Utility Considerations

Prior to the assembly/erection of any crane it must be determined if any part of the crane, load line, or load (including rigging and lifting accessories) could get in the direction or area of assembly within proximity of a power line. Minimum clearance distances are on the table on the next page. In the event this clearance must be encroached the line will be de-energized prior to the planned encroachment.

Minimum Clearance Distances

Voltage (nominal kV, alternating current)	Minimum clearance distance (feet)
Up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1000	45
Over 1000	(as established by the power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

5. Inspection and Oversight Requirements

Prior to any crane arriving on a W.T. Rich project the previous monthly and annual inspection shall be reviewed by W.T. Rich site management. Verification that all noted defects have been corrected shall be included with the inspection form if applicable. Inspection forms must be compatible with the applicable forms in Appendices P, Q, and R of this standard.

In addition, erection of tower cranes shall be directed by a third party inspector. Upon completion of erection a new annual inspection shall be accomplished by the third party inspector and all defects corrected and documented prior to any lift. The Tower Crane Protocol Checklist is included in Appendix U of this standard to serve as a guidance checklist.

Section 400 – Post Erection Procedures and Requirements

1. Inspection Requirements (annual, monthly, daily)

On-going comprehensive inspections are a critical component that ensures the on-going safe operation of all cranes.

- Daily Inspections will be accomplished for all cranes on W.T. Rich projects. It is highly recommended that the checklists in Appendix R of this standard are used to document that this requirement has been met. However, the only documentation required by this standard are any deficiencies identified during the daily inspection. Daily inspections may be accomplished by a Qualified Operator as defined in Section 200 of this standard.
- Monthly Inspections will be accomplished for all cranes on W.T. Rich projects that reside on the project for greater than 30 calendar days, regardless of operating days during that period. The monthly inspection forms (or equivalent) in Appendix Q of this standard are required to be completed and maintained in the cab of the equipment. Monthly forms will be retained for a minimum of 3 months, as some local agencies may require them to be retained longer. Monthly inspections may be accomplished by a 1) Qualified Operator, 2) W.T. Rich Crane Inspector, or 3) Third Party Inspector as defined in Section 200 of this standard.
- Annual Inspections will be accomplished for all cranes on W.T. Rich projects that reside on that project for greater than 365 calendar days, regardless of operating days during that period. The annual inspection forms shall be maintained in the cab of the equipment. Annual inspections must be accomplished by Third Party Inspector as defined in Section 200.

2. Operator, Rigger, and Signalman Qualifications

The intent of this standard is to require all crane operators on W.T. Rich projects to be a certified crane operator (CCO), and posses all of the requisite skills to safely operate the applicable equipment. However, until CCO's are available at all US locations W.T. Rich will make every effort to use operators who are certified by the National Commission for the Certification of Crane Operators (NCCCO) for the cranes they are operating. Prior to any lifts the operator's competency shall be verified by W.T. Rich site management.

This certification however does not ensure that an operator is capable of safely operating a particular piece of equipment. The following guidelines will be followed to ensure operators are fully qualified to safely operate the applicable equipment for the project:

NCCCO Certified

1. Review and inspect NCCCO Certification Card for types of cranes the operator is certified to operate.
2. Verify on the Application for Employment or by sub-contractor certification that the applicant has operated cranes in the classification for which they are being hired.
3. W.T. Rich site staff will verify that the operator is competent to operate the applicable crane.
4. Upon determining that the potential operator is qualified, personal training will be given to the operator that may include the following:
    a. Site-Specific requirements
    b. Review of specific sections of the Company Safety Manual such as safe material handling practices
    c. Equipment maintenance and periodic equipment check requirements

Non NCCCO Certified (Items 2 – 4 above will apply)

Riggers and signalman shall be certified and/or qualified as outlined in Section 200 of this standard.

These guidelines do not overrule any local, state or federal requirements. In the event of conflict the more stringent standard shall prevail.

Operators of cranes and motorized hoisting equipment shall possess a Commonwealth of Massachusetts, Dept of Public Safety Hoisting License, for the type of equipment that they operate. Any crane operator on site for more than five working days shall possess a certification from the National Commission for Certification of Crane Operators (NCCCO) for the type of crane that will be utilized. Documentation of these licenses/certifications shall be submitted to the W.T. Rich EHS group prior to the use of the hoisting equipment.

3. Critical and Major Lift Planning

Critical Lift Determination

The decision to designate a lift as a critical lift is a management decision, incorporating both critical and major lifts (see definition of critical and major lifts in Section 200). Guidelines provided here are intended to aid in making that decision. The manager who has the responsibility for the item being lifted has the authority to require that it be handled as a critical lift. In addition, the manager at the facility where the lift will be performed also has the authority to require that it be handled as a critical lift. The manager who designated the lift as a critical lift shall ensure that a person-in-charge (PIC) is assigned. (The PIC need not be in the W.T. Rich organization).

Critical Lift Procedures

The PIC shall ensure that a step-by-step procedure is prepared for critical lifts. Although individual procedures are prepared for the one-time critical lifts, general procedures may be employed to accomplish routine recurrent crucial lifts. For example, a general procedure may be used to lift an item or series of similar items that are frequently lifted or repeatedly handled in the same manner.

- Any non-routine or critical equipment lift (as determined by the Project Manager, Superintendent or Safety Supervisor). Critical equipment may include equipment that meets one of the following criteria:
    - The load item, if damaged or upset, would result in a release into the environment of radioactive or hazardous material exceeding the established permissible environmental limits.
    - The load item is unique and, if damaged, would be irreplaceable or not repairable and is vital to a system, facility or project operation.
    - The cost to replace or repair the load item, or the delay in operations of having the load damaged, would have a negative impact on the facility, organization, or budget to the extent that it would affect program commitments.
    - A lift not meeting the above criteria shall also be designated critical if mishandling or dropping of the load would cause any of the above noted consequences to nearby installations or facilities.
    - Further site-specific criteria may be developed to supplement those cited above and may include loads which require exceptional care in handling because of size, weight, close-tolerance installation or high susceptibility to damage as well as lifts using multiple pieces of lifting equipment.

An example of a critical lift procedure and checklist is included in Appendix T of this standard.

Approval of Critical Lifts

The critical lift procedures should be reviewed at a pre-lift meeting by the responsible contractor, the crane operator(s), the PIC, W.T. Rich Site Management, author of the Lift Plan, Manager of the lift operation, and W.T. Rich Safety Department.

Revisions of Critical Lift Procedures

Any revisions to the procedure shall be reviewed and approved though the same cycle as the original procedure.

Pre-Lift Meeting

Before the critical lift is performed, a pre-lift meeting with all participating personnel shall be held. During the meeting, the critical lift procedures shall be reviewed and questions shall be resolved. The pre-lift meeting shall be documented.

Note: Practice lifts are recommended. (If used, requirements for the practice lift should be documented in the procedure.)

4. Jumping Cranes

Jumping of cranes must follow similar protocols as a critical or a major lift and requires a comprehensive written plan to address the following:

1. Number of sections to be added/removed
2. Work sequence
3. Rigging to be used
4. Inspection of all rigging equipment including shackles, hooks, etc.

5. Review of all equipment such as collars, ties, and bolts, including capacities and a record of visual inspection by a competent person.
6. Relevant weather warnings and emergency procedures
7. Full compliance with manufacturer's recommendations

5. Lift and Pre-Task Planning

Prior to any lifts a lift plan (*see Definitions Section 200*) should be in place. The final lift plan should fully incorporate the current site conditions, including utility locations and any possible intersections with public access areas.

A daily pre-task plan must be accomplished prior to any lift for that particular day to ensure that no deviations from the lift plan exist.

An example of a lift plan is included in Appendix V for reference.

6. Safety Plan and Job Hazard Analysis

All incidents involving crane operations (*i.e., unsafe observation, near miss, etc.*) must be reported immediately to W.T. Rich site staff, including safety dept. W.T. Rich will collaborate with other contractors if appropriate and develop a corrective action in response to the cause of the incident prior to resuming crane operations.

Accessible areas within the swing radius or the rotating superstructure must be barricaded to prevent serious injury or death to workers. Crane baskets are not permitted without the prior approval of site management and W.T. Rich safety personnel.

In addition, the following guidelines for mobile cranes should be adhered to:

1. Ensure the crane is level 360o and maintained during operation.
2. Extend outriggers fully or set per the manufacturer's recommendation for a particular lift configuration. Weight must be off the tires.
3. Cribbing or mats under outrigger pads should be of sufficient size and properly placed to ensure adequate soil bearing as required by the manufacturer.
4. Before a lift, determine the load weight, radius, and load capacity. Crane capacity charts are the ideal gross capacity of the crane at certain boom lengths, boom angles, and load radius from the crane center pin.
    a. Deductions to the net capacity should be made per manufacturer's load chart or operating manual for attachments such as jibs (stowed or attached), headache balls, wind, less than ideal setups, etc. to determine the load that can be safely lifted.
    b. Additional deductions to the net capacity are the weight of the crane's load block, rigging and amount of load line required to make the lift. Some manufacturers include the load line in their load charts but others, like Manitowoc, do not.
5. A designated, qualified person will determine the load weight. Note: OEM drawings listing the equipment or machinery assemblies are not always accurate. Refer to the shipping weight or have the equipment or machinery assembly weighed. Calculate all structural loads and determine the center of gravity.
6. Determine the radius from the center pin of the crane to the load using a steel ruler.

7. Determine the boom length, counterweight, and crane configuration to determine the correct load chart required.
8. Position the hook over the “Center of Gravity” of the load before starting the lift.

The following guidelines for tower cranes should be adhered to:

1. No employee will work or travel on any part of the crane boom without proper fall arrest equipment. No worker will be allowed to climb the tower or get on the boom when the crane is in operation
2. Hoisting ropes must be shortened by the removal of ten feet at the dead end after every three months of use unless otherwise specified by the manufacturer.
3. No load will be swung over any public street that is occupied by the general public unless authorized by local authorities.
4. Prior to a load being swung over other workers, the first-line supervisor using the crane will provide a lookout that shall sound an alarm as the load is moved across the work area. The lookout shall wear a fluorescent orange vest or other similar high-visibility garment.
5. A written crane dismantling plan is required for dismantling of any crane.

In addition to the above safety requirements, the requirements of OSHA standards 29 CFR 1926.550 shall be complied with too.

7. Emergency Planning (Weather or manmade event)

Every site shall incorporate crane specific emergency response procedures specific to the equipment on that site in accordance with the manufacturer’s notes and instructions. These procedures shall include provisions for:

- Cold and Freezing Temperatures
- Wind
- Water, drainage, and wet conditions
- Power lines and whether
- Electrical storms
- Flooding
- Rescue and evacuation procedures

Section 500 – Management Systems

1. Documentation Control

Every crane operating on a W.T. Rich project must have the following documentation in the cab of the crane available for review.

- The last annual inspection
- The last monthly inspection
- Exception reports, if any

- Manufacturer's operating manual
- Manufacturer's lift charts

Demolition

Prior to the start of any demolition work, the subcontractor must ensure a competent person has performed an engineering survey of the building or area to be demolished to determine the condition and location of utilities, whether hazardous materials (such as asbestos, lead, and mercury) exist, means and methods of performing the work, sequencing, etc. No work will commence until a written engineering survey has been completed and has been submitted to and reviewed by W.T. Rich.

Debris and material shall not be dropped through walls, floor holes, windows or other elevated work areas without the area below being barricaded and properly signed. Under no circumstances shall materials be dropped more than 20 feet without using a chute.

Debris chutes shall have a substantial gate at all elevated openings.

If demolition of a building will involve implosions, the demolition contractor shall submit to W.T. Rich a detailed safety plan to specifically address site preparation, installation of explosives, debris/dust control, and blaster qualifications.

See Non Mandatory Appendix X or its equivalent for Pre-demolition guidelines.

Electrical

No work will be performed on any energized electrical circuit, buss bars, equipment, or panels unless an approved written work plan is developed in accordance with Chapter 1 of NFPA 70E and submitted to W.T. Rich for review prior to performance of work.

Electrical equipment and tools used on this project shall be inspected by a competent person to prevent any worker from receiving an accidental electrical shock. This rule will apply to all cord sets, portable electrical equipment, tools and appliances not part of any permanent building or structural electrical systems.

All temporary cords will be three wire, 16 gauge or heavier, with a hard or extra hard duty rating.

Ground Fault Circuit Interrupters (GFCI)

All cord sets and cord-plug electrical equipment, tools or appliances that are 120 volts will be connected to a ground fault circuit interrupter (GFCI). No cord set or cord-plug electrical equipment, tool or appliance will be plugged directly into any permanent building or structural electrical system not equipped with a GFCI. Office equipment and appliances in site offices do not require GFCI devices.

When the source of electricity is from a two-wire, single-phase portable or vehicle mounted generator rated not more than 5KW, a GFCI is not required, as long as the generator is insulated from the frame and all other grounded surfaces.

Each worker, after plugging in his/her tool and /or extension cord, shall test and reset the GFCI device being used to ensure it is working properly with each use. If the GFCI device is not functioning properly he/she will repeat the process until a properly working GFCI device is found. He/She will report the defective GFCI device to his/her supervisor.

Double-Insulated Tools

Double-insulated tools are allowable if the case bears the Underwriter Laboratories “double-insulated” label. Tools where this label has been removed, painted over or is otherwise not readable must be removed from service.

Inspection Form

An inspection program must be established to inspect all cord sets, portable electrical equipment, tools and appliances as described below and before first use, before returned to service following any repair, and after an incident that could have caused damage.

Daily Inspection:

Each cord set, attachment cap, plug, and receptacle of cord sets, portable electrical equipment, tools or appliances connected by a cord and plug, will be visually inspected daily by workers for external damage, such as deformed or missing ground pins, insulation damage, frayed wires or indications of possible internal damage. Cord sets and receptacles that are fixed to the permanent electrical system and are not exposed or damaged are exempt from daily inspections.

Any electrical equipment, tool, appliance or cord set that is damaged or defective will be immediately removed from service and tagged out as defective equipment for repair. A qualified electrician will repair tagged electrical items.

Quarterly Inspection:

All cord sets, receptacles and cord-plug connected electrical equipment, tools or appliances not part of the building or structure's permanent wiring, will have the following performed each quarter:

- Visually inspect for damage or missing ground pin
- Inspect insulation for damage
- Inspect for frayed or exposed wires
- Inspect for signs of internal damage

Weekly Cord Rollup:

Each cord set shall be disconnected from power outlets and rolled up, inspected and properly stored at the end of shift each Friday. Defective cord sets shall be removed from service.

General Electrical Rules

All cord sets will be elevated above the work surface when practical.

Wire, nails, or other conductive material will not be used to hang or attach cord sets or welding leads.

Cord sets that cross roadways will be protected from damage by vehicle and equipment traffic by devices such as hose bridges.

Light stringers and halogen lamps will have the lamps protected from accidental contact or breakage and will be hung per manufacturer specifications.

UL approved covers are required on all panels, load centers, pull boxes, etc. prior to energizing. Necessary steps will be taken to prevent unauthorized or unqualified workers access to energized electrical parts or equipment.

Equipment and Vehicles

Heavy equipment (cranes, forklifts, dump trucks, excavators/back hoes, man-lifts, etc.) used on this project will be inspected prior to use and comply with applicable OSHA and ANSI standards, which will be documented.

Equipment that is equipped with a windshield will be free of cracks or other visible damage.

All equipment will be equipped with rollover protective structures (ROPS).

Seatbelts are required to be worn at all times when provided in moving equipment.

Only company and/or delivery vehicles used for the sole purpose of conducting work tasks on-site are permitted in construction areas. Vehicles one ton or greater and equipment used on-site must have an audible backup alarm. The driver and all passengers in any vehicle will wear seat belts.

No equipment or vehicle will be used to transport personnel unless it is specifically designed to do so, including beds of pick up trucks.

Equipment operators are responsible to check their equipment daily to verify it is working properly.

As a minimum, each operator will check:

- Brakes
- Lights
- Backup alarm and horn
- Hydraulic systems
- Steering mechanism
- Operating controls
- Mirrors
- Fire extinguisher
- Limit switches
- Leaks

Equipment operators will possess the required training, certification, and licenses as required by law for the equipment that they are operating.

The use of mobile phones, iPods or other similar electronic devices while operating equipment and motor vehicles is prohibited.

Excavation and Trenching

Prior to any disruption of ground, excavation, or trenching on this project, the following will be performed:

- W.T. Rich shall request locations for existing underground private utilities from the owner.
- Subcontractors shall notify public utility locating authorities.
- The subcontractor will identify the competent person and submit qualifications to W.T. Rich.
- The competent person will analyze the soil of the work area to determine the condition and type of soil to ascertain proper sloping or shoring requirements.

During excavation or trenching operations on this project, the following requirements will be followed:

- All trenches and excavations will be barricaded and signage posted at the work area.

- Fall protection shall be provided for excavations six feet or more in depth.
- Trenches or excavations will be sloped or benched in accordance with local rules and regulations, and as determined by the competent person.
- Supporting systems (i.e. shoring, piling, trench boxes, etc.) will be utilized for all trenches and excavations where sloping or benching could not be performed.
- Spoil piles and all other material will be placed a minimum of two feet from the edges of all trenches or excavations.
- When underground utilities are suspected, they will be located first by hand digging.
- Adequate access must be maintained at all times during trenching or excavating activities. Access points will be placed such that no worker travels more than 25 feet in any direction.
- The competent person will inspect excavations and trenches at the beginning of each day before work begins and when conditions change.
- Excavations in Type C soil will not be benched.
- Excavations and trenches four feet or greater in depth will be evaluated for atmospheric hazards to determine whether permit required confined space requirements apply.
- A Professional Registered Engineer must design sloping, benching, and all protective systems in excavations over 20-feet in depth.

Fall Prevention/Protection

This project is committed to the philosophy of 100% continuous fall protection whenever workers are exposed to fall hazards of six feet (6') or greater. A monitor system is not an acceptable form of fall protection on any W.T. Rich project. In the event any deviation from this fall protection procedure is required, the activity must be approved by the Safety Director, Vice President and CEO.

W.T. Rich, subcontractors, vendors, or other third party individuals will take all practical measures to eliminate, prevent, and control fall hazards. All work will be planned with the intent to eliminate identified fall hazards. When a fall hazard has been identified and cannot be eliminated, then effective means of fall protection will be implemented.

Acceptable fall protection systems include the following:

- Guardrail systems
- Safety netting
- Covers for floor, roof and wall openings
- Positioning device systems
- Protection from falling objects
- Personal fall arrest systems

Workers exposed to fall hazards that cannot be eliminated will be equipped, trained and given periodic refresher training in fall protection to minimize the adverse effects of accidental falls. Fall protection training records shall be maintained on the project and available for review by W.T. Rich.

On this project, 100% Fall Protection means protected from falls at all times when working at or above six feet. This is mandatory for all trades.

Workers may work from ladders without personal fall protection when the following criteria are met with no exception:

- Working height does not exceed 12 feet

- Work can be performed without reaching (worker remains inside the area between the vertical side rails)
- Work does not involve working within 15 feet or above an open side, leading edge, or shaft, even if the edge has a proper guardrail.

Personal Fall Arrest Systems will consist of a full-body harness, double lanyard with shock absorbing device or retractable lifeline, locking snap hook and anchorage points meeting OSHA regulations and ANSI requirements.

Workers will not tie off to a perimeter cable or wire rope handrail.

When wire rope is used to construct guardrail systems, at least 1/4" diameter cable shall be used with cable clamps as required by wire rope manufacturers. Turnbuckles shall be required at all terminations.

Subcontractors will submit all engineered documentation on horizontal lifelines to W.T. Rich. All horizontal lifelines will be installed under the direct supervision of a qualified person.

The use of personal fall arrest systems requires the submission of a Rescue Plan for each condition.

Lanyards will not be tied back to themselves unless the lanyard is specifically manufactured to tie back to itself.

If any component of a guardrail system must be removed, a W.T. Rich Guardrail Removal Permit must be issued (Appendix E or equivalent). Any contractor that must remove a fall protection system in the course of their work will be responsible for immediately replacing and restoring the protective system.

Floor openings two inches or greater in the least dimension and all wall openings will be guarded or covered with an appropriate cover or guardrail. Floor covers will be secured to the floor to prevent easy removal. The floor or wall cover will be properly marked with a Danger sign stating, "**Cover-Do Not Remove**." Elevated work must have protection from falling objects if work is permitted below.

Fire Protection/Prevention

Fire Protection/Prevention
Temporary fire protection measures such as fire extinguishers, sprinkler systems, and/or temporary standpipes are required during construction.
The Project Team shall develop a NFPA 241 Plan in accordance with NFPA 241, NFPA 101, and OSHA 29 CFR 1926 Subpart F.
Fire extinguishers will be:

- Conspicuously located
- Within fifty feet (50') of travel distance
- Certified annually and inspected monthly
- Equipped with weather appropriate inspection tag
- Protected from freezing
- Placed within the immediate area of any welding/cutting operation or flammable liquid storage area
- Placed within five feet whenever gasoline operated equipment is used

If a fire extinguisher is discharged for any purpose, it shall be reported to W.T. Rich immediately.
Each temporary building and trailer (shops, field offices, storage boxes, ect.) will have its own appropriately sized ABC fire extinguisher.
Access to fire hydrants and extinguishers will be maintained at all times. Clear access to buildings and other structures will be maintained at all times.

Fire Prevention

All temporary enclosures, tarps, or protections shall be constructed of non-combustible material or have a fire resistance rating of one (1) hour or greater.
Combustible refuse from construction operations will not be burned or dumped anywhere on the construction site. Such refuse will be removed at frequent intervals, as needed. Storage of large quantities of construction debris will be placed in metal dumpsters.
Storage of compressed gases will include:

- Stored in identified area on project specific NFPA 241 plan
- Cylinders stored in approved cages
- Valves, regulators and hoses removed with valve caps securely on
- Secured upright at all times, including when transported in vehicles
- Fuel and Oxygen cylinders separated by a minimum of 20 feet
- Empty cylinders stored separate from full cylinders

Only approved high flash point solvents are to be used for cleaning purposes.
Oily rags and waste are to be stored separately in metal containers fitted with self-closing lids. Trash and refuse must be placed in trash containers provided for this purpose.

Fire and Flammable Liquid Storage and Dispensing

Flammable and combustible liquids will be stored, dispensed, and used in accordance with OSHA and NFPA requirements, and the following:

- All flammable and combustible liquids shall be stored in designated fuel storage area determined in project specific NFPA 241 plan.
- No more than a total of 25 gallons of flammable and combustible liquids can be stored outside of an approved locker.
- Stored in approved portable containers marked as to contents and ownership.
- Posted with “NO SMOKING” signs.
- Outside storage areas kept free of weeds and other combustible materials.
- Metal storage cans must be used for all diesel and gas storage.
- Storage of flammables will be in an enclosure away from open flame, heat, direct sun or other sources of ignition.

All storage tanks/drums will be placed in a berm or other secondary containment.
Berms will be lined with minimum 6-mil plastic sheeting that is fuel resistant. PVC lining are not allowed.
W.T. Rich will designate vehicle refueling locations and procedures.

Fuel and flammable liquid tanks, drums, or barrels will have the proper DOT placard and contents label.
All Fuel storage tanks and compressed gas cylinders will be protected from vehicle traffic.
All fuel dispensing points shall be located away from storm drains and wetlands. The following is required:

- Portable 20 lb ABC fire extinguisher no closer than 25 feet or further than 75 feet from the fueling point
- No Smoking signs posted
- Self-locking combustible materials nozzle prohibited
- Spill kit stored nearby
- Tanks will be grounded and when dispensing flammable liquids, the containers will be bonded

Hot Work

Hot work is defined as work involving burning, welding, or a similar operation that is capable of initiation fires or explosions. Hot work processes include welding and allied processes, heat treating, grinding, thawing pipe, hot riveting, torch-applied roofing, and similar application producing or using a spark, flame, or heat.
Prior to performing Hot Work operations, workers will obtain a Hot Work Permit from the AHJ and from W.T. Rich (Appendix H or equivalent). W.T. Rich Hot Work permits a valid for one shift and must be pulled daily. The Hot Work Permit shall document that the following conditions have been verified:

- The area within thirty-five (35) feet of the hot work operations, and all areas below the hot work operations where sparks and slag may drop have been cleared of all personnel, combustible materials, compressed gases, and flammable or combustible liquids. Where this is not possible, combustibles shall be covered with fire blankets.
- An individual, trained and knowledgeable in hazards associated with hot work operations and the use of portable fire extinguishers, is designated as the fire watch, and will remain present for the duration of the hot work operation, and one-half hour after the completion of the hot work. Torch –applied roofing operations require fire watch for two (2) hours after the completion of the hot work. NOTE: the fire watch shall hold no other duties or responsibilities during his or her service as a fire watch. Where sparks and slag cannot be contained in the immediate work area (i.e. fall to another level), a fire watch shall be posted at each area.
- At least one twenty (20) pound multi-purpose dry chemical fire extinguisher is present with each fire watch.
- Hot work permits shall be valid for one shift or one operation only, whichever is shorter.
- Red Hot Work Tag must be displayed near the Hot Work area and returned at close of Hot Work operation at end of shift.

Mean of Egress

- In all buildings over one story in height, at least one stairway shall be provided that is in usable condition at all times.
- Stairway shall be extended upward as each floor is installed in new construction and maintained for each floor still remaining during demolition.
- All exit stairs shall be provided with stair identification signs to include the floor level, stair designation, and exit path direction as required to provide for safe egress.
- System scaffolding shall be used for all means of temporary egress in accordance with NFPA 101.

Housekeeping

The W.T. Rich policy on housekeeping is that all equipment, tools, and materials will be stored, stacked, or set up to prevent an incident or injury. The area will be a clean and orderly work place.

Project management, supervision, workers, vendors and third party persons will maintain all work locations in an orderly and clean manner at all times.

Mud and dirt tracked onto public streets or alleyways will be removed continuously during the workday.

The following are the minimum housekeeping requirements for this project:

- Access walkways, roadways, and fire lanes will not be blocked.
- Electrical extension cords, light stringers, air hoses, and welding leads will be elevated above walkways a minimum of seven feet or the area marked with signage stating: “Trip Hazard”
- Welding rods, nuts, bolts, and washers will be kept in proper containers.
- Shackles, slings, chokers, ladders, and safety equipment will be removed from the work area when not needed and properly stored.
- Trash containers will be placed at appropriate locations.
- All nails will be removed from scrap and form lumber and swept up daily.
- Rubbish, trash, and debris will be removed from the work area daily.

All subcontractor materials, equipment, etc. are the responsibility of each individual subcontractor. No subcontractor shall ever touch, move, hoist, lift, or relocate other subcontractors’ materials, equipment, tools, storage containers, etc. without direct written permission to do so.

Ladders and Stairways

Fall protection while working from a ladder is addressed in the Fall Prevention/Protection section.

Stairways having four or more risers or rising 30 inches or more shall have a stair rail system 36 inches high on each unprotected side.

Metal pan stairs shall not be used until the pans are filled to prevent a tripping hazard.

Ladders, stairs, or ramps will be provided where there is a change in elevation of 19 inches or greater.

Workers will be trained on the safe use of ladders.

Ladders are required to ascend or descend truck beds and/or trailers.

Ladders will extend past the bearing point no less than 36 inches.

Ladder landings shall remain clear of all obstacles and obstructions to allow safe access and egress. Each contractor is required to inspect ladders daily prior to use. Ladders with broken or bent rungs, steps or side rails will be immediately destroyed and removed from the project.

When ladders are used to access upper levels, they must be secured to prevent displacement and extend a minimum of 36 inches above the upper landing surface to which the ladder is used to gain access.

Aluminum ladders are not allowed.

All ladders will be heavy-duty type with a minimum capacity rating of 250 lbs.

Stepladders

Stepladders will not be used as straight ladders.

Stepladders will only be used with the spreader bars fully extended and locked in place.

Workers will not stand on the top or top step of a stepladder.

Workers will not straddle the top of a stepladder

Workers will not stand on the back of a stepladder unless designed for this use.

Straight/Extension Ladders

Ladders will be set up so the horizontal distance at the bottom is not less than ¼ of the vertical distance to the bearing point.

Workers will not stand on the top three rungs of a straight ladder. No worker will work when his/her knees are above the top of the ladder.

All straight ladders will have non-skid feet at the base.

Job Made Ladders

Job-made ladders shall be constructed for intended use. If a ladder is to provide the only means of access and egress from an elevated working area for 25 or more employees, or simultaneous two-way traffic is expected, a double cleated ladder shall be installed.

Job-made ladders will be constructed in accordance with OSHA and ANSI standards.

Lasers

Precautions will be taken to ensure all workers that use lasers are trained in proper use and the hazards associated with lasers.

No worker will install, adjust, or operate any laser equipment without a valid qualification card, which the worker must have on their person.

Standard laser warning signs will be placed around the perimeter of the area where the laser is being used.

No laser equipment will be used that does not contain a label indicating make, maximum output, and beam spread.

Whenever a laser is not in use, shutters or caps will be used and the laser turned off.

When performing internal alignment, lasers will only be guided by mechanical or electronic means.

No laser beam will be directed at any worker.

When environmental conditions exist such as rain, fog, snow, or extremely dusty conditions, use of lasers will not be permitted.

Workers using lasers will use appropriate eye protection.

Lockout/Tagout

The Project Team will establish a lockout/tagout procedure to ensure that workers are not exposed to the hazards from moving machinery or equipment and those hazards posed by an energized source (pneumatic, steam, hydraulic, electrical, chemical, etc.).

Safety locks and tags will be applied to all circuits, switches, valves, isolating devices, and any other energy sources to ensure equipment, machinery, or processes that have been considered functioning, charged, or could otherwise be operable have been rendered non-operational or de-energized.

No person will remove another worker's safety lock or attempt to energize any piece of equipment, machinery or process that has been locked out and tagged.

Appendix O or its equivalent shall be completed prior to beginning any work activity involving lockout/tagout procedures.

<u>De-Energizing Equipment and Processes</u>

A W.T. Rich representative will coordinate with the operating facility representative and/or construction start-up group when any energized equipment or process must be de-energized.

The W.T. Rich representative and operating facility representative and/or construction start-up group will identify all circuits and sources of energy that require locking and tagging to make the equipment or process inoperable. The operating facility representative/construction start-up group will notify their personnel that may be affected by the de-energizing. The first-line supervisor overseeing the work will sign out sufficient safety locks to lockout the piece of equipment or process.

The following procedures shall be followed:

1. The operating facility representative and/or construction start-up group and first-line supervisor(s) will make certain the operating controls to the equipment, machinery or process are in the "off" or "neutral" position.
2. Once the operating controls are in the "off" or "neutral" position, the operating facility representative will place a safety lock and tag on the energy isolating device(s) first.

3. The first-line supervisor(s) will apply their safety lock to each of the isolating devices that provides power or other energy to the machinery, equipment or process. The first-line supervisor(s) will also apply a visible warning tag, which will contain the name of the first-line supervisor(s), company, date and phone number.
4. Once the first-line supervisor(s) have placed their safety lock(s) and tag(s) on the energy-isolating device, all affected workers will then apply a safety lock and tag to the energy-isolating device. Alternatively, the first-line supervisor may place the key(s) to their equipment safety lock(s) in a safety lock box, place their individual safety lock and tag on the safety lock box, and then have each affected worker place their safety lock and tag on the lock box.
5. Prior to any work being performed on the piece of equipment, machinery, or process, the operating facility representative/construction start-up group and first-line supervisor will verify that it is inoperable. The operating facility representative/construction start-up group will attempt to operate the piece of equipment machinery, or process. After verifying it is inoperable, the switch will be returned to the "off" or "neutral" position.

Stored or residual energy will be dissipated by whatever means are necessary. Capacitors will be discharged and high capacitance elements short-circuited and grounded by a qualified electrician.

Re-Energizing Equipment and Processes

When the required work is completed and the machinery, equipment or process can be returned to service, the first-line supervisor will contact the operating facility representative/construction start-up group to notify of completed work operations.

The first-line supervisor will make a visual inspection of the equipment, machinery, or process to insure all workers have completed their work and equipment, tools and other material is removed from the area.

After confirming all workers, materials, tools and other equipment are out of the area, the operating controls are still in the "off" or "neutral" position, and each worker has removed their safety lock and tag, the first-line supervisor will remove their safety lock and tag from each of the isolating devices.

If a worker fails to remove his or her safety lock at the completion of the job or assigned duties, their immediate supervisor will immediately notify management and the W.T. Rich Environmental Health and Safety Department. **Every attempt should be made to contact the worker and require them to return to the project to remove their lock.** If the worker is unwilling or cannot return to the project, it must be verified that he/she is not physically at the project site before the safety lock can be removed. All safety lock removal incidents will be investigated following the incident investigation process and disciplinary action will occur.

The management representative will notify the operating facility representative/construction start-up group that the equipment, machinery or process is clear to be energized.

De-Energizing Fluid Processes

Any vessel, pipe, hose or process that contains a hazardous liquid or gas will be purged with nitrogen or flushed before work begins as described in the pre-task plan for the activity.

A management representative will coordinate with operating facility representative/construction start-up group when any fluid process requires de-energizing.

The management representative and operating facility representative/construction start-up group will identify all valves or gates and where blanks are required to be installed to isolate the work area. The operating facility representative/construction start-up group will notify their personnel that may be affected by the de-energizing.

The first-line supervisor overseeing the work will sign out sufficient safety locks and tags to completely isolate the system.

The operating facility representative/construction start-up group and first-line supervisor will verify that each valve or gate is in the "off", "neutral," or closed position.

Once the valve or gate is in the "off", "neutral," or closed position, the operating facility representative will place a safety lock on the valve or gate first. Then the first-line supervisor will apply a safety lock to each valve or gate. The first-line supervisor will also apply a visible warning tag with the name of the first-line supervisor, company, date and phone number.

Once the first-line supervisor has placed their safety lock(s) and tag(s) on the energy-isolating device, all affected workers will then apply a safety lock and tag to the energy-isolating device. Alternatively, the first-line supervisor may place the key(s) to their equipment safety lock(s) in a safety lock box, place their individual safety lock and tag on the safety lock box and then have each affected worker place their safety lock and tag on the lock box. The required blanks will be placed at this time.

Prior to commencing work, the operating facility representative and first-line supervisor will verify the system and all piping, hoses, valves and processes are de-energized and that any stored energy is dissipated or restrained.

Welded valve connections should have the valve handles removed and the stem tagged "**Do Not Operate**." All other valves and isolating devices must be physically prohibited from being operated.

Hydraulic and pneumatic equipment or machinery will be blocked to prevent movement.

Re-Energizing Fluid Processes

When the required work is completed and the system can be returned to service, the first-line supervisor will contact the operating facility representative/construction start-up group to notify them of completed work operations.

The first-line supervisor will make a visual inspection of the area to ensure all workers; equipment, tools, and materials are removed from the area.

After confirming all workers, equipment, tools and materials are removed from the area, the valves and gates are in the "off", "neutral," or "closed" position, and each worker has removed their safety lock and tag, the first-line supervisor will remove their safety lock and tag from each of the isolating devices.

The management representative will notify the operating facility representative/construction start-up group that the system is ready to be energized.

Masonry Construction

A limited access zone is required to be in place prior to the construction of any masonry wall.

Masonry walls over eight feet in height shall be adequately braced to prevent collapse and bracing shall remain in place until permanent support is in place.

Mold Control

All work areas must be maintained to prevent the formation of mold, which grows when there is water and a nutrient source (i.e. wallboard, wood, and/or other building material).

Work will be planned to:

Prevent moisture accumulation

Double check points where moisture may enter:

- Doors
- Windows
- Flashings and caulking
- Waterproof membranes (proper lapping at joints and corners)
- Roofing systems and penetrations

Properly store material

- Dry location
- Off the ground
- Loose tarps or sheets to allow air flow

Have drying equipment readily available

- Fans
- Dehumidifiers
- Wet-dry vacuum

If mold is observed, notify W.T. Rich so that an evaluation of the exposure can be done and an abatement plan developed.

Personal Protective Equipment (PPE)

All W.T. Rich, subcontractors, vendors, and third party individuals will at a minimum wear the following personal protective equipment while on this project (except in office and lunch areas).

Head Protection

Hard hats will be worn at all times on this project, in accordance with the following:

- Hard hats will be worn according to manufacturer requirements.
- Company name displayed on hardhat
- Hardhats that have a manufacturer date of five years or greater will not be worn
- Meets ANSI Z89.1 requirements

Eye and Face Protection

Safety glasses with side-shields that meet ANSI Z87 criteria are required to be worn at all times. Prescription glasses must meet ANSI Z87 requirements or employees will be required to wear “over the glasses” (OTG) safety eyewear.

In addition, the following eye/face protective equipment must be used when performing the following work activities:

Activity	Safety Equipment
Welding	Welding Hood and safety glasses
Burning	Burning Goggles with Shield
Abrasive grinding or cutting	Face Shield and safety glasses
Drilling	Goggles or Face Shield and safety glasses
Reaming	Face Shield and safety glasses
Chemical Handling	Goggles and Face Shield
Molten Materials	Goggles and Face Shield
Corrosive Liquids	Goggles and Face Shield
Concrete Pouring	Safety glasses with side shields

Foot Protection

Sturdy work boots that are in good condition must be worn (heel and sole will not show excessive wear). Tennis shoes, sandals, or other street-type shoes are not allowed, even if they have steel toes.

High Visibility Attire

Every worker, visitor, and vendor will wear Class 2 high-visibility attire at all times meeting the requirements of the most recent ANSI 107 standard. In some cases Class 3 attire may need to be worn. Consult with the ANSI classification requirements. Reflective vests that have reduced reflectivity due to age, wear or soiling must be replaced immediately.

Work Attire

Shirts will have a minimum sleeve length of three (3) inches. Tank tops and cut-off shirts are not permitted.

Long trousers that fit properly around the waist and ankles are required. Trousers that are worn low on the hips or thigh are not allowed. The length of the trouser will be such as to not present a tripping hazard. Shorts are not permitted.

Respiratory Protection

A competent person will determine if a hazard exists that requires respiratory protection prior to start of work. Written documentation supporting this hazard assessment will be made available to W.T. Rich upon request.

Whenever respiratory protection is deemed required or requested by a worker on this project, the requirements outlined in OSHA 29 CFR 1926.103 will be followed, which include:

1. Have workers complete a Medical Questionnaire for Respirator Use.
2. Submit questionnaires to a physician or Licensed Health Care Professional (PLHCP) for review and further testing.
3. Once medical approval to wear a respirator is received from the PLHCP, select the appropriate type of respirator to protect workers from the hazard(s).
4. For air purifying respirators, choose the appropriate filter/cartridge.

5. For supplied air respirators, ensure breathing air source provides “Grade D” breathing air.
6. Train workers about the specific type of respirator being used.
7. Fit-test the workers with the specific type of respirator being used.

If a worker decides to voluntarily wear a filtering face piece (dust mask) and a respirator is not required, the first-line supervisor must inform the worker about the limitations of the selected respirator. The worker must complete, sign, date, and submit the “Voluntary Use of a Disposable Respirator” form (Appendix N) or its equivalent.

Hearing Protection

Approved hearing protection will be worn as specified in posted areas and while working with or around high-noise level producing machines, tools, or equipment. A good rule to follow is: When you must raise your voice to be heard, you need hearing protection. Exposure to impulsive or impact noise will not exceed 140dB noise level.

The following permissible noise levels, per OSHA 29 CFR 1926.52, should not be exceeded:

Hours per day	Sound Level DBA Slow Response
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

Impulsive Or Impact Noise	
Equipment or tools	Sound Level Created*
Pneumatic chip hammer	103-113
Jack hammer	102-111
Concrete joint cutter	99-102
Chop saw	88-102
Stud welder	101
Bulldozer	93-95
Crane	90-96
Hammer	87-95
Backhoe	84-93
* based on an 8 hour exposure	

Hand Protection

Hand and finger protection with a minimum Level 3 cut resistance rating in accordance with ANSI/ISEA 105-2005 is required on this Project for anyone handling tools or material. It is each employer’s responsibility to determine and enforce the appropriate type and level of protection required for its employees based on 29 CFR 1910.138 and 1926.95(a) for the work and tasks being performed. Evaluate each situation to ensure the appropriate type of hand (and forearm, if applicable) protection required. Exclusions to the hand protection policy must be noted in the daily pre-task plan and determined that no laceration exposure is present.

Additional Protections

W.T. Rich may require workers to wear additional personal protective equipment to reduce the likelihood of a work related injury or illness.

Pile Driving

No pile driving work will occur until it is verified that no underground utilities exist where piles will be driven or existing underground utility locations have been verified by hand or vacuum excavation.

Fall protection will be required when personnel climb leads over six feet.

Hose connections will be secured by at least ¼ inch diameter chain or equivalent wire rope to prevent whipping.

Stirrups will be provided on sheet piling to aid in guiding the pile in place.

For pile other than sheet piles, a driving head or bonnet is required to bell the head.

Stop blocks are required for the leads to prevent the hammer from striking the head block.

A designated signalman will be assigned to give direction to the winch-men.

Equipment will meet the OSHA Construction standards on cranes and derricks.

Pits or excavations that piles are being driven into shall be properly braced, sheet-piled, or sloped and barricades shall be provided.

When pile tops are cut, operations will stop for a distance not less than the longest pile that is to be cut.

When driving jacked piles, the pits will be provided with ladders and curbs to prevent material from falling into the pit.

Rigging

Riggers must be properly trained and qualified to rig material or equipment lifted by a crane. Training documentation will be submitted to W.T. Rich.

Hooks will be equipped with safety latches. Safety latches on hooks that are disabled and/or shakeout (“pelican”) hooks will not be used unless in compliance with 29 CFR 1926 Subpart R.

All rigging equipment and spreader bars shall have a manufacturer’s tag or otherwise professionally engineered mark noting its safe working load. Rigging equipment and spreader bars not tagged or marked will be immediately removed from the project.

All rigging will be inspected daily before each shift by the qualified rigger and documented in writing. Inspection reports will be made available to W.T. Rich upon request.

Scaffolding

All scaffolding used on this project will meet the requirements established in Subpart L of OSHA 29 CFR 1926.

Workers engaged in scaffold related work activities will be protected from falls when working at height of six feet or greater. Please refer to Fall Protection Section.

Perry or Baker style scaffold will be equipped with handrails at 4ft.

Each contractor using scaffolds must designate a competent person to direct and supervise the erection and dismantling of all scaffolding on this project. The competent person will sign and attach one of the following color-coded scaffold tags to each scaffold:

- **Green Tag: Scaffolding complete and ready for use.**
- **Red Tag: Scaffolding incomplete and not for use.**
- **Yellow Tag: Scaffolding usable but personal fall protection required.**

The competent person will inspect the scaffolding daily prior to use and sign the tag at the time of inspection. The Daily Scaffold Safety Inspection Report (Appendix L) will be used to document these inspections.

Workers required to work from scaffolding will receive training on the following:

- Nature of any known hazards, such as electrical, fall, or falling objects.
- Correct method of erecting, maintaining, and disassembling fall protection systems.
- Falling object protection system.
- Proper handling of equipment or material on the scaffold.
- Maximum load-carrying capacity of the scaffold.
- Any other pertinent requirements about the scaffold.

During erection and dismantling of scaffolding, if deviation from the fall protection procedure is required, the Safety Dept, Vice President and CEO will be required to approve.

Records must be maintained of scaffolding training and be available for review by W.T. Rich.

Prior to erection, all scaffolding components shall be inspected for defects and any damaged components will not be used.

Scaffolding will be erected on a firm foundation/footing. Scaffold poles, legs, posts, frames, and uprights will bear on metal base plates, and mud sills

Scaffold legs, poles, posts, frames and uprights will be pinned or locked to prevent uplift.

No scaffold will be enclosed unless a qualified engineer designs and approves the attachment to the adjacent structure.

Scaffold platforms will be constructed with no space between the platform components. The space between the platform components and the scaffold uprights will not exceed one inch.

Because of special circumstances such as building a scaffold around a pipe, the space opening between the scaffold and the object/structure cannot exceed 9½ inches.

Scaffold planks shall extend past the horizontal support a minimum of six inches and not more than 12 inches unless cleared or restrained by hooks.

Scaffold plank will not be overlapped unless:

- Overlap occurs at a horizontal support
- The minimum planking overlap is 12 inches

Only scaffolding-grade planking shall be used.

Ladders or stairs must be used to access any scaffold platform that is more than two feet above or below the point of access. End frames of tubular welded scaffold can be used as a ladder if the following criteria are used:

Specifically designed and constructed as ladder rungs

- Rung length of at least eight inches
- Spacing between rungs not to exceed 16 ¾ inches
- A walk through frame or gate is provided for access at each landing

No worker will climb up or down a scaffold using the cross bracing.

Workers working below scaffolding will also be protected from falling objects. Scaffold will be equipped with toe plates, screening, debris netting, catch platforms, or a canopy structure.

Aerial Lifts

The gates of aerial lifts will be properly engaged whenever the lift is in use.

Travel in aerial lifts is prohibited while platform is elevated

Aerial lifts shall not be used as material hoists unless the load is contained within the basket and meets the lift's rated capacity. The lift shall not be modified for hoisting material unless the manufacturer approves it in writing.

Use proper fall prevention/protection in accordance with manufacturer's requirements in all boom supported elevating work platforms.

No shock absorbing lanyards will be permitted while using articulating boom lifts. Only work restraint devices or retractable will be permitted in lifts.

Feet of the worker will remain on platform deck at all times.

Training records will be provided to W.T. Rich prior to the use of Aerial Lifts.

Suspended Scaffolds

A competent person will evaluate suspended scaffolding, anchorages, and suspension lines before each use.

Workers working from suspended scaffolding will wear a full body harness attached to an independent vertical lifeline.

When welding is required from swing stage scaffolding, the scaffold will be grounded and suspension ropes protected.

Mobile Scaffolds

Interior or dry wall scaffolding (Perry or Baker type scaffolding) greater than one section high will be equipped with outriggers. All other built-up scaffolding will follow the four to one rule.

Scaffold 4ft or higher will be equipment with handrails.

Perry or Baker style scaffold will be equipped with handrails at 4ft.

Wheels on mobile scaffolding will be locked in place when workers are working from it (self propelling is prohibited).

Scissor lifts shall be used in accordance with 29 CFR 1926.452 (w). The procedures outlined in the manufacture's operations manual must be followed when using a scissors lift.

Mast-Climbing Work Platforms (ANSI A92.9-1993)

An erection and dismantling plan shall be provided by the manufacturer and submitted to W.T. Rich prior to mobilization.

Fall protection shall be provided when wall openings exist on the façade of the building in front of the work platform, the distance to the façade exceeds that permitted, the platform passes an in-set in the façade or it extends past the façade.

In accordance with ANSI requirements, unless the scaffold is equipped with an emergency decent device an evacuation plan from the platform must be developed.

Building access is prohibited underneath scaffold platforms unless protective walkway is provided.

System specific training must be provided to all workers who will be on the work platform.

Silica

Workers that perform any of the following work tasks must be protected from exposure to silica dust unless historical data or real time air monitoring indicates it is not t necessary. Subcontractors will be required to submit such data to W.T. Rich.

- Chipping, hammering, or mixing of refractory
- Abrasive blasting using silica sand as a blasting medium
- Abrasive blasting of concrete regardless of the type of medium
- Sawing, hammering, drilling, grinding, or chipping of concrete or masonry products
- Chipping, hammering, or mixing of concrete grout
- Demolition of concrete or masonry structures
- Dry sweeping or compressed air blowing of concrete, masonry, rock, or sand dust

Workers performing any of the above tasks who could be exposed to silica dust shall receive training regarding health hazards associated with silica.

Acceptable engineering controls, such as those listed below, will be used when exposure to silica is likely.

- Substitute blasting medium for less hazardous material with less than 1% silica
- Maintain an effective dust control program
- Use internal blast-cleaning machines
- Wet Saw
- Use water through the drill stem

When acceptable engineering controls cannot be used, workers will wear respiratory protection, protective coveralls, and gloves. At a minimum, respirators must be half-face piece elastomeric respirators with N95 filters, per NIOSH recommendations.

Workers will also comply with these hygiene requirements when exposed to silica:

- No eating, drinking, or using tobacco products in areas where silica dust is present.

- Always wash hands and face before eating, drinking, or using tobacco products after working around silica dust.

Structural Steel Erection

The project team will ensure that all aspects of steel erection are properly managed. Part of that management process involves implementing and maintaining controls designed to identify and plan for the risks associated with the activities of erecting, decking, rigging, crane set up, steel delivery, and related activities.

Objective: This section is designed to:

- Establish the minimum requirements to perform steel erection in accordance with 1926.750-761.
- Serve as the minimum mandatory guidelines.

Submittals:

The steel erector must submit a site-specific steel erection plan written by a qualified person prior to commencing work. The plan shall contain at least the following:

- Site Layout
- Sequence of erection
- Deliveries
- Staging & Storage
- Path of overhead loads
- Crane Set up
- Fall protection procedures
- Training documentation
- Qualified and Competent person(s)
- Critical Lifts

General Requirements:

The Project Team will ensure that adequate access roads and a firm, properly graded, drained area, readily accessible to the work with adequate space for the safe storage of materials and the safe operation of the erector's equipment.

It shall be assured that the concrete in Footings, Piers, Walls, and/or mortar in Masonry Piers and walls are in accordance with ASTM standard test method and has reached 75% (Percent) of its intended minimum compression design strength and signed off by a qualified person. The Engineers test results shall be documented and sent to the steel erector prior to steel erection commencing utilizing the “Notice to Commence Steel Erection” Form (see APPENDIX K).

Prior to the erection of a column, W.T. Rich will provide written notification to the steel erector if there has been any repair, replacement or modification of the anchor rods (anchor bolts) of that column. This shall be documented by utilizing the “Notice to Commence Steel Erection”

Form (Appendix K) and given to the steel erector prior erecting any columns on those anchor bolts.

Annual 3rd party crane certification must be obtained from subcontractor before work begins. See crane section for more details.

Erector will submit a Winter Conditions plan to W.T. Rich that addresses, snow and ice removal, procedures to inspect work areas, etc.

Erection Requirements:

Pre-shift visual inspection of the crane by a competent person must be done before the work begins on that shift and a copy of this inspection must be given to W.T. Rich before the shift starts.

All rigging shall be inspected before each shift by a qualified rigger and a written copy given to W.T. Rich before the work begins on that shift. Defective rigging equipment shall be removed from service immediately. At a minimum the inspection shall meet 1926.251, which shall include but not limited to the following:

- Rigging equipment shall not be loaded in excess of its recommended safe working load
- Rigging equipment, when not in use, shall be removed from the immediate work area
- Special custom design grabs, hooks, clamps, or other lifting accessories shall be marked to indicate the safe working loads and shall be proof-tested prior to use
- Slings covered are those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three strand construction), and synthetic web (nylon, polyester, and polypropylene).
- Welded alloy steel chain slings shall have permanently affixed durable identification stating size, grade, rated capacity, and sling manufacturer.
- Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments, shall not be used.
- Hooks will be equipped with safety latches. Pelican hooks used for shaking out structural steel will be in compliance with 29 CFR 1926 Subpart R. At no time shall structural steel be raised above five (5) feet during this activity.
- Natural and synthetic fiber rope slings shall be immediately removed from service if warning threads are exposed.
- Tag lines will be used while hoisting structural steel.

Protection from falling objects and the travel paths during the process of steel erection shall be reviewed daily to insure that no loads are swung over and that no objects could fall on any persons.

It must be assured that proper fall protection is in place and reviewed daily by the competent person and that a written copy is given to W.T. Rich with the daily report.

Workers engaged in steel erection activities including but not limited to connecting, decking, and bolt up are *not exempt* from W.T. Rich's 100% fall protection requirements when working from six feet or greater.

During decking operations metal decking shall be laid tightly and immediately secured upon placement. All floor openings shall be protected immediately. They shall be protected by constructing guardrails around them or by covering the hole. These types of protection must be in accordance with Subpart M. All shafts located in the building shall be decked over at every other floor at a minimum. All decking shall be designed to 50 lbs per square foot.

Multiple Lift Rigging (Christmas Treeing):

Multiple lift rigging means a rigging assembly (manufactured by wire rope rigging suppliers) that facilitates the attachment of up to five independent loads to the hoist rigging of a crane.

Design criteria for any multi-lift device will be submitted to W.T. Rich for review.

A multiple lift may be performed only if the following criteria are met:

- A multiple-lift rigging assembly is used.
- A maximum of five (5) structural members are hoisted per lift.
- Only beams and similar structural members are lifted.
- All employees engaged in the multiple lift have been trained in these procedures.
- No crane is permitted to be used for a multiple lift where such use is contrary to the manufacturer's specifications and limitations.
- Multiple-lift rigging assembly capacity, for the total assembly and for each individual attachment point, must be certified by the manufacturer or a qualified rigger, be based on the manufacturer's specifications, and have a 5-to-1 safety factor for all components.
- The total load must not exceed the rated capacity of the hoisting equipment specified in the hoisting equipment load charts and the rigging capacity specified in the rigging rating chart.
- The multiple-lift rigging assembly must be rigged with members attached at their center of gravity and maintained reasonably level, rigged from top down, and rigged at least 7 feet apart.
- The members on the multiple-lift rigging assembly must be set in position from the bottom up.
- Controlled load lowering must be used whenever the load is over the connectors.

Floor Turnover:

This policy has been implemented to assure that, when the steel decking is complete on a given floor, a mechanism is in place to accept the completed floor to enable other trades to safely commence work on that specific floor. This inspection shall be conducted by a W.T. Rich rep in conjunction with the steel erectors representative. When turning over a floor, a copy of the Floor Turnover Form will be given to the steel erector by W.T. Rich. There are several items that must be completed prior to allowing other trades to access and perform work on a floor. If all the items below are not completed, the floor is not to be turned over.

Required items prior to floor turnover:

1. Overhead protection, being the next floor, must be complete in the area to be turned over.

2. All openings on the floor above are to be decked over. Large shaft openings that are not planned to be decked over (i.e. elevator shafts, stairs wells, etc.) are to be covered with wood until proper guardrails and pour stops are installed.
3. All openings on the floor to be turned over are to be decked over or otherwise covered. Large openings (i.e. elevator shafts, stair wells, etc.) must have proper guardrails in place.
4. All pour stops on the perimeter of the building and all interior shafts must be in place. These act as the toe board (i.e. overhead protection) to the workers below these areas until the floor is poured and wood toe boards/vertical netting are installed.
5. Access to the floor must be provided. If gang ladders are to be used and more than 25 workers are going to be in the area, a double cleated ladder is required or two access ways.
6. All perimeter cables must be tight and do not deflect more than 3 inches, this includes the mid rail. Same goes for the interior shaft openings.
7. All top rails of the cable guardrail systems must be flagged for visibility with high visibility material.
8. No holes or gaps around the columns.
9. Housekeeping must be completed by the ironworkers or their labor force.

Should any of the items above be deficient, the floor is to be rejected until it is corrected. If rejected, the bottom portion of the Appendix in the SSSP is to be completed and a copy given to the representative from the steel erector. If all items above are satisfactory, the top portion of Appendix is to be completed and a copy given to the steel erector's representative.

It is permissible to turn the floor over in sections given that all the above items are 100% in the given area, there is means of access to this particular area, and there is a clear delineation between the area turned over and the area not turned over.

Required Training:

Prior to steel erection starting the following specified training shall be required of the erection crews for the following work:

- Fall Hazards – Associated with 100% protection above 6 feet
- Multiple lift rigging procedures – For all iron workers that are involved with this work.
- Connector procedures – For all ironworkers that are involved with this work.
- Controlled Decking Zone procedures – For all ironworkers that are involved with this work.

Structural Steel Erection-Safety in Design and Management: planning needs to be conducted during the design phase by the project team prior to structural steel fabrication. The exterior columns will be pre punched at pre-determined elevations to necessitate the installation of a cable fall protection exterior guard rail system. Once cables are installed, vertical debris netting will be attached where required and fastened to the deck to provide falling object protection.

Interior columns will need to be pre-punched at pre determined heights to necessitate installation of static horizontal cable systems for use by deckers needing to tie-off to protect

against the leading edge fall exposure. Design on the fall protection system for deckers will be by the steel erector.

Temporary Barricades

Temporary barricades will be erected to warn or protect workers whenever hazards or processes, such as those listed below, are encountered on this project.

- Floor or wall openings
- Working above other workers
- Open excavations/trenches
- Unguarded equipment
- Overhead loads
- Closed stairwells
- Exposure to vehicular traffic
- Low light work areas
- Startup operations and testing of equipment/systems
- Process hazards such as discharges, open systems, etc.

When barricading is required, the following guidelines should be followed:

- **Yellow "Caution" tape** is used to limit the passage of workers through the barricaded area. This barricading should only be used to protect workers from hazards that are not severe or the potential for severe injury or death is unlikely.
- **Red "Danger" tape** is used to prohibit the passage of unauthorized workers through the barricaded area. This barricading should be used to protect workers from hazards that have the potential to cause serious injury or death. Danger tape is not to be used if the hazards cannot be eliminated or removed during a single work shift.
- **Rigid barricades** are used when protection is required beyond a single work shift. They will be used to protect workers from unguarded moving machinery/equipment, vehicular or heavy equipment traffic, and low light conditions. Rigid barricading will consist of standard guardrail, temporary chain link fencing, tube and coupler scaffold members with blue construction fencing attached and concrete barriers.

When using "Caution" or "Danger" tape barricading:

- Install at least six feet from excavations, trenches.
- Reinforced "Danger" tape or ¼ in high visibility rope at least six feet back from edge shall be used for holes, leading edges, and floor or wall openings. A hard barricade is preferred.
- Install a standard "Caution" or "Danger" sign that identifies the hazard at regular intervals around the barricaded area and the name and contact information for the individual who erected the barricade
- Do not impede stairs, walkways, driveways, or aisles without notifying W.T. Rich and identifying alternative passageways

When using rigid barricading:

- Support construction fencing to prevent tipping or sagging.
- Install pins in concrete barriers whenever there is a danger of vehicles or heavy equipment striking them
- Provide adequate access to the work area

When work is complete and the hazard is eliminated, remove the barricading immediately.

Workers who enter a “Danger” or “Radiation” barricaded work area without authorization will be subject to disciplinary action up to and including termination.

Tools, Hand and Power

All hand and power tools will be kept in good condition with regular maintenance. Hand and power tools are to be operated according to manufacturers’ instructions and guidelines and the personal protective equipment appropriate for the hand or power tool will be worn.

Hand Tools

- Impact tools such as chisels, wedges, etc. are not to have mushroomed heads
- Wooden handles will not be splintered or cracked
- Pocketknives will not be used for stripping wire

Electric Tools

- Never lift or carry a power tool by its cord
- Guards and safety switches will not be removed or made inoperative
- Electric tools must have a three-wire cord unless they are double insulated

Portable Abrasive Wheel Tools

- Guards will not be removed
- Grinding disks and wheels will be checked to verify they are the correct one for the grinder and speed.

Pneumatic Tools

- Air hoses ½ inch in diameter or greater will have a safety excess valve installed at the source of air.
- Clips, whips or retainers are required at each air hose coupling and to prevent attachments from being ejected from the tool.
- Only pneumatic nail guns requiring the muzzle to be pressed against the work surface to fire are allowed.
- Hose couplings will be secured to prevent displacement.
- Pneumatic nail guns shall be disconnected from the air supply when unattended.

Powder Actuated Tools

- Workers will be trained to operate a powder actuated tool and required to carry their training card at all times.
- Fired cartridges shall be placed in a container or bucket and properly disposed.
- The powder-actuated tool must not be able to fire until it is placed against the surface with a force of five pounds or greater.
- Misfire cartridges shall be disposed of properly.

Traffic Maintenance and Protection

There will be no temporary blocking or occupying of any street or alleyway without prior approval of W.T. Rich and local authorities.

When it becomes necessary to temporarily close a public street or alley, a written traffic control plan is required showing how the closure will occur. The plan must be submitted to W.T. Rich for review. Refer to the Manual of Uniform Traffic Control Devices (MUTCD) Part VI when developing a traffic control plan.

At a minimum, the written Traffic Control Plan will contain:

- Time the street(s) will be required to be closed.
- Detail drawing showing temporary signage, tapers, etc.
- Detail plan illustrating detour routes for traffic impacted by the closed streets.

All workers and supervision will wear high visibility attire in accordance with the ANSI requirements.

Workers assigned as flaggers will be trained as recommended in the Manual of Uniform Traffic Control Devices and state DOT. Trained flaggers are required to direct all construction traffic entering and leaving the project site.

Work that fails to follow the traffic control plan or occupies a city street or sidewalk without authorization will not be allowed.

Welding and Cutting

When burning or welding using compressed gases, flame arrestors will be installed on both the torch side and regulator side of the oxygen and gas hoses. All compressed gas cylinders shall be tagged or labeled with the name of the subcontractor responsible for them.

Arc Welding and Cutting

Welding current return circuits or grounds must carry their current without hot or sparking contacts and without passage of current through equipment or structures. Specifically, welding current must not be allowed to pass through any of the following materials:

- Acetylene, fuel gas, oxygen, or other compressed gas cylinders.
- Tanks or containers used for gasoline, oil, or other flammable or combustible material.
- Pipes carrying compressed air, steam, gases, or flammable or combustible liquids.
- Conduits carrying electrical conductors.
- Chains, wire ropes, metal hand railings or ladders, machines, shafts, bearings, or weighing scales.

Whenever practical, all arc welding and cutting operations shall be shielded by non-combustible or flame-proof screens.

The ground for the welding circuit shall be mechanically strong and electrically adequate for the service required and should be attached directly to the work piece.

When possible, electrode and ground cables shall be supported to prevent obstructions interfering with the safe passage of workers.

Cables with worn insulation may not be used.

Gas Welding, Cutting, and Soldering

A suitable cylinder cart, chain or other secure non-flammable fastening shall be used to keep cylinders from being knocked over while in use.

Cylinders of oxygen shall not be stored next to cylinders of acetylene or other fuel gas. They will be separated by 20 feet or by a non-combustible 5 ft barrier with a half-hour fire rating.

Oxygen cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free of and away from oil and grease. Oil or grease in the presence of oxygen under pressure may ignite violently.

Empty cylinders shall have their valves closed. Valve protection caps shall always be in place except when cylinders are in use or connected for use.

When moving cylinders by a crane or derrick, a cradle, boat or suitable platform shall be used. Slings, hooks or electric magnets shall not be used. Valve protection caps shall always be in place.

Compressed gas cylinders, empty or full, shall be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being moved. Empty cylinders should be marked Empty or MT for identification.

Regulators and hoses shall be frequently inspected for leaks, worn places, and loose connections. Regulators shall also be checked for operable gauges.

Approved flash arresters shall be provided in both oxygen and acetylene hoses at the regulator connection.

Post Tension Cabling

Workers authorized to stress cables shall be trained in the proper use and function of all equipment.

All equipment shall be properly inspected and tested by an independent agency prior to being placed into service on the job. All equipment shall be compatible with each other and / or marked so crews know exactly which units are compatible. Equipment shall be inspected daily prior to the start of work. Equipment repairs shall only be performed y qualified technicians under controlled conditions.

Warning lines and signs shall be installed to isolate the area immediately involved with the stressing of cables. No workers shall be allowed to be on the slab and inside of the warning lines while cables are being stressed unless directly involved with the stressing operation.

No worker shall be within 5 feet either side of the cable being stressed.

A safety meeting shall be held for all hands on the project to discuss the hazards of stressing cables. Workers shall be instructed to stay out of the areas marked with warning lines and signs.

Workers assigned to perform the stressing operation shall watch out for any unauthorized workers walking into the area.

Workers shall never stand in such a position as to be in direct line with the cable being stressed. Workers shall never stand directly over the ram or the cable during the stressing operation. Workers shall inspect cable, wedges and head prior to stressing.

Quality of Life Requirements

Smoking Policy

W.T. Rich encourages a Smoke-Free Workplace. No worker will smoke any tobacco product on this project designated as Smoke-Free. In Smoke-Free workplaces, smoking is only authorized in designated areas or inside your personal vehicle, if permitted while on the owner's property. Workers that violate this rule will be subject to immediate termination.

Sanitation

Toilet Facilities

Adequate bathroom facilities will be available at the jobsite field office for use by subcontractor personnel.

Drinking Water

Every day contractors will provide fresh clean drinking water to their employees. Drinking water will be dispensed in containers with a tight sealing lid and labeled as "Drinking Water." Drinking water containers are to be cleaned daily.

Adequate cups will be made available at each drinking water container. Cups will be stored in a durable, clean dispenser. A trash can or other type receptacle will be provided to collect used cups. Contractors are responsible for cleaning up around the water container area.

The dipping of cups into the container, storing soda cans and bottles, drinking directly from the spout, or placing of hands or material into drinking water are prohibited.

Emergency Procedures

Each project team shall develop an Emergency Action Plan; each project team shall develop the following:

- Owner requirements and procedures
- W.T. Rich Crisis Management and site logistics protocols
- Coordination with local emergency response personnel

The Emergency Action Plan will be posted throughout the jobsite and communicated to workers during the safety orientation and weekly safety meetings.

Building Evacuation

Exit signs shall be conspicuously posted along evacuation routes.

A signal or alarm shall be designated to initiate evacuation. Temporary pull stations should be considered.

Personnel should de-energize tools and equipment and observe their work area for fellow workers in need of assistance.

Workers should observe stairs for safe passage before accessing.

Report any hazardous conditions that are known to exist within the building to your supervisor

A plan view drawing will be developed for each project's evacuation plan. This drawing will clearly identify the following:

- Building footprint
- Primary and secondary assembly areas
- Exits
- Fire alarm pull stations or air horn locations
- Site telephones
- Stairs
- Fire extinguishers
- W.T. Rich's project office
- First aid kit locations
- Emergency numbers

Medical Emergency

During the safety orientation, workers will be given information on how to summon medical assistance in case of a medical emergency. Workers should know the following information:

Emergency Phone Number:	911
Project Address:	(insert here)
City:	(insert here)

When reporting a medical emergency, the worker will state their name, the nature of the emergency, the severity of the emergency and where assistance is needed. A worker may be required to meet medical personnel and guide them to where the emergency is located.

Do not move an injured worker before medical assistance arrives unless further injury is possible.

Fire

In case of a fire, workers will evacuate their work area immediately and report to the pre-determined assembly area.

After reporting the fire, workers will evacuate the work area and report to the pre-determined assembly area that was stated during the safety orientation.

Severe Weather

Should weather conditions, such as severe thunderstorms or tornadoes, develop around or near this project; workers will follow the direction of their immediate supervisor. Work in areas where severe weather events are possible will have a contingency plan in place.

Emergency Action Plan

Project Management will ensure the Emergency Action Plan is communicated to all workers during orientation. Specific emergency procedures and emergency phone numbers will be posted in lunch areas, near all telephones and on project bulletin boards.

The plan shall be reviewed periodically by W.T. Rich to ensure continued accuracy and applicability. Daily Pre -Task Plans shall also address emergency egress from each work area.

The emergency action plan shall be reviewed by all workers and posted with a site plan in prominent locations accessible to all workers.

Emergency Action Plan

Project Name: _____

Work Location: _____

1. This is a project specific Emergency Action Plan communicating evacuation procedures, specific alarms, and assembly points, should an emergency evacuation become necessary because of severe weather, fire, hazardous chemical release, explosion or other emergencies that could cause worker harm.
2. It is each worker's responsibility to familiarize themselves with evacuation routes, alarms and assembly points in case an emergency evacuation of the work area is required.
3. **Caution:** Evacuation routes, alarms or assembly points for one emergency may differ from another emergency.
4. **In case of fire or medical emergency:**

Emergency Phone Number:	911 from landline
Alarm or Notification:	Air horn
Evacuation Route:	As determined by W.T. Rich and the location of the medical emergency
Primary Assembly Point:	See logistics plan.
Secondary Assembly Point:	See logistics plan.

5. **In case of severe weather:**

Alarm or Notification:	verbal communication of incident type and instructions.
Evacuation Route:	As determined by W.T. Rich and the location of the medical emergency
Assembly Point:	TBD

6. **In case of chemical release or explosion:**

Alarm or Notification:	verbal communication of incident type and instructions.
Evacuation Route:	As determined by W.T. Rich and the location of the medical emergency
Primary Assembly Point:	See logistics plan
Secondary Assembly Point:	See logistics plan
Spill Kit Location:	W.T. Rich field trailer
Remediation Contact:	Clean Harbers

7. Workers will immediately evacuate their work area upon hearing the alarm or being notified of the emergency and ordered to evacuate. No worker is exempt from evacuation even if the evacuation is a drill.
8. Workers are required to report immediately to their designated assembly point and be accounted for. Failure to report may cause another to risk danger in an effort to search for you. Do not leave the project without prior authorization from first-line supervision.
9. A designated W.T. Rich employee will call the identified Remediation Company to respond to chemical spills that require outside attention. An agreement must be made with the Remediation Company prior to identifying them as the remediation contact.

Project Hazard Communication Program

All workers on this project are entitled to know the properties and potential safety and health hazards of chemicals or substances that they may come in contact with on this project.

Each project will develop a written project specific Hazard Communication Plan. This plan will be posted in a location where workers can easily access and review the plan.

Each subcontractor will submit to W.T. Rich a Master Chemical and Substance Inventory List and a copy of the Material Safety Data Sheet (MSDS) of all known hazardous chemicals that are in their work area. Prime subcontractors will be responsible for obtaining all sub-tier subcontractors' Master Chemical and Substance Inventory Lists/MSDS and forwarding to W.T. Rich.

The Master Chemical and Substance Inventory List (Appendix G) or equal will be maintained, even if they do not have or will not use any hazardous chemicals or substances. *This is an OSHA requirement.*

Subcontractors will maintain a project specific MSDS on location for each hazardous chemical or substance listed on the Master Chemical and Substance Inventory List. Prime subcontractors will be responsible to ensure all sub-tier subcontractors have their project specific MSDS sheets at the project.

It will be the responsibility of each worker's supervision or project manager to assure Material Safety Data Sheets are received prior to, or at the time of delivery of, a hazardous chemical.

Project management and first-line supervision will ensure all hazardous chemicals are properly labeled in accordance with the MSDS. Containers that hazardous chemicals have been transferred into for use during a single work shift will be labeled as to contents.

Every worker on this project shall receive instruction from their employer on their Hazard Communication Program, the location of the Master Hazardous Chemical and Substance Inventory list, the location of the Material Safety Data Sheets, labeling requirements and specific safety or health instructions about the hazardous chemical or substance.

Recommended minimum Hazard Communication Training will consist of:

1. The contents of the program
2. Prior to use of or the potential exposure to any hazardous chemical or substance, workers are to be instructed in:
    - Physical and health hazards
    - Procedures to protect against the hazards
    - Engineering and administrative controls
    - Personal protective equipment
    - Emergency procedures in case of exposure or accidental spill
3. Labeling requirements
4. Whenever a new chemical or substance is introduced into the workplace, workers will be briefed of its hazards

The client, vendors, and subcontractors that may have business in or near a work area will be notified that hazardous chemicals are being used and the hazards they may encounter.

If a worker believes they have encountered a hazardous chemical or substance unfamiliar to them, they will immediately notify their supervisor. Project management or supervision will

attempt to identify the hazardous chemical or substance and initiate all precautions to handle and dispose of this material, if required, and to properly protect workers.

Hazard Communication Program

This plan will be reviewed by all W.T. Rich workers and posted in a prominent location accessible by all workers. This plan is a supplement to the site-specific safety plan.

Project Name: Worcester South Division

This is a project specific Hazard Communication Plan ensuring that information on hazardous chemicals and substances is communicated to workers in accordance with OSHA 29 CFR 1926.59 and the W.T. Rich Hazard Communication Program.

1. An inventory of known hazardous chemicals and substances used on this project has been conducted and listed on the Master Chemical and Substance Inventory which is located and can be reviewed at W.T. Rich Field Office.
2. A copy of the Safety Data Sheets (SDS) for known hazardous chemicals and substances used on this project are located and can be reviewed at W.T. Rich Field Office.
3. If a copy of a SDS cannot be located, contact your Project Manager, Superintendent, Foreman or W.T. Rich Safety Department.
4. Project management and first line supervision are responsible for obtaining SDS and ensuring they are received prior to, or at the time of delivery of, a hazardous chemical.
5. Hazardous chemicals will be properly labeled in accordance with the SDS. Containers that hazardous chemicals have been transferred into for use during a single work shift require secondary labeling.
6. Workers who work with, or may be potentially exposed to, a hazardous chemical or substance will be informed of the physical and health hazards and procedures to protect against those hazards. Included in the procedures are engineering and administrative controls, personal protective equipment, and emergency instructions for accidental exposure, emergency evacuations, or spill containment of the hazardous chemical or substance.
7. When new hazardous chemicals or substances are introduced into the work environment, workers will be informed of the physical and health hazards.
8. Employers, who may be working in a W.T. Rich work area where workers could be exposed to a hazardous chemical or substance, will be informed of where that hazardous chemical or substance is in use.
9. Workers performing non-routine tasks will be informed of chemical hazards associated with the work activity and the appropriate protection measures.

Subcontractor Requirements

Subcontractor Safety Orientation

In addition to the W.T. Rich project orientation, each subcontractor will conduct an additional safety orientation for their employees to ensure they understand the project safety requirements as well as their company's requirements.

Monthly Man-hour Report

At the end of each month subcontractors must submit total man-hours worked, including hours for tiered subcontractors using Appendix A or its equivalent.

Subcontractor Safety Submittals

Prior to beginning work, each subcontractor shall submit to W.T. Rich the following:

- Subcontractor written project specific safety plan.
- Name(s) of designated safety representative or professional and qualifications.
- Name(s) and training verification of designated competent persons as required by the scope of work for trenching, scaffolding, rigging, etc.
- A list of activities the contractor has identified that will be made available in the event light duty has been directed by a physician.
- Name(s) and training verification of trained and qualified equipment operators as required by the scope of work for cranes, forklifts, aerial lifts, etc.
- Name(s) and training verification of employees trained in first aid and CPR.
- Current annual crane inspections by a third party crane inspection firm for all cranes brought onto the project.
- Project specific Master Chemical and Substance Inventory Sheet and Material Safety Data Sheets for all hazardous chemicals and materials to be used or stored on the project.
- Training verification of OSHA or project required training as necessary. Verification shall include training rosters. Examples of OSHA or project required training may be:

Fall Protection	Confined Space	Respiratory Protection	Excavations and Trenches
Scaffolding	Crane Signals	Hazard Communications	Ladders

<u>On-Going Submittals</u>

Each subcontractor will be required to submit various on-going safety documents to W.T. Rich as required by the scope of work. These submittals may include the following:

- Subcontractor Monthly Man-hour Report (Appendix A).
- Incident Notification and Investigation Report (Appendix C) (Within 24-hours of any incident or near miss).
- Weekly "Tool Box" safety meeting minutes.
- Daily Pre-Task Safety Plan (Appendix F).

<u>Maintain While Working on the Project</u>

Throughout the course of the project, each subcontractor will maintain the following records or documents on site and make available for inspection by W.T. Rich:

- Subcontractor Work Site Safety Inspection
- Scaffold, Trench, Crane, and Forklift Inspections

W.T. Rich permits or forms, or their approved equivalent, shall be used.

Permits or Safety Plans as Required

Subcontractors will submit to W.T. Rich work permits or plans for review by W.T. Rich prior to start of work as required. Work permits or plans that are required include:

- Confined Space Entry
- Hot Work
- Excavation and Trenching
- Crane Lift Permit
- Fall Protection Plan
- Lockout/Tagout Checklist
- Other work plans as deemed necessary

Forms Appendix

Appendix A	Subcontractor Monthly Incident Summary Report
Appendix B	General Safe Work Practices Poster
Appendix C	Incident Notification & Investigation Form
Appendix D	Safety Training Roster
Appendix E	Guard Rail Removal Permit
Appendix F	Daily Pre-Task Plan
Appendix G	Master Chemical & Substance Inventory List
Appendix H	Hot Work Permit
Appendix I	Confined Space Entry Permit
Appendix J	Excavation Permit
Appendix K	Notice to Commence Steel Erection
Appendix L	Daily Scaffold Safety Inspection Report
Appendix M	Work Site Safety Inspection Form
Appendix N	Voluntary Use of a Disposable Respirator
Appendix O	Lockout/Tagout Checklist
Appendix P	Annual Inspection – Lattice and Telescoping Boom Crane
Appendix Q	Monthly Inspection – Lattice and Telescoping Boom Crane
Appendix R	Daily Inspection – Lattice and Telescoping Boom Crane
Appendix S	Crane Maintenance Checklist
Appendix T	Critical Lift Checklist
Appendix U	Tower Crane Checklist
Appendix V	Lift Plan – Example
Appendix W	Soil Bearing Chart
Appendix X	Pre-Demolition Survey
Appendix Y	Safety Deviation Ticket

Appendix A: Subcontractor Monthly Incident Summary Report

Project: _____

Subcontractor Name: _____

Sub-Tier Subcontractor To: _____

Reporting Period: _____ Month: _____ Year: _____

This form must be submitted to W.T. Rich no later than the 5th of each month. It is to be submitted even if no accidents occurred.

Note: Subcontractors that fail to submit this report may not receive payment.

Directions: *Report all injuries, no matter how minor as indicated below!* When reporting number of OSHA recordable medical cases that had lost work days, enter number of calendar days away from work (do not count first day of injury, but the weekends must be counted). Carry over days from a previously reported lost time case where the worker is still off work in this reporting period. Report the number of OSHA recordable medical cases that had restricted or light duty work and the total number of calendar days or restricted or light duty (do not count the first day of injury, but the weekend must be counted). Carry over days from a previously reported restricted or light duty case where the worker is still on restricted or light duty. Report number of first aid only cases for period as well.

	Man-hours Worked	First Aid Injuries	Medical Treatment Only	Lost Time Injuries	Days Lost	Restricted Work Injuries	Days of Restricted Work
Month							
YTD							

Person Making Report: _____ **Phone Number:** _____

Appendix B: General Safety Work Practices Poster

Clean and safe working conditions are absolutely essential for achieving a safe work environment, as well as for the promotion of construction efficiency and progress. Each worker on this project is valued not only for what they do, but for who they are. Everyone must maintain a strong personal desire to think and act safely, in an effort to create a safe work environment. The following general safe work rules are a partial list of the general rules that apply to each worker on this project. There will be no tolerance for any worker who carelessly or callously disregards these rules or other applicable health and safety rules.

1. It is the responsibility of each worker to perform his/her assigned duties so as to provide:
    a. Safety for themselves and their fellow worker
    b. Protection of the general public and all other workers
    c. Protection of equipment, materials and tools
2. Report all unsafe acts and conditions to supervision.
3. Report work related injuries or illnesses immediately to supervision.
4. Work only in conditions that appear to be safe.
5. Use proper fall protection when working six (6') feet or greater above the surface.
6. Wear the minimum personal protective equipment (hardhat, safety glasses, shirt, trousers, class 2 high visibility attire and work boots).
7. Use tools and equipment properly. Remove damaged or defective tools and equipment from service.
8. Lock out and tag equipment, machinery, and/or systems prior to working on them.
9. Maintain clean and orderly work areas.
10. Operate tools and equipment with proper guards and safety devices in place.
11. Request instruction from supervision when unsure as to the safe performance or procedures.
12. Obtain authorization and training prior to entering a confined space.
13. Operate equipment, machinery or any specialty tool (e.g. powder-actuated tools) only with proper training and authorization.
14. Wear eye and face protection when cutting, welding, grinding, chipping, or performing other tasks where the danger of flying debris exists.
15. Use safe lifting techniques when required to lift material or other loads.
16. Wear respiratory protection when the task or work area requires it.
17. Ride vehicles only in the cab with proper restraining devices.
18. No worker will be under the influence of drugs/alcohol or engage in any horseplay, fighting or gambling of any form.
19. Observe and comply with covered, barricaded, taped, or flagged areas. Do not remove, cross, or enter without proper authorization and protection.
20. No worker will intentionally discharge or remove fire-fighting equipment.
21. Radios and other audio distractions are not allowed in any work area.
22. Mobile phones, iPods and similar electronic devices will not be permitted while operating equipment and motor vehicles.

Appendix C: Incident Notification Form

Date of Incident:			**Date Incident Reported:**	
Employer Type: (Circle)	**W.T. Rich**	**Subcontractor**	**Vendor/Supplier**	**General Public**
Description of Incident:				
How could the incident have been prevented?				
Project Information				
Project Name:			**Project Number:**	
Operations Lead:			**Account Manager:**	
Safety Director:			**Home Office:**	
Injured Employee Information				
First Name:		**Last Name:**		**Middle Initial:**
Home Phone:	**Date of Birth:**	**Primary Language:**	**Marital Status** (Circle) Married Single Divorced Widowed Separated	
Other Phone:	**Craft /Position / Hire Date / ID Number:**			
Shift:	**Title:**			
Company Name:			**Phone Number:**	
Address:		**City:**	**State:**	**Zip:**
Supervisor Name:		**Supervisor Phone:**		
OSHA Recordable: yes / no		**Body Part Injured:**		
Side of Body Injured:		**Prescriptions Given:** yes / no		
Work Restrictions: yes / no		**Restricted Days Lost:** yes / no		
Lost Days: yes / no	**How many days?**	**Physician/Hospital Name, Address & Phone Number**		
Investigator Contact Information Name: Phone:				

Appendix D: Safety Training Roster

Project Name:		**Project Location:**
Course:		
Date:		**Presented by:**
	Name	**Signature**
This is to certify that I, the undersigned, have attended this W.T. Rich Safety Training course and understand the contents presented during the program.		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

Appendix E: Guard Rail Removal Permit

Work will not be performed until form is approved by a W.T. Rich representative.

Contractor: _____ Date: _____

Foreman's Name: _____

Write out specific **Location** (N, S, E, W, NW, SW, etc.) Include Guardrail location with column lines or gridlines (if known), **Level** (Level 1, Level 2, Suite A, Concourse 1 etc.)

	Location		**Level**

Employee(s) Performing Work:

Name	Signature

Considerations:

- Reason for Cable being dropped/removed?
- Number of Spans being affected?
- Total Length of Cable affected?
- Amount of time Cable will be down?
- What other contractors are working in the area?
- How will you continually notify other contractors?

Fall Protection Plan:	**yes**	**no**
• Does your company have a fall protection Program?	☐	☐
• Have workers performing work been trained in Fall Protection?	☐	☐
• Has this work been pre-planned?	☐	☐
• Will workers be tied off if within six (6) feet of down cable?	☐	☐

If <u>No</u> is answered to any of the above questions then the W.T. Rich Safety Department must be contacted for review prior to guardrail remove

Appendix F: Daily Pre-Task Plan

Subcontractor:	**Job Name:**	**Medical Emergency #:**
Foreman Name:	Task Description:	Fire Emergency #:
Date:	Emergency Assembly Location:	Other #:

Debrief from Previous Days Activities (Near Misses or Accidents, Any Activities Missing in Steps of Work):		

List All the Steps of the Job	**Identify All Specific Hazards Found (Foreman)**	**How will YOU Control the Hazards?**

Identify All Specific Hazards Found (Craft Worker)		

Hazards from Other Working in the Same Area:	**Potential Hazard**	**How Will You Control the Hazards?**

Environmental Exposures/Hazards from Today's Activities:	**Potential Hazard**	**How Will YOU Control the Hazards?**
Examples: *Hazardous Material Handling* *Equipment Leaks*		

PERMITS	**Signatures:**				
	Superintendent:		General Foreman:		
	Crew Members:		Foreman:		

Use the back of this form to list any additional steps and other information and crew signatures						

Appendix G: Master Chemical & Substance Inventory List

Subcontractor: **Date of Update:**

Date	Brand Name	Manufacturer	Chemical Name

Appendix H: Hot Work Permit

Permit #	Date

Location: _____

Company Name: _____ Shift: ☐ 1st ☐ 2nd ☐ 3rd

Location of Work: _____

Floor/Level/Elevation: _____

Description of Work: _____

Any Special Precautions: _____

Employees Performing Work:

Name:	Signature:

Fire Watch:

Name: _____ Signature: _____

Hot Work Requirements

Hot Work Activities:

1. Hot work activities include any spark-producing activity that includes welding, burning, and grinding.

Requirements:

1. Each foreman will complete permit and have authorized prior to performing any hot work activities.
2. Foreman will instruct employees as to work being performed, precautions to be taken, how to use a fire extinguisher correctly, emergency procedures in case of fire, and the duties of a fire watch.
3. Work area must be clear of combustible and/or flammable material within a 35' radius. If these materials are immovable, then fire blankets or other fire-resistive material must protect them.
4. A twenty-pound, or larger, dry-chemical fire extinguisher must be in immediate vicinity of work area.
5. Sparks and slag shall be confined to the work area. When working in elevated areas, protect areas below from sparks and slag.

Fire Watch Duties:

1. Continually check work area and all adjacent areas (above, below, around) to ensure free of fire during work activities, during breaks and for ½ hour after completed activities.
2. Trained in the proper use of a fire extinguisher and how to summon fire department or brigade.

Fire Extinguisher Use - Follow the P.A.S.S. method:

1. **P**ull the pin on the extinguisher.
2. **A**im the extinguisher nozzle at the base of the fire.
3. **S**queeze the handle.
4. **S**weep the base of the fire.

Approval

W.T. Rich Project Manager/Superintendent or Safety Representative: _____ Date: _____

Appendix I: Confined Space Entry Permit

Description – Required for all entries

Permit #: _____ Subcontractor: _____

Supervisor: _____ Location: _____

Type: ☐ Non-Permit ☐ Permit Date and Time of Entry: / / AM/PM

Location of Confined Space: _____

Type of Confined Space: ☐ Tank ☐ Pipe ☐ Manhole ☐ Tunnel ☐ Vault ☐ Other: _____

Work Description/Purpose of Entry: _____

_____

Hazards: _____

Verifications – required for all entries

	Date	Entry Supervisor's Initials
Lockout/Tagout (electrical, mechanical, hydraulic, etc.)		
Purged, Cleaned, Drained, and Ventilated		
Employee Training		

Required for all entries	Required	Verified	Additional Permit Required Controls	Required	Verified
Safety Department Notified	X	☐	Authorized Entry Log at Access	☐	☐
Adequate Access	X	☐	Fire Extinguisher Available	☐	☐
Adequate Lighting (low voltage)	X	☐	Attendant	☐	☐
Harness / Lifelines	X	☐	Warning Signs Posted at Access	☐	☐
Training	X	☐	Respirators Required? If required, what type? _____	☐	☐
Ventilation Adequacy	X	☐			☐
Communications Equipment	X	☐	Protective Clothing Required (describe)	☐	☐
Continuous Air Monitoring	X	☐	Rescue Equipment/Service Available (Tri-pod/winch or emergency services)	☐	☐
			Hot Work Permit Required	☐	☐

Attendant(s) Name(s):

Entrant(s) Name(s):

* Attach a separate log if more entrants are involved in permit required confined space activity than allowed for on this form.

Air Monitoring – required for all entries

Make: _____ Model: _____ ID# _____

Field Calibration Date: _____ Calibrated By: _____

Atmosphere Checked By: _____

Contaminants	Permissible Levels	1st Check*	Time	2nd Check*	Time	3rd Check*	Time
% Oxygen (O2)	19.5% to 23.5%						
LEL	Less than 10%						
Carbon Monoxide (CO)	Less than 35 ppm						
Hydrogen Sulfide (H2S)	Less than 10 ppm						
Other:							

*** 1ST CHECK TO BE COMPLETED PRIOR TO ENTRY**

IN CASE OF EMERGENCY, CALL: _____ ***OR*** _____

Authorization

Entry Supervisor: Date:

Appendix J: Excavation Permit

Location: _____

Permit #: _____ Date: _____

Company Name: _____ Shift: _____

Excavation Location: _____

Excavation Length
Width & Depth: _____

Soil Classification:
- ☐ Type A
- ☐ Type B
- ☐ Type C

NOTE: Trenches over 4 feet deep will use a protective system.



Protective System Used: ☐ Yes ☐ No

Type:
- ☐ **Shielding (Box)**
- ☐ **Sloping**
- ☐ **Shoring**
- ☐ **Benching**
- ☐ **Other:**

Weather: _____

Competent Person: _____ Person Completing Report _____

Excavation Requirements

Yes	No	N/A	General
☐	☐	☐	Protective system used in any trench/excavation greater than 4 feet deep
☐	☐	☐	Spoils, materials & equipment set back ≥ 2 feet from the edges of the excavation
☐	☐	☐	Engineering designs for sheeting and/or manufacturer's data on trench box capabilities on site
☐	☐	☐	Adequate signs posted and barricades provided
☐	☐	☐	Employee training conducted prior to beginning work
Yes	**No**	**N/A**	**Utilities**
☐	☐	☐	Utility company contacted & given 24 hours notice &/or utilities already located & marked
☐	☐	☐	Utility locations (overhead & underground) reviewed with operator & employees
☐	☐	☐	Utilities protected, supported or removed when excavation opened
Yes	**No**	**N/A**	**Wet Conditions**
☐	☐	☐	Employees protected from water accumulations (continuous dewatering)
☐	☐	☐	Inspection made after every rainstorm
Yes	**No**	**N/A**	**Hazardous Atmospheres**
☐	☐	☐	Air monitored for methane gas prior to entering trench/excavation
☐	☐	☐	Air monitoring & ventilation provided for potentially hazardous atmospheres
☐	☐	☐	Emergency equipment available where hazardous atmospheres could or do exist
Yes	**No**	**N/A**	**Entry & Exit**
☐	☐	☐	Ladders no further than 25 feet from ANY employee in ANY direction
☐	☐	☐	Ladders extend 3 feet above excavation edge and secured
☐	☐	☐	Wood ramps constructed of uniform material thickness and cleated together at bottom
☐	☐	☐	Employees protected from cave-ins where entering/exiting the excavation

Note: Items marked *No* below must be corrected prior to any employee entering the excavation.

Approval

Superintendent: _____ Date: _____

Appendix K: Notice to Commence Steel Erection

Project name:
Steel Erector Subcontractor:
Contact Name:
Address:

W.T. Rich is hereby authorizing you to commence steel erection activities with the following notifications:

Concrete in footings, piers, and walls, and mortar in masonry piers and walls has attained, based on the appropriate ASTM standard test for field cured samples either 75% of the intended minimum compressive strength or sufficient strength to support the loads imposed during steel erection.	Name of testing agency: Attached testing reports:
Repairs or modifications were made to anchor rods/bolts: ☐ Yes ☐ No Locations of repairs/modifications:	Approval by: (Structural Engineer of Record): Approval in writing? ☐ Yes ☐ No (attach) Date approved: As built drawings available? ☐ Yes ☐ No

You are notified of your responsibility to: (initial each)

	Initials:
Indicate to W.T. Rich what material lay down areas are needed, and intended routes of transferring materials. Only those designated lay down areas will be utilized, and W.T. Rich responsibility to maintain lay down areas will be limited to those that are designated.	
Preplan all overhead hoisting operations to prevent traveling loads over other contractor personnel, and to coordinate hoisting activities with W.T. Rich and other contractors to minimize impacts on other operations.	
Provide a written Site-Specific erection plan if any part of your operations will deviate from the published OSHA Standard 29 CFR 1926.752(e).	
Conduct documented daily inspections of all cranes, forklifts, and other hoisting equipment utilized in steel erection activities.	
Designate a qualified trained rigger(s) to inspect all rigging equipment (Submit record of training) Name of qualified rigger:	
Maintain on the project written proof of training for all employees engaged in connecting, bolt-up, multiple lift rigging procedures, exposure to falls, equipment operation, and as required by any other specific standard.	
Assure that all columns are properly anchored by a minimum of 4 anchor bolts.	
Maintain and require the use of fall protection equipment for all employees exposed to fall elevations of 6 feet or greater as directed in the project Incident Prevention Program.	
Properly install perimeter guardrail systems on all exterior and interior leading edges consisting of a top rail and mid rail meeting the requirements of 29 CFR1926.502 (b)(1-15)	
Maintain required fire protection/prevention equipment appropriate to the type of work operation and hazards involved.	
Meet all other requirements of the W.T. Rich Incident Prevention Program, Published OSHA Standards, and the requirements of local regulations.	

W.T. Rich Project Manager/Superintendent **Steel Erector Subcontractor**

Appendix L: Daily Scaffold Safety Inspection Report

Inspection by: _____ **Date:** _____
(Must Be a Competent Person)

Company Name: _____ **Time:** _____

Project Name: _____ **Project #:** _____

Scaffold Location: _____

Inspection Criteria

		Yes	No	N/A	Action Taken
1.	Are 2”x10” mud sills and base plates used?	☐	☐	☐	
2.	If CMU piers are used for footings are they poured solid?	☐	☐	☐	
3.	Are all components free of damage?	☐	☐	☐	
4.	Are scaffold frames plumb and level?	☐	☐	☐	
5.	Are scaffold frames pinned together to prevent displacement?	☐	☐	☐	
6.	Are cross braces used at all locations?	☐	☐	☐	
7.	Are frames and braces compatible?	☐	☐	☐	
8.	Are all working levels fully planked (Max. 1” gap between planks)?	☐	☐	☐	
9.	Are all platforms at least 18” wide?	☐	☐	☐	
10.	Is the work platform not more than 14” from the wall?	☐	☐	☐	
11.	Do all planks overlap their end supports 6”-12”?	☐	☐	☐	
12.	Are scaffold planks free of damage, splits, etc.?	☐	☐	☐	
13.	Are scaffolds secured to the structure once the scaffold is 4 times as high as it is wide including guardrails?	☐	☐	☐	
14.	Are scaffold ties repeated every 26’ vertically after the first set of ties?	☐	☐	☐	
15.	Where scaffold ties are required are they installed at both ends of the scaffold and at 30’ max. intervals between ends?	☐	☐	☐	
16.	Is a safe means of access provided to all scaffold platforms more than 2’ high? (Extension ladders, attachable ladders, stairs or integral ladder access frames must be used.)	☐	☐	☐	
17.	Does the ladder extend 3’ above the platform?	☐	☐	☐	
18.	Are ladders secured to prevent displacement?	☐	☐	☐	
19.	Are ladders installed as scaffold is erected to provide access	☐	☐	☐	

	for erectors?				
20.	Are scaffolds at safe distances from power lines?	☐	☐	☐	
21.	Are tag lines used when hoisting loads onto scaffolds with cranes?	☐	☐	☐	
22.	Are guardrails installed on all platforms over 6' high?	☐	☐	☐	
23.	Is the top rail between 38"–45" high and capable of supporting 200 lbs?	☐	☐	☐	
24.	Are midrails capable of supporting 150 lbs.?	☐	☐	☐	
25.	Where cross bracing is used as a midrail is the crossing point of the brace between 20" –30" above the work platform?	☐	☐	☐	
26.	Where cross bracing is used as a top rail is the crossing point of the brace between 38" –48" above the work platform? (cross bracing cannot serve as both top rail and midrail)	☐	☐	☐	
27.	Are platforms kept clear of unnecessary material and debris?	☐	☐	☐	
28.	Are all material platforms equipped w/ toeboards?	☐	☐	☐	
29.	Are all areas below and around scaffolds barricaded to prevent workers from walking under scaffolds?	☐	☐	☐	
30.	Are canopies erected when workers must pass under scaffolds?	☐	☐	☐	
31.	Are all scaffolds that are incomplete tagged "Danger Do Not Use"?	☐	☐	☐	
32.	Are all damaged components removed from service and tagged "Danger Do Not Use"?	☐	☐	☐	
33.	Are there legible scaffold tags at each access point?	☐	☐	☐	
34.	Is the tag proper for the scaffold condition? (red, yellow, or green)	☐	☐	☐	

Signatures

Competent Person's Signature _____ Date: _____

Superintendent's Signature: _____ Date: _____

Appendix M: Work Site Safety Inspection Form

Superintendent's Name _____

Specific Area(s) Inspected: _____

Instructions: Performed by superintendent/foreman of work area responsible for. Work Site Safety Inspections will be maintained at project location and available for inspection by W.T. Rich Safety Department.

Pre-Work											
Y	N	NA		Y	N	NA					
☐	☐	☐	Pre-task safety plan communicated, understood and signed by each worker?	☐	☐	☐	All required permits obtained				
☐	☐	☐	Pre-task safety plan posted in conspicuous place at work site?	☐	☐	☐	Lockout/Tryout performed				
☐	☐	☐	Workers physically ready for work?	☐	☐	☐	All training completed for work to be performed?				
☐	☐	☐	MSDS Sheets obtained and available?	☐	☐	☐					
Personal Protective Equipment											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Hardhat bills forward	☐	☐	☐	Safety glasses with side shields	☐	☐	☐	Leatherwork Boot
☐	☐	☐	Face shields	☐	☐	☐	Burning goggles	☐	☐	☐	Welding hood and gloves
☐	☐	☐	Gloves	☐	☐	☐	Hearing Protection	☐	☐	☐	Reflective Vests
Fall Protection (100% Fall Protection Required at six feet or greater)											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Guardrail system checked	☐	☐	☐	Harness and lanyards checked	☐	☐	☐	Horizontal lifeline checked
☐	☐	☐	Floor Openings covered	☐	☐	☐	Roof Opening guarded	☐	☐	☐	Wall openings guarded
☐	☐	☐	Blue fencing up	☐	☐	☐	Netting checked	☐	☐	☐	
Ladders and Scaffolding											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Ladder tied off	☐	☐	☐	Ladder extended three feet	☐	☐	☐	Stepladders in open position
☐	☐	☐	Scaffold inspected and tagged	☐	☐	☐	Sections properly pinned	☐	☐	☐	Components not damaged
☐	☐	☐	Ladder access	☐	☐	☐	Handrail in place	☐	☐	☐	Planking secured
Housekeeping											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Material stacked orderly	☐	☐	☐	Trash cans in work area	☐	☐	☐	Debris removed
☐	☐	☐	Cords and hoses off floor	☐	☐	☐	Access maintained	☐	☐	☐	
Hoisting and Rigging Equipment											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Daily crane inspection	☐	☐	☐	One-eye per hook	☐	☐	☐	Sling/chokers stored
☐	☐	☐	Qualified rigger named	☐	☐	☐	Safety latch on hook checked	☐	☐	☐	Cranes flagged off
☐	☐	☐	Slings/chokers inspected	☐	☐	☐	Knowledge of crane signals	☐	☐	☐	Lift zone designated
Mobile Equipment											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Seatbelts used	☐	☐	☐	Workers trained	☐	☐	☐	Equipment inspected
☐	☐	☐	Backup alarms working	☐	☐	☐	Spotters used when needed	☐	☐	☐	
Excavations											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Competent person named	☐	☐	☐	Shore/shield/slope/bench proper	☐	☐	☐	Excavation checked daily
☐	☐	☐	Proper access/egress	☐	☐	☐	Spoil pile 2' from edge	☐	☐	☐	Workers trained
Temporary Barricades											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Proper tape used (Red-Danger, Yellow-Caution)	☐	☐	☐	All sides of work area barricaded	☐	☐	☐	Barricade removed or disposed of properly
Electrical											
Y	N	NA		Y	N	NA		Y	N	NA	
☐	☐	☐	Cords checked for damage	☐	☐	☐	Current inspection color on cords	☐	☐	☐	GFCI working
Comments											
Inspection Performed By:							**Title:**				**Date:**

Appendix N: Voluntary Use of a Disposable Respirator

I _____ am requesting to use a disposable paper filter respirator, also known as a Dust Mask for my personal comfort.

I will be performing the following work task: (Example Sweeping Floor, etc.)

_____

_____

I clearly described the task I am to perform to my supervisor or safety coordinator and upon evaluating the task they determined I should not be exposed to a hazardous chemical or substance.

I have been supplied the following Dust Mask:
Brand: Model:

I understand that the disposable dust mask is for personal comfort and not intended to protect me from a hazardous chemical or substance. I further understand the voluntary use is limited to the task described above. Please read the following:

Appendix D to Sec. 1910.134 (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirators use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substances does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern, NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

I have read the above section from the OSHA standard for respiratory protection and understand its content. I further understand that I am responsible for the care, maintenance/upkeep, and proper storage of this respirator. Instructions on the proper wear were made available to me.

_____

Signature: Date:

Appendix O: Lockout/Tagout Checklist

Name of Contractor(s):	Scope of Work: ❑ Temporary Electrical Service ❑ Permanent Electrical Service ❑ Mechanical Work ❑ Other _____
Name of Contractor's On-site Supervisor :	
Date of Coordination Meeting:	Date(s) LO/TO Will Be In Affect:

Electrical hazards and many forms of stored energy are unique in that there are very few properties that warn of their presence**. The goal of this Checklist is to minimize the circumstances where electrical workers and others are exposed to the deadly hazards associated with stored energy.**

This Checklist shall be used to identify and/or review the following:

- ✓ Scope of work that requires LO/TO,
- ✓ Identify circumstances and/or locations where electrical hot work or other 'hot taps' cannot be avoided, and
- ✓ Identify the procedures and safety precautions that will be followed in the event hot work or a hot tap must proceed.

The contents of this Checklist shall be reviewed with all affected contractor employees and W.T. Rich personnel.

Name of Meeting Attendees:	Title/Responsibility:

1. Does the Owner or host employer have a LO/TO Permit or LO/TO requirements? **Yes** **No**
2. Has a project specific safety plan or Job Hazard Analysis (JHA) been developed by the contractor(s) doing the work? **Yes** **No**
3. What type of energy sources or systems will be worked on and/or need to be isolated and locked out? (Check all that apply)

Type of System	**LO/TO Required? (Check One)**		
	Yes	**No**	**N/A**
▪ Electrical			
▪ High volt (≥ 480 v)			
▪ Low volt (< 480 v)			

▪ Mechanical			
▪ Hydraulic/Steam			
▪ Pneumatic			
▪ Chemical			
▪ Other			

4. Are other contractors or entities affected by this lockout? **Yes** **No**

   If yes please Identify:

   _____

5. Identify the companies and individuals who will responsible for leading the Lockout-Tagout program for their employer. These individuals must be on site for the duration of the lockout-tagout in most circumstances.

Name of Contractor	**Name of Individual**

❑ Check here if W.T. Rich will be participating in locking out the affected system(s).

Safety Equipment and Procedures Checklist

A. Will the work proceed in a flammable or Class I atmosphere? **YES** **NO**
If no, continue to item B. If Yes, check all safety equipment that will be used.

- ❑ Non sparking tools
- ❑ Intrinsically safe lights, tools, radios, etc.
- ❑ Non static charging clothing or shoes
- ❑ LEL Monitor

B. Will other trades be working in the immediate vicinity of live circuits or otherwise be affected or exposed to the hazards of the activity? **YES** **NO**

If Yes, describe safety precautions that must be taken to protect affected workers:

_____
_____
_____

C. Check the safety equipment or procedures that will be followed to protect the safety of the workers conducting live work (hot taps, working on energized circuits, etc):

❑ Safety glasses with side	❑ Electrical blankets	❑ Gloves (electrical, hot

shields and/or face shield		work, or chemical resistant?)
❑ Hard hat (regular or high volt?)	❑ Blankets for hot work	❑ Insulating mats
❑ Leathers or heat resistant clothing	❑ Chemical resistant clothing	❑ Barricades around the work area
❑ Insulating tools	❑ Air monitor	❑ Retrieval equipment
❑ Low volt lighting	❑ Harness and lanyard	❑ Locks and Tags
❑	❑	❑
❑	❑	❑

D. **To be completed by the employer(s) completing the work:** If work is to proceed on live, energized, charged, or otherwise operating systems, describe why work *cannot* proceed in a locked-out or de-energized state.

Appendix P: Annual Inspection Forms – Lattice & Telescoping Boom

Lattice Boom Crane – Periodic (Annual) Inspection

Date:		Location:		Service Status:	
Make:		Model:		Serial Number:	
Unit ID Number:		Max. Capacity:		Date of Manufacturer:	
Inspector:		Title:		Inspector Certification Number:	

☒ Before inspection crane, lockout/tagout power source
☒ Consult Operator / Service Manual for additional inspection items, service bulletins, and other service information
☒ Before inspection and operating, crane, crane must be set up away from power lines and leveled.

References: O – OSHA 1926.550, 101-.180, ANSI B30.5 (1968)
A – ANSI / ASME B30.5 (1995)
C – New York City Cranes & Derricks (1996)

Status S – Satisfactory – Recommendation
D – Deficiency – Not Applicable

	Item	Status
1.	**Historical Data**	
1.1	Monthly Inspection Records	
1.2	Maintenance Records	
1.3	Repair/Modification Records	
1.4	Load Test Reports	
1.5	NYC Cranes & Derricks Certificate	
1.6	Other	
2.	**General**	
2.1	Sheet Metal	
2.2	Guards / Covers	
2.3	External Lights	
2.4	Housekeeping	
2.5	Safety / Warning Decals & Labels	
2.6	Hand Signal Chart (outside)	
2.7	Paint Condition / Corrosion Control	
2.8	Other	
2.9	Other	
3.	**Power Plant**	
3.1	Performance	
3.2	Exhaust System/Guards & Insulators	
3.3	Belts / Hoses – Condition	
3.4	Guards/Covers–Rotate & Recip Parts	
3.5	Other	
4.	**Crawler Assembly**	
4.1	Car Body / Side Frames	
4.2	Chain – Condition / Adjustment	
4.3	Sprockets / Idlers / Rollers	
4.4	Track Pads / Pins	
4.5	Travel Locks	
4.6	Steering Clutches	
4.7	Other	
4.8	Other	
5.	**Operator's Cab and Station**	
5.1	Grab Rails / Steps / Platforms	

	Item	Status
5.	**Operator's Cab & Station (cont)**	
5.7	Fire Extinguisher	
5.8	Mirrors	
5.9	Seat Restraint	
5.10	Seat Belt	
5.11	Operator's Manual	
5.12	Operating Instructions / Decals	
5.13	Electrocution Warning Sign(inside)	
5.14	Hand Signal Chart	
5.15	Swing Brake	
5.16	Positive Swing Lock	
5.17	Controls-Forces / Movements	
5.18	Air Pressure	
5.19	Foot Brakes – Latches / Linkage	
5.20	Power Controlled Lowering	
5.21	Engine Clutch	
5.22	Accelerator / Throttle Control	
5.23	Other	
5.24	Other	
6.	**Load Chart**	
6.1	Per Configuration	
6.2	Durable	
6.3	Legible	
6.4	Visible from Operator's Station	
6.5	Secured	
6.6	Other	
7	**Safety Devices/ Operational Aids**	
7.1	Warning Devices	
7.2	Boom Angle Indicator	
7.3	Boom Length Indicator	
7.4	Main Drum Rotation Indicator	
7.5	Aux. Drum Rotation Indicator	
7.6	Load Moment Indicator	
7.7	Load Weight Indicator	
7.8	Radius Indicator	
7.9	Crane Level Indicator	

5.2	Anti-Skid Surface	
5.3	Protection from Weather	
5.4	Window Glass	
5.5	Windshield Wiper(s)	
5.6	Door Restraint	

7.10	Anti-Two Block Device	
7.11	Two Block Warning Device	
7.12	Boom Hoist Shut Off	

8.	**Rotating Upper Structure**	
8.1	Turntable / Bearing	
8.2	Turntable – Rollers / Roller Path	
8.3	Ring Gear / Pinion Gear	
8.4	Hydraulic Pump(s)	
8.5	Hydraulic Hoses / Tubes / Fittings	
8.6	Hydraulic Pressure	
8.7	Electrical Wiring	
8.8	Main Hoist – Motor / Valves / Lines	
8.9	Main Hoist – Clutches / Brakes	
8.10	Main Hoist – Wrapping on Drum	
8.11	Main Hoist – Min. 2 Rope Wraps	
8.12	Aux. Hoist – Motor / Valves & Lines	
8.13	Aux. Hoist – Clutches / Brakes	
8.14	Aux. Hoist – Wrapping on Drum	
8.15	Aux. Hoist – Min. 2 Rope Wraps	
8.16	Boom Hoist – Motor / Valves & Lines	
8.17	Boom Hoist – Clutches / Brakes	
8.18	Boom Hoist – Wrapping on Drum	
8.19	Boom Hoist – Minimum 2 Rope Wraps	
8.20	Boom Hoist – Gears / Shafts / Etc	
8.21	Swing System / Assembly	
8.22	Hydraulic Motors / Valves / Lines	
8.23	Drums / Flanges	
8.24	Clutch / Brake Protection	
8.25	Torque Converter	
8.26	Anti-Skid Surface	
8.27	Steps / Hand Holds / Platforms	
8.28	Access to Cab and Roof	
8.29	Air System – Compressor / Lines etc	
8.30	Counterweight & Mounting	
8.31	Counterweight Warning Sign	
8.32	Electrocution Warning Sign (outside)	
8.33	House Lock	
8.34	Frame	
8.35	Swing Gear Box	
9.	**Boom Support System**	
9.1	Gantry / Mast	
9.2	Boom Stops	
9.3	Inner Ball	

9.4	Outer Ball / Equalizer	
9.5	Sheaves	
9.6	Boom Hoist Reeving	
9.7	Other	
10.	**Boom**	
10.1	Boom Selection Identification	
10.2	Boom Section Sequence	
10.3	Boom Section Alignment	
10.4	Warning Decals	
10.5	Spreader Bar	
10.6	Sheaves	
10.7	Hoist Line Dead End	
10.8	Wire Rope Retainer(s)	
10.9	Boom Foot Pins / Keepers	
10.10	Boom Head Section	
10.11	Auxiliary Boom Head	
10.12	Lattice Members	
10.13	Cord Members	
10.14	End Connections / Pins	
10.15	Lift Cylinder(s)	
10.16	Telescoping Cylinder(s)	
10.17	Hydraulic Hoses/Tubing & Fittings	
10.18	Holding Device (check valve)	
10.19	Wear Pads	
10.20	Equal Extension	
10.21	Boom Hinge Pin	
10.22	Structure	
10.23	Other	
10.24	Other	
11.	**Jib**	
11.1	Positive Stops	
11.2	Sheave(s)	
11.3	Wire Rope Retainer(s)	
11.4	Lattice Members	
11.5	Cord Members	
11.6	End Containers / Pins	
11.7	Other	

12. Wire Rope

Rope Application	Type	Size	Construction	Grade	Core	Rope Damage	Measured Wear	Broken Wires	Lubrication	End Connections	Status
Main Hoist Drum											

Aux. Hoist Drum											
Boom Hoist Drum											
Boom Pendants											
Jib Pendants											

13.	**Main Load Block & Hook**	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
13.1	Capacity Marking	
13.2	Weight Marking	
13.3	Sheaves	
13.4	Safety Latches	
13.5	10 Degree Hook Twist	
13.6	15% Hook Throat Opening	
13.7	10% Hook Wear	
13.8	Swivel	
13.9	Bearing	
13.10	Wedge Socket / End Fitting	
13.11	Reeving	
13.12	NDT – Results	
13.13	Other	

14.	**Overhaul Ball & Hook**	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
14.1	Capacity Marking	
14.2	Weight Marking	
14.3	Safety Latches	
14.4	10 Degree Hook Twist	
14.5	15% Hook Throat Opening	
14.6	10% Hook Wear	
14.7	Swivel	
14.8	Bearing	
14.9	Wedge Socket / End Fitting	
14.10	NDT – Results	
14.11	Other	
14.12	Other	
14.13	Other	

15. No-Load Operational Test			
ITEM		Status	Caution: Operation of cranes by Safety Department inspectors shall be limited to those crane functions necessary to accomplish the inspection. Inspectors must be qualified as outlined in ANSI/ASME B30.5
15.1	No-Load Operational Test		

16. Load Test							
Hoisting From:	Boom / Ext. / Jib Length	Load Radius	Boom Angle	Parts of Line	Rated Capacity	Test Weight	% of Rated Capacity
Main Boom							
Jib							

Item	Status
Load Test Results	Passed Failed N/A
Explanation:	

Deficiency/Recommendation Report

The following corrective action(s) (repairs, adjustments and replacement parts, etc.) are to be performed by a qualified person in accordance with all manufacturer's instructions, specifications and requirements. OSHA requires that "any deficiency (d) be repaired or defective parts replaced before continued use".

Recommendation(s) (R) should be considered for corrective action. The advisability of a particular recommendation depends on the facts of each situation. Any corrective action(s) is to be performed by a qualified person in accordance with all manufacturer's recommendations, specifications and requirements.

D = Deficiency R = Recommendation

D / R	Item #	Explanation/Corrective Action	Date Corrected

Crane Inspector

Project / Equipment Manager

Project Name: _____ **Project No.** _____ **Date**_____

Telescoping Boom Crane – Periodic (Annual) Inspection

Date:		Location:		Service Status:	
Make:		Model:		Serial Number:	
Unit ID Number:		Max. Capacity:		Date of Manufacturer:	
Inspector:		Operator:		Inspection Interval:	Annual/ monthly

☒ Before inspection crane, lockout/tagout power source
☒ Consult Operator / Service Manual for additional inspection items, service bulletins, and other service information
☒ Before inspection and operating, crane, crane must be set up away from power lines and leveled.

References: O – OSHA 1926.550, 1910-.180, PCSA#2, ANSI B30.5(1968)
A – ANSI / ASME B30.5 (1998), PCSA#4

Status S – Satisfactory D – Deficiency
R – Recommendation N – Not Applicable

	Item	Status
1.	**Historical Data**	
1.1	Monthly Inspection Records	
1.2	Maintenance Records	
1.3	Repair/Modification Records	
1.4	Load Test Reports	
1.5	NYC Cranes & Derricks Certificate	
1.6	Other	
2.	**General**	
2.1	Sheet Metal	
2.2	Guards / Covers	
2.3	External Lights	
2.4	Housekeeping	
2.5	Safety / Warning Decals & Labels	
2.6	Electrocution Warning Chart (outside)	
2.7	Hand Signal Chart (outside)	
2.7	Paint Condition / Corrosion Control	
2.8	License Plates	
2.9	Other	
3.	**Power Plant**	
3.1	Performance	
3.2	Exhaust System/Guards & Insulators	
3.3	Belts / Hoses – Condition	
3.4	Guards/Covers–Rotate & Recip Parts	
3.5	Other	
4.	**Carrier**	
4.1	Transmission Function	
4.2	Drive Line Function	
4.3	Main Frame Members	
4.4	Hydraulic Hoses / Tubing / Fittings	
4.5	Hydraulic Fluid Level	
4.6	Anti-Skid Surface	
4.7	Backup Alarm	
4.8	Tires / Wheels Condition	
Front Left:	Size- Press-	
Front Rt:	Size- Press-	
Back Left:	Size- Press-	
Back Rt:	Size- Press-	
4.9	Tire Size & Pressure per Load Chart	

	Item	Status
5.	**Outriggers**	
5.1	Boxes	
5.2	Beams	
5.3	Cylinders	
5.4	Floats / Pads	
5.5	Hydraulic Hoses / Tubing / Fittings	
5.6	Holding Valves	
5.7	Position Locks	
5.8	Warning Signs	
5.9	Other	
6	**Operator's Cab & Station**	
6.1	Grab Rails / Steps / Platforms	
6.2	Anti-Skid Surface	
6.3	Protection from Weather	
6.4	Window Glass	
6.5	Windshield Wiper(s)	
6.6	Door Restraint	
6.7	Fire Extinguisher	
6.8	Mirrors	
6.9	Seat Restraint	
6.10	Seat Belt	
6.11	Operator's Manual	
6.12	Controls Clearly Identified	
6.13	Operating Instructions / Decals	
6.14	Electrocution Warning Sign (inside)	
6.15	Hand Signal Chart	
6.16	Parking Brake	
6.17	Swing Brake	
6.18	Positive Swing Lock	
6.19	Controls – Forces / Movements	
6.20	Accelerator / Throttle Control	
6.21	Air Pressure	
6.22	Hydraulic Leaks	
6.23	Horn / Warning Device	
6.24	Electrical Access Panels Covered	
6.25	Other	
7.	**Load Chart**	
7.1	Per Configuration	
7.2	Durable & Legible	

8.	**Safety Devices/ Operational Aids**	
8.1	Boom Angle Indicator	
8.2	Boom Length Indicator	
8.3	Main Drum Rotation Indicator	
8.4	Aux. Drum Rotation Indicator	
8.5	Load Moment Indicator	
8.6	Load Weight Indicator	
8.7	Radius Indicator	
8.8	Crane Level Indicator	
8.9	Anti-Two Block Device	
8.10	Overload Indicator	
9.	**Rotating Upper Structure**	
9.1	Turntable	
9.2	House Lock	
9.3	Frame	
9.4	Hydraulic Pump(s)	
9.5	Hydraulic Hoses / Tubes / Fittings	
9.6	Hydraulic Pressure	
9.7	Electrical Wiring	
9.8	Main Hoist – Motor / Valves / Lines	
9.9	Main Hoist – Wrapping on Drum	
9.10	Main Hoist – Minimum 2 Rope Wraps	
9.11	Aux. Hoist – Motor / Valves & Lines	
9.12	Aux. Hoist – Wrapping on Drum	
9.13	Aux. Hoist – Minimum 2 Rope Wraps	
9.14	Counterweight / Mounting	
9.15	Swing Gear Box	
9.16	Electrocution Warning Sign (Outside)	
9.17	Counterweight Warning Sign	
9.18	Other	
9.19	Other	

7.3	Visible from Operator's Station	
7.4	Secured	
7.5	75% of Tipping	
10.	**Main Boom**	
10.1	Lift Cylinder(s)	
10.2	Telescoping Cylinder(s)	
10.3	Hydraulic Hoses/Tubing & Fittings	
10.4	Holding Device (check Valve)	
10.5	Boom Sections Alignment	
10.6	Wear Pads	
10.7	Equal Extension	
10.8	Sheaves	
10.9	Hoist Line Dead End	
10.10	Wire Rope Retainer	
10.11	Boom Hinge Pins	
10.12	Boom Head Section	
10.13	Auxiliary Boom Head	
10.14	Structure	
10.15	Other	
11.	**Manual / Pinned Section**	
11.1	Alignment	
11.12	Locking Device	
11.13	Structure	
11.14	Other	
12.	**Lattice Boom Extension**	
12.1	Boom Extension Alignment	
12.2	Cords	
12.3	Lattices	
12.4	End Connections	
12.5	Storage Device	
12.6	Sheave(s)	
12.7	Wire Rope Retainer	
12.8	Structure	
12.9	Other	
13.	**Jib**	
13.1	Positive Stops	
13.2	Sheave(s)	
13.3	Wire Rope Retainer(s)	
13.4	Structure	
13.5	Other	

15.. Wire Rope

Rope Application	Type	Orig Size	Construction	Grade	Core	Rope Damage	Measured Wear	Broken Wires	Lubrication	End Connections	Status
Main Hoist											
Aux. Hoist											

13.	Main Load Block & Hook	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
13.1	Capacity Marking	
13.2	Weight Marking	
13.3	Sheaves	
13.4	Safety Latches	
13.5	10 Degree Hook Twist	
13.6	15% Hook Throat Opening	
13.7	10% Hook Wear	
13.8	Swivel	
13.9	Bearing	
13.10	Wedge Socket / End Fitting	
13.11	Reeving	
13.12	NDT – Results	
13.13	Other	

14.	Overhaul Ball & Hook	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
14.1	Capacity Marking	
14.2	Weight Marking	
14.3	Safety Latches	
14.4	10 Degree Hook Twist	
14.5	15% Hook Throat Opening	
14.6	10% Hook Wear	
14.7	Swivel	
14.8	Bearing	
14.9	Wedge Socket / End Fitting	
14.10	NDT – Results	
14.11	Other	

15. No-Load Operational Test			
ITEM		Status	Caution: Operation of cranes by Safety Department inspectors shall be limited to those crane functions necessary to accomplish the inspection. Inspectors must be qualified as outlined in ANSI/ASME B30.5
15.1	No-Load Operational Test		

16. Load Test							
Hoisting From:	Boom / Ext. / Jib Length	Load Radius	Boom Angle	Parts of Line	Rated Capacity	Test Weight	% of Rated Capacity
Main Boom							
Jib							
Boom Extension							
Jib							

ITEM	STATUS
Load Test Results	PASSED FAILED N/A
Explanation:	

Deficiency/Recommendation Report

The following corrective action(s) (repairs, adjustments and replacement parts, etc.) are to be performed by a qualified person in accordance with all manufacturer's instructions, specifications and requirements. OSHA requires that "any deficiency (d) be repaired or defective parts replaced before continued use".

Recommendation(s) (R) should be considered for corrective action. The advisability of a particular recommendation depends on the facts of each situation. Any corrective action(s) is to be performed by a qualified person in accordance with all manufacturer's recommendations, specifications and requirements.

D = Deficiency R = Recommendation

D / R	Item #	Explanation/Corrective Action	Date Corrected

Crane Inspector

Project / Equipment Manager

Project Name: _____ **Project No.** _____ **Date**_____

Appendix Q: Monthly Inspection Forms – Lattice & Telescoping Boom

Lattice Boom Crane – Frequent (Monthly) Inspection Checklist

Date:		Location:		Service Status:	
Make:		Model:		Serial Number:	
Unit ID Number:		Max. Capacity:		Date of Manufacturer:	
Inspector:		Operator:		Superintendent:	

☒ Before inspection crane, lockout/tagout power source
☒ Consult Operator / Service Manual for additional inspection items, service bulletins, and other service information
☒ Before inspection and operating, crane, crane must be set up away from power lines and leveled.

References: O – OSHA 1926.550, 101-.180, ANSI B30.5 (1968)
A – ANSI / ASME B30.5 (1995)
Status S – Satisfactory R – Recommendation
D – Deficiency N – Not Applicable

	Item	Status
1.	**Historical Data**	
1.1	Daily Inspection Records	
1.2	Maintenance Records	
1.3	Repair/Modification Records	
1.4	Load Test Reports	
1.5	NYC Cranes & Derricks Certificate	
1.6	Other	
2.	**General**	
2.1	Sheet Metal	
2.2	Guards / Covers	
2.3	External Lights	
2.4	Housekeeping	
2.5	Safety / Warning Decals & Labels	
2.6	Hand Signal Chart (outside)	
2.7	Paint Condition / Corrosion Control	
2.8	Other	
2.9	Other	
3.	**Power Plant**	
3.1	Performance	
3.2	Exhaust System/Guards & Insulators	
3.3	Belts / Hoses – Condition	
3.4	Guards/Covers–Rotate & Recip Parts	
3.5	Other	
4.	**Crawler Assembly**	
4.1	Car Body / Side Frames	
4.2	Chain – Condition / Adjustment	
4.3	Sprockets / Idlers / Rollers	
4.4	Track Pads / Pins	
4.5	Travel Locks	
4.6	Steering Clutches	
4.7	Other	
	Other	
5.	**Operator's Cab and Station**	

	Item	Status
5.	**Operator's Cab & Station (cont)**	
5.7	Fire Extinguisher	
5.8	Mirrors	
5.9	Seat Restraint	
5.10	Seat Belt	
5.11	Operator's Manual	
5.12	Operating Instructions / Decals	
5.13	Electrocution Warning Sign(inside)	
5.14	Swing Brake	
5.15	Positive Swing Lock	
5.16	Controls-Forces / Movements	
5.17	Air Pressure	
5.18	Foot Brakes – Latches / Linkage	
5.19	Power Controlled Lowering	
5.20	Engine Clutch	
5.21	Accelerator / Throttle Control	
5.22	Other	
5.23	Other	
6.	**Load Chart**	
6.1	Per Configuration	
6.2	Durable	
6.3	Legible	
6.4	Visible from Operator's Station	
6.5	Secured	
6.6	Other	
7	**Safety Devices/Operational Aids**	
7.1	Warning Devices	
7.2	Boom Angle Indicator	
7.3	Boom Length Indicator	
7.4	Main Drum Rotation Indicator	
7.5	Aux. Drum Rotation Indicator	
7.6	Load Moment Indicator	
7.7	Load Weight Indicator	
7.8	Radius Indicator	
7.9	Crane Level Indicator	

5.1	Grab Rails / Steps / Platforms	
5.2	Anti-Skid Surface	
5.3	Protection from Weather	
5.4	Window Glass	
5.5	Windshield Wiper(s)	
5.6	Door Restraint	
8.	**Rotating Upper Structure**	
8.1	Hydraulic Hoses/Tubes/Fittings	
8.2	Electrical Wiring	
8.3	Main Hoist – Clutches / Brakes	
8.4	Main Hoist – Wrapping On Drum	
8.5	Main Hoist – Min. 2 Rope Wraps	
8.6	Aux. Hoist – Motor, Valves & Lines	
8.7	Aux. Hoist – Clutches / Drums	
8.8	Aux. Hoist – Wrapping on Drum	
8.9	Aux. Hoist – Min. 2 Rope Wraps	
8.10	Boom Hoist – Motor, Valves & Lines	
8.11	Boom Hoist – Clutches / Brakes	
8.12	Boom Hoist – Wrapping on Drum	
8.13	Boom Hoist – Minimum 2 Rope Wraps	
8.14	Swing System / Assembly	
8.15	Anti-Skid Surface	
8.16	Steps / Hand Holds / Platforms	
8.17	Access to Cab and Roof	
8.18	Air System – Compressor / Lines etc	
8.19	Counterweight and Mounting	
8.20	Counterweight Warning Sign	
8.21	Electrocution Warning Sign (outside)	
9.	**Boom & Support System**	
9.1	Boom Hoist Reeving	
9.2	Hoist Line Dead End	
9.3	Wire Rope Retainer(s)	
9.4	Boom Head Section	
9.5	Auxiliary Boom Head	
9.6	Hydraulic Hoses / Tubing & Fittings	
9.7	Holding Device (check valve)	
9.8	Other	
	Visual (Unable to lay boom down)	
	Physical (Able to lay boom down)	

7.10	Anti-Two Block Device	
7.11	Two Block Warning Device	
7.12	Boom Hoist Shut Off	
7.13	Boom Hoist Ratchet and Pawl	
7.14	Other	
10.	**Jib**	
10.1	Positive Stops	
10.2	Sheave(s)	
10.3	Wire Rope Retainer(s)	
10.4	Lattice Members	
10.5	Cord Members	
10.6	End Containers / Pins	
10.7	Other	
	Visual (Unable to lay boom down)	
	Physical (Able to lay boom down)	
11.	**Main Load Block & Hook**	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
11.1	Capacity Marking	
11.2	Weight Marking	
11.3	Sheaves	
11.4	Safety Latches	
11.5	10 Degree Hook Twist	
11.6	15% Hook Throat Opening	
11.7	10% Hook Wear	
11.8	Swivel	
11.9	Bearing	
11.10	Wedge Socket / End Fitting	
11.11	Reeving	
12.	**Overhaul Ball & Hook**	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
12.1	Capacity Marking	
12.2	Weight Marking	
12.3	Safety Latches	
12.4	10 Degree Hook Twist	
12.5	Swivel	
12.6	Bearing	
12.7	Wedge Socket / End Fitting	

13. Wire Rope											
Rope Application	Type	Size	Construction	Grade	Core	Rope Damage	Measured Wear	Broken Wires	Lubrication	End Connections	Status

Main Hoist Drum											
Aux. Hoist Drum											
Boom Hoist Drum											
Boom Pendants											
Jib Pendants											

Deficiency/Recommendation Report

The following corrective action(s) (repairs, adjustments and replacement parts, etc.) are to be performed by a qualified person in accordance with all manufacturer's instructions, specifications and requirements. OSHA requires that "any deficiency (d) be repaired or defective parts replaced before continued use".

Recommendation(s) (R) should be considered for corrective action. The advisability of a particular recommendation depends on the facts of each situation. Any corrective action(s) is to be performed by a qualified person in accordance with all manufacturer's recommendations, specifications and requirements.

D = Deficiency R = Recommendation

D / R	Item#	Explanation/Corrective Action	Date Corrected

Crane Inspector

Project / Equipment Manager

Telescoping Boom Crane – Frequent (Monthly) Inspection

Date:		Location:		Service Status:	
Make:		Model:		Serial Number:	
Unit ID Number:		Max. Capacity:		Date of Manufacturer:	
Inspector:		Operator:		Superintendent:	

☒ Before inspection crane, lockout/tagout power source
☒ Consult Operator / Service Manual for additional inspection items, service bulletins, and other service information
☒ Before inspection and operating, crane, crane must be set up away from power lines and leveled.

References: O – OSHA 1926.550, 1910.180, PCSA#2, ANSI B30.5 (1968)
A – ANSI / ASME B30.5 (1998)
Status S – Satisfactory D – Deficiency
R – Recommendation N – Not Applicable

Item		Status
1.	**Historical Data**	
1.1	Daily Inspection Records	
1.2	Maintenance Records	
1.3	Repair/Modification Records	
1.4	Load Test Reports	
1.5	NYC Cranes & Derricks Certificate	
1.6	Other	
2.	**General**	
2.1	Sheet Metal	
2.2	Guards / Covers	
2.3	External Lights	
2.4	Housekeeping	
2.5	Safety / Warning Decals & Labels	
2.6	Electrocution Warning Chart (outside)	
2.7	Hand Signal Chart (outside)	
2.7	Paint Condition / Corrosion Control	
2.8	License Plates	
2.9	Other	
3.	**Power Plant**	
3.1	Startup and Performance	
3.2	Exhaust System/Guards & Insulators	
3.3	Belts / Hoses – Condition	
3.4	Guards/Covers–Rotate & Recip Parts	
3.5	Other	
4.	Carrier	
4.1	Transmission Function	
4.2	Drive Line Function	
4.3	Main Frame Members	
4.4	Hydraulic Hoses / Tubing / Fittings	
4.5	Hydraulic Fluid Level	

Item		Status
5.	**Outriggers**	
5.1	Boxes	
5.2	Beams	
5.3	Cylinders	
5.4	Floats / Pads	
5.5	Hydraulic Hoses / Tubing / Fittings	
5.6	Holding Valves	
5.7	Position Locks	
5.8	Warning Signs	
5.9	Other	
6	**Operator's Cab & Station**	
6.1	Grab Rails / Steps / Platforms	
6.2	Anti-Skid Surface	
6.3	Protection from Weather	
6.4	Window Glass	
6.5	Windshield Wiper(s)	
6.6	Door Restraint	
6.7	Fire Extinguisher	
6.8	Mirrors	
6.9	Seat Restraint	
6.10	Seat Belt	
6.11	Operator's Manual	
6.12	Controls Clearly Identified	
6.13	Operating Instructions / Decals	
6.14	Electrocution Warning Sign (inside)	
6.15	Hand Signal Chart	
6.16	Parking Brake	
6.17	Swing Brake	
6.18	Positive Swing Lock	
6.19	Controls – Forces / Movements	
6.20	Accelerator / Throttle Control	
6.21	Hydraulic Leaks	

4.6	Anti-Skid Surface	
4.7	Backup Alarm	
4.8	Tires / Wheels Condition	
Front Left: Size-	Press-	Front Rt: Size- Press-
Back Left: Size-	Press-	Back Rt: Size- Press-
4.9	Tire Size & Pressure per Load Chart	
8.	**Safety Devices/ Operational Aids**	
8.1	Boom Angle Indicator	
8.2	Boom Length Indicator	
8.3	Main Drum Rotation Indicator	
8.4	Aux. Drum Rotation Indicator	
8.5	Load Moment Indicator	
8.6	Load Weight Indicator	
8.7	Radius Indicator	
8.8	Crane Level Indicator	
8.9	Anti-Two Block Device	
8.10	Overload Indicator	
9.	**Rotating Upper Structure & Boom**	
9.1	Hoist Line Dead End	
9.2	Main Boom Head Section	
9.3	Auxiliary Boom Head	
9.4	Main Hoist – Wrapping on Drum	
9.5	Main Hoist – Minimum 2 Rope Wraps	
9.6	Aux. Hoist – Wrapping on Drum	
9.7	Aux. Hoist – Minimum 2 Rope Wraps	
9.8	Counterweight Warning Sign	
10.	**Manual / Pinned Section**	
10.1	Alignment	
10.2	Locking Device	
10.3	Structure	
10.4	Other	
11.	**Lattice Boom Extension**	
11.1	Boom Extension Alignment	
11.2	Sheave(s)	
11.3	Wire Rope Retainer	
11.4	Structure	
	Visual (Unable to lay boom down)	
	Physical (Able to lay boom down)	

6.22	Horn / Warning Device	
6.23	Electrical Access Panels Covered	
6.24	Other	
7.	**Load Chart**	
	Per Configuration	
	Durable & Legible	
	Visible from Operator's Station	
	Secured	
	75% of Tipping	
12.	**Jib**	
12.1	Positive Stops	
12.2	Sheave(s)	
12.3	Wire Rope Retainer(s)	
12.4	Structure	
12.5	Other	
	Visual (Unable to lay boom down)	
	Physical (Able to lay boom down)	
13.	**Main Load Block & Hook**	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
13.1	Capacity Marking	
13.2	Weight Marking	
13.3	Sheaves	
13.4	Safety Latches	
13.5	10 Degree Hook Twist	
13.6	15% Hook Throat Opening	
13.7	10% Hook Wear	
13.8	Swivel	
13.9	Bearing	
13.10	Wedge Socket / End Fitting	
13.11	Reeving	
14.	**Overhaul Ball & Hook**	
Manufacturer:		
Rated Capacity:		
Block Weight:		
Original Hook Throat Opening:		
14.1	Capacity Marking	
14.2	Weight Marking	
14.3	Safety Latches	
14.4	10 Degree Hook Twist	
14.5	15% Hook Throat Opening	
14.6	10% Hook Wear	
14.7	Swivel	
14.8	Bearing	
14.9	Wedge Socket / End Fitting	

15.. Wire Rope											
Rope Application	Type	Size	Construction	Grade	Core	Rope Damage	Measured Wear	Broken Wires	Lubrication	End Connections	Status
Main Hoist											
Aux. Hoist											

Deficiency/Recommendation Report

The following corrective action(s) (repairs, adjustments and replacement parts, etc.) are to be performed by a qualified person in accordance with all manufacturer's instructions, specifications and requirements. OSHA requires that "any deficiency (d) be repaired or defective parts replaced before continued use".

Recommendation(s) (R) should be considered for corrective action. The advisability of a particular recommendation depends on the facts of each situation. Any corrective action(s) is to be performed by a qualified person in accordance with all manufacturer's recommendations, specifications and requirements.

D = Deficiency R = Recommendation

D / R	Item #	Explanation/Corrective Action	Date Corrected

Crane Inspector

Project / Equipment Manager

Appendix R: Daily Inspection Forms – Lattice & Telescoping Boom

Lattice Boom Crane – Daily Inspection Checklist

Make/Model: _____ Serial #: _____

Unit ID: _____ Jobsite: _____

Inspector: Date:

S = Satisfactory		D = Deficiency			N/A = Not Applicable				
Condition			**MON**	**TUE**	**WED**	**THU**	**FRI**	**SAT**	**SUN**
Fluid Level	1.	Crankcase Oil							
	2.	Coolant							
	3.	Hydraulic Oil							
CAB(S)	4.	Electrical System							
	5.	House Lock							
	6.	Service / Parking Brake							
	7.	Swing Brake / House Lock							
	8.	Gauges							
	9.	Housekeeping							
	10.	Fire extinguisher(s)							
	11.	Load Chart							
	12.	Windows / Mirrors							
Functions	13.	Travel							
	14.	Steering							
	15.	Outriggers							
	16.	Boom Up / Down							
	17.	Hoist Up / Down							
	18.	Swing							
Safety Devices	19.	Anti Two-Block							
	20.	LMI / Load Weight Indicator							
	21.	Boom Angle Indicator							
	22.	Lights / Locks / Buzzers							
	23.	Back Up Alarm / Horn							
	24.	Boom Kick Out							
Boom, Jib & Accessories	25.	Load Block / Ball / Hooks							
	26.	Safety Latches							
	27.	Wedge Sockets							
	28.	Sheaves							
	29.	Wire Rope Retainers							
	30.	Main Boom							
	31.	Jib / Extension							
Lower Works	32.	Tires / Inflation							
	33.	Carrier / Car Body							
	34.	Shoes / Tracks / Chain							
	35.	Outriggers							
	36.	Machine Guards							
	37.	Hoist Brakes / Clutches							
Upper Works	38.	Hoses / Tubing							
	39.	Hoist(s)							
	40.	Wrapping on Drum							
	41.	Rope Reeving							
	42.	Wire Rope							
	43.	Gantries / Bridles							

Operator's Initials								

Superintendant Signature: _____

Telescoping Boom Crane – Daily Inspection Checklist

Make/Model: _____ Serial #: _____

Unit ID: _____ Jobsite: _____

Inspector: Date:

S = Satisfactory		D = Deficiency				N/A = Not Applicable			
Condition			**MON**	**TUE**	**WED**	**THU**	**FRI**	**SAT**	**SUN**
Fluid Level	1.	Crankcase Oil							
	2.	Coolant							
	3.	Hydraulic Oil							
CAB(S)	4.	Electrical System							
	5.	Service / Parking Brake							
	6.	Swing Brake / House Lock							
	7.	Gauges							
	8.	Housekeeping							
	9.	Fire Extinguisher(s)							
	10.	Load Chart							
	11.	Windows / Mirrors							
	12.	Travel							
Functions	13.	Steering							
	14.	Outriggers							
	15.	Boom Up/Down							
	16.	Boom In / Out							
	17.	Hoist Up/Down							
	18.	Swing							
Safety Devices	19.	Anti Two-Block							
	20.	LMI / Load Weight Indicator							
	21.	Boom Length Indicator							
	22.	Boom Angle Indicator							
	23.	Radius Indicator							
	24.	Warning Lights / Alarms							
Boom, Jib & Accessories	25.	Back Up Alarm & Horn							
	26.	Load Block / Ball / Hook(s)							
	27.	Safety Latches							
	28.	Wedge Socket(s)							
	29.	Sheaves							
	30.	Wire Rope Retainers							
	31.	Main Boom							
Lower Works	32.	Jib / Extension							
	33.	Lift Cylinder(s)							
	34.	Tires / Inflation							
	35.	Carrier							
	36	Outriggers							
	37.	Machine Guards							
Upper Works	38.	Hoist Break(s)							
	39.	Hoses / Tubing							
	40.	Hoist(s)							
	41.	Wrapping on Drum(s)							
	42.	Rope Reeving							

	43.	Wire Rope							
		Operator's Initials							

Superintendant Signature: _____

Appendix S: Crane Maintenance Checklist

Recommended
Monthly Maintenance Check List

Rig # :	
Rig Model:	
Rig Hours:	
CD #:	
Date of Check List	
Month of Check List	
Operator	
Maintenance Person	
Super/PM on Jobsite	
Job#	
Jobsite Name	

Description of Service	***Action***	**Action Recorded** ***Good***	***N/G***	***Needs Mechanic***
Air Cleaner Restriction	Check			
Charge Air Piping	Check			
Charge Air Cooler	Check			
Fuel Injection Pump Mounting	Check			
Air Compressor Mounting	Check			
Filter or Change the Hydraulic Oil	Check/Change If Needed			
Replace the Hydraulic Oil Filter Elements	Check/Change If Needed			
Clean the Hydraulic Oil Tank	If Needed			
Pressure Settings of the Hydraulic System	Check			
Hydraulic Valve System Functions Properly	Check			
Hydraulic Hose and Pipe Connections	Check			
Mountings of the Hydraulic Pumps	Check			
Torque up the Slewing Ring and the Swing Drive Bolts	Check/Tighten If Needed			
Winch Brakes	Check			
Winch Transmission Oil Level	Check/Refill If Needed			
Track Drive Transmission Oil Level	Check/Refill If Needed			
Swing Drive Transmission Oil Level	Check/Refill If Needed			
Tighten the Track Shoe Bolts	Check / Tighten If Needed			
Hydraulic Cooler	Check/Clean If Needed			

A copy of this Report must be left in the rig at all times.
Please note that all actions shall be done the first of every month.
If a Mechanic is needed please notify your Superintendent or Project Manager

Appendix T: Critical Lift Checklist

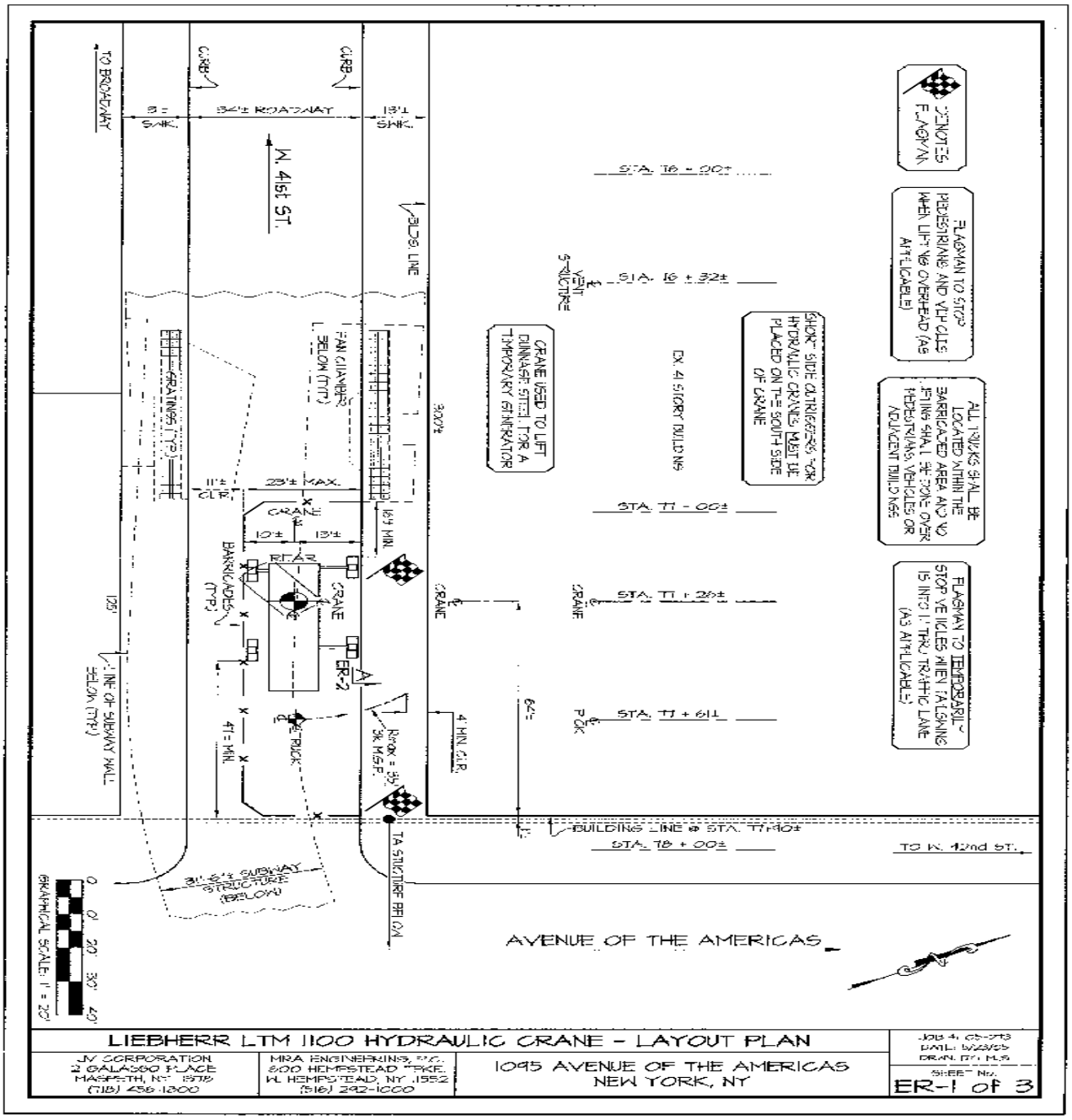
		Go	No Go
Date			
Work Description			
Work Duration			
Associated Working Drawings			
Crane Model			
Location Pick			
Capacity of Crane at Pick Radius			
Weight of Pick			
Ground Conditions			
Overhead Wires Present			
Proximity to Traffic			
Outrigger Placement			
Outrigger Blocking as per Drawing			
Rigging in good working order			
Delivery Location			
Wind Speed and Approximate Direction			
Weather			
Operator			
IW Foreman			
Supervisor			
Design Engineer			
Prepared by			
Approved by			

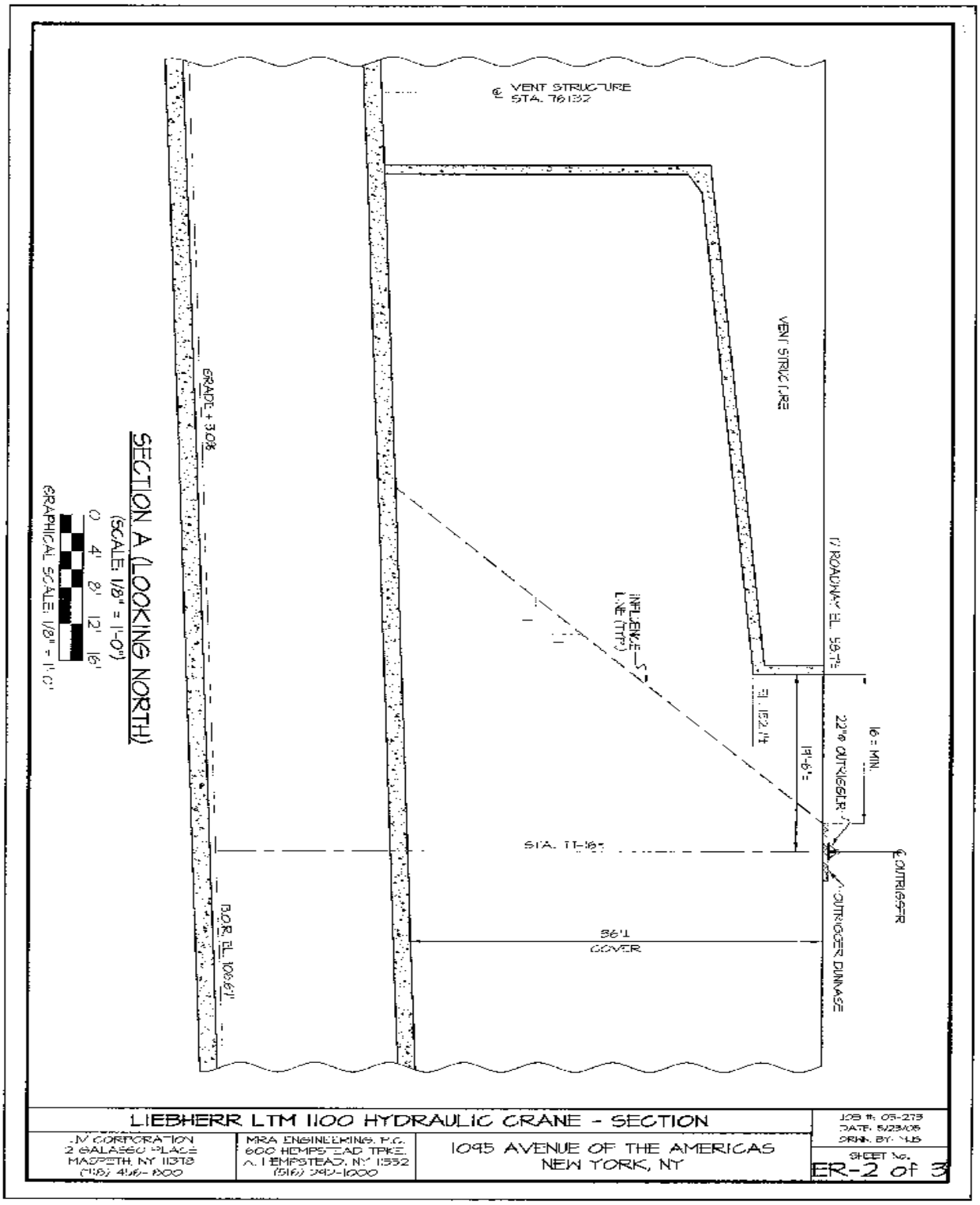
Appendix U: Tower Crane Checklist

1	**Tower Crane Requirement**		
	A	Mobile Vs. Tower	Superintendent
2	**Tower Crane Selection**		
	A	Load Requirements.	Superintendent
	B	Reach Requirements	Superintendent
	C	Location	Superintendent
	D	When Required	Superintendent
	E	Lead Time	Superintendent
	F	Place Order (Define Final commitment Date)	Superintendent / PM
3	**Geotechnical Considerations**		
	A	Sub grade - Evaluation & Test Report	Geo Technical Engineers
	B	Slab Installation Prior to Tower Crane Foundation Pour	W.T. Rich
4	**Foundation Considerations**		
	A	Structural Design by Structural Engineer	Structural Engineer
	B	Tower Crane Loads Transmitted to Structural Engineer Provided by Crane Supplier	Crane Supplier
	C	Reinforcing Steel Submittal (Blow-up of Footing Detail and Rebar Schedule)	W.T. Rich
	D	Special Inspection Report of Footing Reinforcing and Concrete	Special Inspector
	E	Structural Engineer Inspection of Footing Prior to Concrete Pour	Structural Engineer
	F	Concrete Strength Required for Plinths and Footing from Structural Engineer	Structural Engineer
	G	Concrete Break Reports of Plinth and Footing	Special Inspector
5	**Electrical Considerations**		
	A	Electrical Permit for Crane Temporary Power	Electrical Contractor
	B	Electrical Inspection Report	Electrical Contractor
	C	Miscellaneous Crane Specific Electrical Information	Crane Supplier
6	**Tower Crane Erection Considerations**		
	A	Set Tower Crane Base	
		1 Critical Pick Plan to Set Base Provided by Erector	Crane Erector
		2 Plumb Tolerance of Base	
		a Crane Supplier Provide Base Plumb Tolerance	Crane Supplier
		b Pre-erection Base Plumb Survey Transmitted to Crane Supplier	W.T. Rich
		c Post-erection Base Plumb Survey Transmitted to Crane Supplier	W.T. Rich
		3 Traffic Control Plan	Crane Erector
	B	Pre-Inspection of Tower Crane	
		1 Pre-erection Inspection Report from W.T. Rich 3rd Party Consultant	3rd Party Crane Inspector
		2 W.T. Rich Superintendent Daily Log as witness to Pre-erection Inspection	W.T. Rich
		3 Documentation of W.T. Rich Request for Repairs Noted in 3rd Party Pre-erection Inspection Report	W.T. Rich
		4 Documentation from Crane Supplier that W.T. Rich 3rd Party Consultant Requested Repairs are Complete	Crane Supplier
		5 Crane Suppliers 3rd Party Consultant Pre-Inspection Report	Crane Supplier
		6 Documentation from Crane Supplier that their 3rd Party Consultant Requested Repairs are Complete	Crane Supplier

	C	Set Tower Crane		
		1	JHA in Place	W.T. Rich
		2	Traffic Control Plan	Crane Erector
		3	Critical Pick Plan to Set Tower Provided by Erector	Crane Erector
		4	Documentation of Where and How Erection Equipment can sit on Site Relative to Shoring Wall	W.T. Rich
		5	Copies of Crane Certificate for Assist Cranes	Crane Erector
		6	Confirmation of W.T. Rich Operator being Nationally Certified	W.T. Rich
		7	Confirmation of Erector Operators being Nationally Certified	Crane Erector
		8	Erector Safety Plan	
			a Project Specific Safety Plan for Erector	Crane Erector
			b Pre-task Safety Plan - Including day of erection crew signatures	Crane Erector
			c Fall Protection Plan Specific to Erection Day Operation - Including day of erection crew signatures	Crane Erector
		9	Copies of Insurance Certificates	
			a Erector	Crane Erector
			b Crane Supplier - for their Technician	Crane Supplier
		10	Drug Testing	
			a Copy of Erector's Company Drug Test Policy - w/employees names if possible	Crane Erector
		11	Site Safety Orientation	W.T. Rich
7	**Post-Erection Inspections**			
	A	Crane Suppliers Post Inspection Reports		
		1	Certification & Acceptance Report	Crane Supplier
		2	2nd Re-torque Tower & Turntable Inspection & Field Service Report (30 days or 80 hours)	Crane Supplies
	B	W.T. Rich 3rd Party Consultant Inspection Report		3rd Party Crane Inspector
8	**Jump Considerations**			
	A	JHA in Place		W.T. Rich
	B	Pre-task Safety Plan		Crane Erector
	C	Post Jump 3rd Party Consultant Inspection Report		3rd Party Crane Inspector
9	**Appendix**			
	A	Yearly Inspection Report - Crane Supplier		Crane Supplier
	B	Miscellaneous Field Service Reports - Crane Supplier		Crane Supplier
	C	Quarterly Inspection Reports		3rd Party Inspector
	D	Daily Inspections - Operator		W.T. Rich

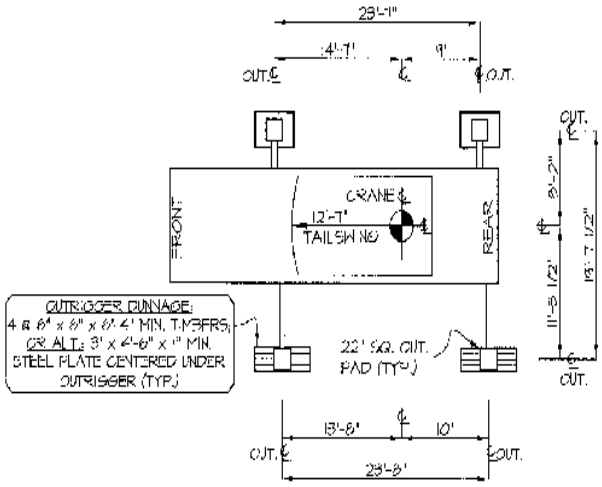
Appendix V: Lift Plan Example




SECTION A (LOOKING NORTH)
(SCALE: 1/8" = 1'-0")
GRAPHICAL SCALE: 1/8" = 1'-0"
0 4' 8' 12' 16'
GRADE + 3.08
B.O.R. EL. 10.67'
STA. 11+18.1
INFLEWE-S LINE (TYP.)
VENT STRUCTURE
℄ VENT STRUCTURE STA. 78+32
17 ROADWAY EL. 58.75
EL. 152.74
19'-6"±
16'± MIN.
22'ø OUTRIGGER
℄ OUTRIGGER
OUTRIGGER DUNNAGE
36'-1
COVER
LIEBHERR LTM 1100 HYDRAULIC CRANE - SECTION
JV CORPORATION
2 GALASSO PLACE
MASPETH, NY 11378
(718) 416-1000
MRA ENGINEERING, P.C.
600 HEMPSTEAD TPKE.
W. HEMPSTEAD, NY 11552
(516) 292-1000
1095 AVENUE OF THE AMERICAS
NEW YORK, NY
JOB #: 05-273
DATE: 5/23/06
DRWN. BY: YLB
SHEET No.
ER-2 of 3

GENERAL NOTES FOR MOBILE CRANES

1. Contractor to verify all dimensions and site conditions prior to commencing work. Any errors, omissions, or unusual conditions to be reported to the Office of Neil Greenblatt immediately.
2. That the crane to be used is a Liebherr LTM 1100/2 Hydraulic crane with 171' boom + 62' Jib @ 0° offset and 25.4 kip counterweight on 19'-7 1/2" outrigger spacing (CD#3244). Refer to drawing ER-1 for pick-radii limits.
3. The operational notes herein are offered for information and guidance and are not to be taken to infer that the Engineer is any way involved in or is responsible for the actual placement, installation, or operation of the crane in the field.
4. Reduce crane load ratings to account for wind on load. Consult operator's manual for requirements when wind exceeds 20 m.p.h. Do not operate in winds over 30 m.p.h.
5. If winds exceed 50 m.p.h. lower boom to ground unless manufacturer's instructions indicate otherwise.
6. Crane operations are to be conducted in accordance with A.N.S.I./A.S.M.E. B30.5a-1984, appropriate OSHA rules and R.S. 19-2 of the New York City Building Code.
7. Crane is to be operated only by New York City Licensed Operator.
8. All trucks shall be located within the barricaded area and no lifting shall be done over pedestrians, vehicles or adjacent buildings.



LIEBHERR LTM 1100 CRANE PART PLAN
(SCALE: 1" = 10')

0 5' 10' 15' 20'
GRAPHICAL SCALE: 1" = 10'

LIEBHERR LTM 1100 HYDRAULIC CRANE - PART PLAN & NOTES

1095 AVENUE OF THE AMERICAS
NEW YORK, NY

JOB #: 05-213
DATE: 5/24/05
DRAWN BY: M.S.
SHEET NO.
ER-3 OF 3

JV CORPORATION
2 GLASSO PLACE
MASPETH, NY 11378
(718) 456 1000

PCA ENGINEERS, P.C.
600 HEMPSTEAD TPKE.
W. HEMPSTEAD, NY 11552
(516) 292-1000

NYC TRANSIT GENERAL NOTES

NOTE: The appropriate notes apply to the type of work performed.

1. The NYCT Transit Authority reserves the right to perform, by force account or contract, any work in connection with or adjacent to the subject work as it deems necessary or desirable.
2. Contractor shall not perform any work on the subject structure, trackwork, ROW, or adjacent property without first obtaining written permission from the NYCT Transit Authority.
3. All work performed by contractor personnel must be performed in accordance with the NYCT Rules and Procedures Manual.
4. Equipment and materials shall not be placed on the roadway or walkway so as to interfere with the operation of trains or the safety of persons.
5. Contractor shall not perform any work on the subject structure between the hours of 6:00 AM and 10:00 PM without prior approval from the NYCT Transit Authority.
6. Contractor shall not perform any work on the subject structure between the hours of 10:00 PM and 6:00 AM without prior approval from the NYCT Transit Authority.
7. Contractor shall not perform any work on the subject structure during the following dates: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day.
8. Contractor shall not perform any work on the subject structure during the following dates: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day.
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43. Contractor shall not perform any work on the subject structure during the following dates: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day.

LIEBHERR LTM 1100 HYDRAULIC CRANE – NYCTA GENERAL NOTES

JOB #: 05-278
DATE: 5/23/05
DRWN. BY: MJS

SHEET No.
TA-1 of 2

1095 AVENUE OF THE AMERICAS
NEW YORK, NY

MRA ENGINEERING, P.C.
600 HEMPSTEAD TPKE.
W. HEMPSTEAD, NY 11552
(516) 292-1000

JV CORPORATION
2 GALASSO PLACE
MASPETH, NY 11378
(718) 456-1800

NEW YORK CITY TRANSIT AUTHORITY INSURANCE CLAUSES

Responsibility of the Contractor - The Contractor shall be solely responsible for the safety and protection of the work, materials, equipment and all property thereon.

(a) The Contractor shall be solely responsible for all injuries, including death, to persons and damage to property caused by, resulting from or arising out of any act, omission or negligence of the Contractor or its subcontractors or their employees or agents during the progress of the work on the site or otherwise. The Contractor shall indemnify and hold harmless the City and the Authority, their boards and officers, agents and employees from and against all claims, damages, losses and expenses, direct and indirect, including attorneys' fees and court costs, arising out of or resulting from the performance of the work, provided any such injury, death or damage is caused in whole or in part by any act, omission or negligence of the Contractor or its subcontractors or their employees or agents, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this paragraph. In any and all claims against the City or the Authority or any of their boards, officers, agents or employees by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts. This indemnity and hold harmless agreement shall apply whether or not such claims arise out of the negligence of the City or the Authority, but shall not apply to liability for damages for injuries to persons or property caused by or resulting from the sole negligence of the City or the Authority, their boards and officers, agents and employees. The term "boards and officers" as used above shall be deemed to include, but not be limited to, the Commissioner of Transportation of the City of New York and all other officials, boards and commissions of the City and the Authority. This section shall survive the expiration or termination of this Contract.

(b) The Contractor shall not pay any claim for injuries or damages to persons or property for which the Authority may be liable, except to such extent as may be directed or authorized by order of a court of competent jurisdiction or as may be provided by a stipulation or agreement signed by the Authority, with the consent of the City, duly filed with the clerk of such court or with the arbitrator or arbitration board, and the Contractor hereby assigns to the City and the Authority all rights of the Contractor in and to any unearned premium upon any insurance policy upon the work performed hereunder, including any such unearned premium which may become payable or be granted in the event of cancellation of any such policy, and the Contractor will execute and deliver such instruments and take such other steps as the City or the Authority may require to effectuate or evidence such assignment.

(c) The Contractor shall pay, and indemnify the City and the Authority from loss or cost arising out of any claims or actions brought against the City and/or the Authority for any fines, penalties, damages or costs which may be assessed against or imposed upon the City and/or the Authority as a result of any violation of environmental laws, rules or regulations which may be caused by the Contractor or its subcontractors or their employees or agents during the performance of the work hereunder.

(d) The Contractor shall take all precautions necessary and shall be responsible for the safety of its employees on the work site and shall comply with all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises on which the work is being performed. The Contractor shall provide all necessary safeguards for the protection of workers and the public and shall post danger signs warning against any hazards created by its operations and working conditions in and about the work site.

(e) The Contractor shall comply with all applicable laws, ordinances, rules and regulations of federal, state and local governments and all lawful orders of public authorities bearing on the performance of the work.

(f) The Contractor shall designate a responsible member of its organization on the work site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Engineer.

(g) In case any discrepancy should be found to exist between the Contract Documents and the site conditions or any provisions of applicable laws, codes, rules or regulations, or in the event that any material ambiguity or uncertainty exists in the Contract Documents, the Contractor shall immediately inform the Engineer, who shall promptly issue such clarifications as he may deem necessary. Any work done after the discovery of such discrepancy, ambiguity or uncertainty shall be done at the Contractor's risk until the Engineer's clarifications have been issued.

(h) The Contractor shall not load or permit any part of the structure to be loaded in any manner that will endanger the structure, nor shall the Contractor subject any part of the work or adjacent property to stresses or pressures that will endanger it.

(i) The Contractor shall provide adequate facilities for the safe conduct of pedestrian and vehicular traffic, as may be affected by the Contractor's operations or equipment on the work site or adjacent thereto. The Contractor shall control the movement of persons and vehicles around the work site, and shall direct them to use the proper walkways, crossings, detours and roadways.

(j) The Contractor shall not interfere unnecessarily with the use by others of streets, highways, rights-of-way and property adjacent to the work site, whether public or private, and shall use all reasonable care to avoid damage or injury to same. The Contractor shall promptly repair or restore any such property damaged during the performance of the work, to the satisfaction of the City and the Authority, and in accordance with the directions of the owner or operator of such property, or, if the owner or operator fails to make the required repairs or restoration promptly, the City or the Authority may cause the repairs or restoration to be made and deduct the cost thereof from any payments due or to become due to the Contractor.

(k) The Contractor shall not store any materials or equipment in such manner as will unnecessarily increase the danger of damage by fire or other hazard. Upon the completion of the work, the Contractor shall remove all surplus materials, false work, temporary structures, debris and waste of every kind from the site of the work and from any other part of the premises or public property affected by any of the operations of the Contractor or its subcontractors, and shall leave the site of the work in a neat and orderly condition satisfactory to the Engineer.

(l) The Contractor shall not place any signs on the work site or on any structure or equipment thereon, except such signs as may be required by law or as may be approved by the Engineer.

(m) The Contractor shall not employ any unfit person or anyone not skilled in the work assigned to him. The Contractor shall at all times maintain good discipline and order at the site.

(n) The Contractor shall not employ any person who is unable to speak English as required to perform the work safely and properly, or who is unable to read and understand instructions, warnings and regulations in English which may be encountered in the work.

(o) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

(p) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

(q) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

(r) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

(s) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

(t) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

(u) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

(v) The Contractor shall not employ any person who is not skilled in the work assigned to him, or who is unfit to perform such work or to work with other employees, or who endangers the safety of persons or property or the progress of the work by his presence on the site or otherwise.

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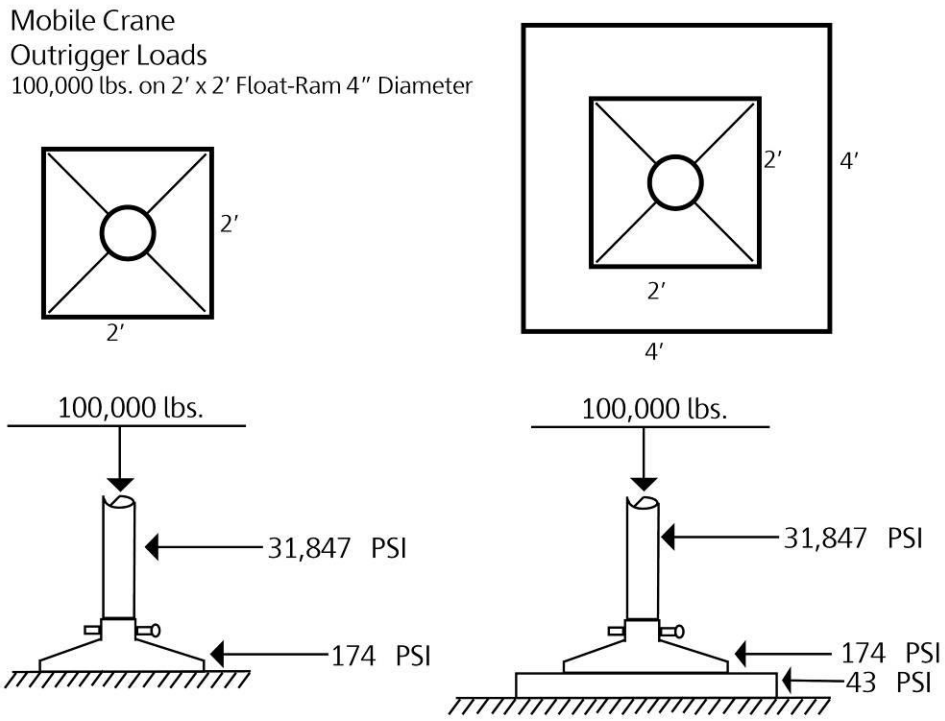
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Appendix W: Soil Bearing Chart



Soil Bearing Capacities

Soils		Approximate Bearing Capacities
Hardpan-Cemented Sand & Gravel		135 PSI
Gravel-Sand & Gravel -	Compact	110 PSI
	Firm	81 PSI
	Loose	54 PSI
Sand-Coarse to Medium -	Compact	81 PSI
	Firm	60 PSI
	Loose	40 PSI
Sand-Fine, Silty, or with trace of Clay -	Compact	54 PSI
	Firm	40 PSI
	Loose	27 PSI
Silt	Compact	40 PSI
	Firm	33 PSI
	Loose	27 PSI
Clay	Compact	54 PSI
	Firm	33 PSI
	Loose	13 PSI

Appendix X: Pre-Demolition Survey

Please Print Clearly

Project Name:		Project No:	
Location:		Survey Date:	
		Name:	
Major Cross Streets:		Title:	

Structure Information

Structure Type: _____

Basement:	Yes	No	**Type:**	Block	Concrete	Other: _____
Building Height:	_____		**No: of Stories:**	_____		
Shoring Required:	Yes	No				
If Yes complete the following:						
Type of Shoring			**Describe:**	_____		
Location of Shoring			**Describe:**	_____		
Adjacent Properties:	Yes	No	**Describe:**	_____		
If Yes complete the following:						
Protection Required:	Yes	No	**Describe:**	_____		
Underground Tanks	Yes	No	**Describe:**	_____		
Location of Tanks			**Describe:**	_____		
Previous Use:			**Describe:**	_____		
Tanks Drained	Yes	No	**Date:**	_____		
Tanks Purged:	Yes	No	**Date:**	_____		
			Performed			
Tested:	Yes	No	**By:**	_____		
Public Prot. Required:	Yes	No	**Describe:**	_____		
If Yes complete the following:						
Signage:	Yes	No	**Describe:**	_____		
Barricades:	Yes	No	**Describe:**	_____		
Fencing:	Yes	No	**Describe:**	_____		

Demo Methods: _____

Disconnects

Reference No: _____

Utility Disconnect			Disconnect Date	Utility Contact Name & Phone
Electric	Yes	No		
Gas	Yes	No		
Water	Yes	No		
Sewer	Yes	No		
Phone	Yes	No		
Security	Yes	No		
PC Network	Yes	No		

Location of Energized Power / Communication Lines / Gas:

[ ] Original –Superintendent Signature

[ ] Copy-General Superintendent

[ ] Copy-Main Office Safety File via Safety Director

Appendix Y: Safety Deviation Ticket

Subcontractor: _____ **Date Observed:** _____

Job Site:

Type of Deviation: ☐ Safety/Health ☐ Housekeeping
☐ Environmental

Location: _____

Description of Deviation: _____

_____

_____

_____

Remedial Work Required: _____

_____

_____

_____

The subcontractor is hereby directed to perform the noted remedial work by no later than _____. Until the remedial work is completed by the subcontractor and acknowledged by W.T. Rich, $_____ will be withheld from any payment due to the subcontractor prior to the specified date, this document will serve as written notice the W.T. Rich, at it's sole discretion and without any further notice, may elect to perform the remedial work and all associated costs will be deducted from the subcontractor's price.

W.T. Rich Initiator: _____

Remedial Work Acknowledgement

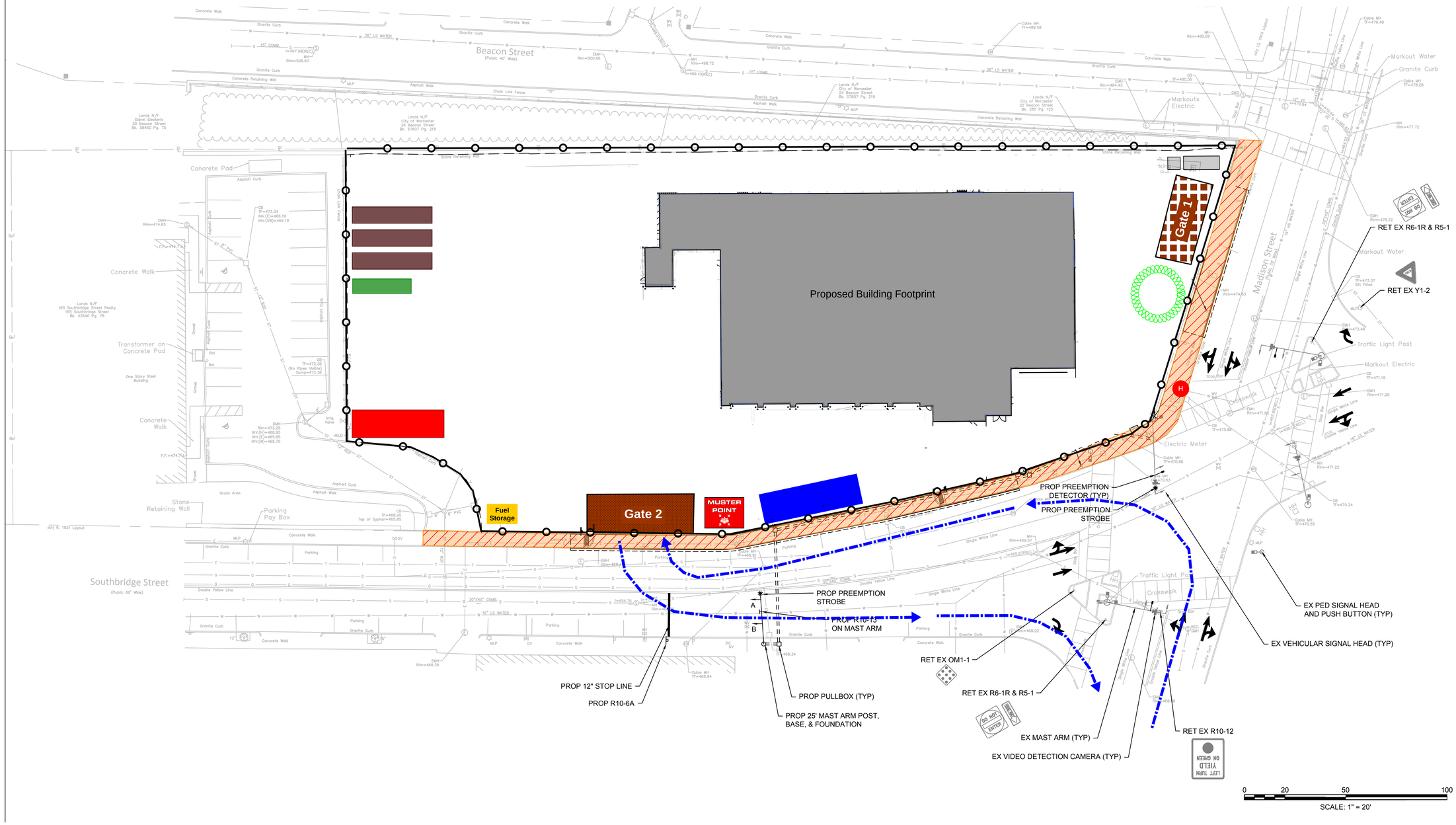
Remedial Work Performed by: _____ Back charge: $ _____

Remedial Work Observed: _____ Date Observed: _____

Additional Copies: _____ Project Accounting _____
Safety Director _____

Legend

- Construction Fence
- Tree protection
- WTR Trailer
- OPM Trailer
- Construction Entrances
- Storage Containers
- Dumpster
- Fire Hydrant
- Fuel Storage Area
- Active Pedestrian Sidewalk
- Typical Trucking Route



Perkins&Will

225 Franklin Street, Suite 700
Boston, MA 02110
t 617.478.0300
f 617.478.0321
www.perkinswill.com

CONSULTANTS

FIREMATIC
WENDEL | MITCHELL ASSOCIATES
29 THACHER PARK RD, VOORHEESVILLE, NY 12186

CIVIL/LANDSCAPE
WESTON & SAMPSON
85 DEVONSHIRE ST, 3RD FL, BOSTON, MA 02109

STRUCTURAL
RSE ASSOCIATES
63 PLEASANT ST, WATERTOWN, MA 02471

MEP/FP/LIGHTING
ARUP
60 STATE ST, BOSTON, MA 02109

CODE
JENSEN HUGHES
33 ARCH ST, BOSTON, MA 02110

ENERGY MODEL
ANDELMANLELEK
1408 PROVIDENCE HWY, NORWOOD, MA 02062

NOT FOR CONSTRUCTION

PROJECT

WORCESTER SOUTH DIVISION FIRE STATION PROJECT
25 MADISON ST
WORCESTER, MA 01608

CITY OF WORCESTER

455 MAIN STREET
WORCESTER, MA 01605

KEY PLAN

ISSUE CHART

MARK	ISSUE	DATE

Job Number 157132.000

TITLE

TRAFFIC PLAN

SHEET NUMBER

C7.01

90% DD ESTIMATE 6/27/25

© 2025 Perkins and Will

6/27/2025 2:53:17 PM P:\MA\Worcester MA\240113 - Perkins & Will South Division Firehouse\05-BIM-CAD\03-Transportation\TRAFFIC PLAN.dwg

SECTION 00 73 17

SUBCONTRACTOR DEFAULT INSURANCE (SDI)

PART 1 - GENERAL

1.1 OVERVIEW

A. A Subcontractor Default Insurance (SDI) program is an alternative form of protection from subcontractor performance or default issues. At the Construction Manager's discretion, the CM may forego requiring a performance and payment bond from a subcontractor (i.e., Non-Trade Contractor) and enroll the subcontractor into the CM's subcontractor default insurance program. A financial prequalification of the subcontractor will be required, and qualification for and enrollment onto the program will be at the discretion of the Construction Manager.

B. Under MGL Chapter 149A, SDI programs will not be utilized for Trade Contractors (i.e., Filed Sub-Bidders). All Trade contractors are required to furnish and pay for performance and payment bonds for the dollar value of their contract amounts.

1.2 SUBCONTRACTOR (NON-TRADE) REQUIREMENTS

A. Each subcontractor and supplier with a proposed contract value in excess of $50,000 will be required to submit their financial and operational qualifications data to a 3rd party assessment firm designated by the Construction Manager.

B. Subcontractors shall be required to subscribe to the designated 3rd party assessment firm. Subcontractors will be responsible for the cost of such subscriptions. The Construction Manager currently employs **Highwire** as its 3rd party assessment firm. The Construction Manager reserves the right to change to another 3rd party assessment firm at its discretion provided the cost to subcontractors is similar or equal to the cost of Highwire.

C. Subcontractors shall submit the following information to the 3rd party assessment firm:
   1. **Company Information**: General information regarding the subcontractors business.
   2. **Project Capabilities**: In general, a subcontractor's track record and experience on similar projects. References from past clients or project owners will be required.
   3. **Financial Information**: Subcontractors are required to submit audited financial statements, including balance sheets, income statements, and cash flow statements.
   4. **Creditworthiness**: Evaluating the subcontractor's credit availability.
   5. **Bonding Capacity**: Subcontractors will demonstrate their respective bonding capacity.
   6. **Insurance Coverage**: Verification of adequate insurance coverage, including general liability and workers' compensation.
   7. **Work Volume History and Project Experience**: An assessment of the subcontractor's contracts to evaluate current and backlog work.

8. **Litigation Compliance**: Compliance with relevant legal and regulatory requirements.
9. **Project-Specific**: Some projects may have unique financial criteria, and subcontractors may need to meet specific financial benchmarks tailored to the project's scope and complexity.

D. Under W.T. Rich Safety program, all contractors with a contract value of over $50,000 are required to subscribe to Highwire for the purposes of Safety Prequalification and Assessment. as outlined within the CM Supplemental Conditions Specification Section 007225. The Highwire enrollment fee includes BOTH safety and financial assessment components. If a contractor is already subscribed to Highwire for one of these components, they may obtain the services of the other service at no additional cost.

E. Timing: It is preferred that subcontractors and suppliers interested in performing work for W.T. Rich Company subscribe to Highwire and submit both their financial and safety prequalification data prior to the time of bidding. In the event that a subcontractor has not subscribed to Highwire and/or submitted its financial assessment data prior to bidding, the Construction Manager may elect to proceed with an award to that subcontractor, but such award will be contingent upon subcontractor submission of all necessary financial data to Highwire within five business days of the date of award.

1.3 ASSESSMENT AND SELECTION

A. The Construction Manager will assess the results of the financial prequalification process for each subcontractor being considered for the program. Based on the results, the Construction Manager may choose any of the following options.
1. Proceed with award; enroll the subcontractor into the SDI program, in which case no performance and payment bond will be provided by the subcontractor.
2. Proceed with award; exclude the subcontractor from the SDI program, in which case the subcontractor will be required to provide a performance and payment bond for the full value of their contract.
3. Withdraw the award from the subcontractor due to financial disqualification. The subcontractor will have no recourse against the construction manager or owner in the event of award withdrawal resulting from financial disqualification.

B. Upon request, the Construction Manager will provide a subcontractor their financial assessment report from Highwire.

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

[NOT USED]

END OF SECTION

SECTION 00 73 43

PREVAILING WAGE RATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 00 and 01.

B. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related shall be bound to this agreement and all of its related documents.

C. Attachment:
1. Prevailing Wage Rates – Issue Date: **12/08/2025**

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

[NOT USED]

END OF SECTION

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS
Prevailing Wage Rates

MAURA HEALY
Governor
KIM DRISCOLL
Lt. Governor

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority:	Worcester	**City/Town:**	WORCESTER
Contract Number:	8612-F6		
Description of Work:	Construction of a New South Division Fire Station		
Job Location:	25 Madison Street, Worcester, MA 01605		

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.
- This annual update requirement is generally not applicable to 27F “rental of equipment” contracts. For such contracts, the prevailing wage rates issued by DLS shall remain in effect for the duration of the contract term. However, if the prevailing wage rate sheet issued does not contain wage rates for each year covered by the contract term, the Awarding Authority must request updated rate sheets from DLS and provide them to the contractor to ensure the correct rates are being paid throughout the duration of the contract. Additionally, if an Awarding Authority exercises an option to renew or extend the contract term, they must request updated rate sheets form DLS and provide them to the contractor.
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the “Wage Request Number” on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$40.95	$15.57	$21.78	$0.00	$0.00	$78.30
	1/1/2026	$40.95	$16.17	$21.78	$0.00	$0.00	$78.90
	6/1/2026	$41.95	$16.17	$21.78	$0.00	$0.00	$79.90
	12/1/2026	$41.95	$16.17	$23.52	$0.00	$0.00	$81.64
	1/1/2027	$41.95	$16.77	$23.52	$0.00	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.02	$15.57	$21.78	$0.00	$0.00	$78.37
	1/1/2026	$41.02	$16.17	$21.78	$0.00	$0.00	$78.97
	6/1/2026	$42.02	$16.17	$21.78	$0.00	$0.00	$79.97
	12/1/2026	$42.02	$16.17	$23.52	$0.00	$0.00	$81.71
	1/1/2027	$42.02	$16.77	$23.52	$0.00	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.14	$15.57	$21.78	$0.00	$0.00	$78.49
	1/1/2026	$41.14	$16.17	$21.78	$0.00	$0.00	$79.09
	6/1/2026	$42.14	$16.17	$21.78	$0.00	$0.00	$80.09
	12/1/2026	$42.14	$16.17	$23.52	$0.00	$0.00	$81.83
	1/1/2027	$42.14	$16.77	$23.52	$0.00	$0.00	$82.43
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 2) For apprentice rates see "Apprentice- PILE DRIVER"	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
AIR TRACK OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$41.97	$10.15	$9.50	$9.11	$0.00	$70.73
	6/1/2026	$43.41	$10.15	$9.50	$9.11	$0.00	$72.17
	12/1/2026	$44.85	$10.15	$9.50	$9.11	$0.00	$73.61
	6/1/2027	$46.30	$10.15	$9.50	$9.11	$0.00	$75.06
	12/1/2027	$47.75	$10.15	$9.50	$9.11	$0.00	$76.51
	6/1/2028	$49.25	$10.15	$9.50	$9.11	$0.00	$78.01
	12/1/2028	$50.75	$10.15	$9.50	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
AIR TRACK OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.97	$10.15	$9.50	$9.21	$0.00	$70.83
	6/1/2026	$43.41	$10.15	$9.50	$9.21	$0.00	$72.27
	12/1/2026	$44.85	$10.15	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
ASBESTOS WORKER (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (WORCESTER)	12/1/2025	$44.80	$14.50	$4.30	$6.75	$0.00	$70.35
ASPHALT RAKER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ASPHALT RAKER (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BACKHOE/FRONT-END LOADER	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
BARCO-TYPE JUMPING TAMPER	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER	12/1/2025	$41.97	$10.15	$9.50	$9.11	$0.00	$70.73
LABORERS	6/1/2026	$43.41	$10.15	$9.50	$9.11	$0.00	$72.17
LABORERS - ZONE 2	12/1/2026	$44.85	$10.15	$9.50	$9.11	$0.00	$73.61
	6/1/2027	$46.30	$10.15	$9.50	$9.11	$0.00	$75.06
	12/1/2027	$47.75	$10.15	$9.50	$9.11	$0.00	$76.51
	6/1/2028	$49.25	$10.15	$9.50	$9.11	$0.00	$78.01
	12/1/2028	$50.75	$10.15	$9.50	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY)	12/1/2025	$41.97	$10.15	$9.50	$9.21	$0.00	$70.83
LABORERS	6/1/2026	$43.41	$10.15	$9.50	$9.21	$0.00	$72.27
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.85	$10.15	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
BOILER MAKER	1/1/2024	$48.12	$7.07	$14.60	$6.00	$0.00	$75.79
BOILERMAKERS LOCAL 29							
BOILERMAKERS LOCAL 29							

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
2	65.00	$31.28	$7.07	$9.32	$3.90	$0.00	$51.57
3	70.00	$33.68	$7.07	$10.03	$4.20	$0.00	$54.98

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: BOILER MAKER

Effective Date: 1/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
4	75.00	$36.09	$7.07	$10.74	$4.50	$0.00	$58.40
5	80.00	$38.50	$7.07	$11.45	$4.80	$0.00	$61.82
6	85.00	$40.90	$7.07	$12.18	$5.10	$0.00	$65.25
7	90.00	$43.31	$7.07	$12.88	$5.40	$0.00	$68.66
8	95.00	$45.71	$7.07	$13.62	$5.70	$0.00	$72.10

Apprentice to Journeyworker Ratio: 1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 (WORCESTER)	8/1/2025	$65.81	$11.49	$15.57	$7.33	$0.00	$100.20
	2/1/2026	$67.16	$11.49	$15.57	$7.33	$0.00	$101.55
	8/1/2026	$69.36	$11.49	$15.57	$7.33	$0.00	$103.75
	2/1/2027	$70.76	$11.49	$15.57	$7.33	$0.00	$105.15

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$32.91	$11.49	$15.57	$7.33	$0.00	$67.30
2	60.00	$39.49	$11.49	$15.57	$7.33	$0.00	$73.88
3	70.00	$46.07	$11.49	$15.57	$7.33	$0.00	$80.46
4	80.00	$52.65	$11.49	$15.57	$7.33	$0.00	$87.04
5	90.00	$59.23	$11.49	$15.57	$7.33	$0.00	$93.62

Apprentice: BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.58	$11.49	$15.57	$7.33	$0.00	$67.97
2	60.00	$40.30	$11.49	$15.57	$7.33	$0.00	$74.69
3	70.00	$47.01	$11.49	$15.57	$7.33	$0.00	$81.40
4	80.00	$53.73	$11.49	$15.57	$7.33	$0.00	$88.12
5	90.00	$60.44	$11.49	$15.57	$7.33	$0.00	$94.83

Apprentice to Journeyworker Ratio: 1:5

BULLDOZER/GRADER/SCRAPER OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2025	$49.85	$10.15	$9.50	$9.80	$0.00	$79.30
	6/1/2026	$51.40	$10.15	$9.50	$9.80	$0.00	$80.85
	12/1/2026	$52.90	$10.15	$9.50	$9.80	$0.00	$82.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING LABORER	12/1/2025	$48.70	$10.15	$9.50	$9.80	$0.00	$78.15
LABORERS	6/1/2026	$50.25	$10.15	$9.50	$9.80	$0.00	$79.70
LABORERS - FOUNDATION AND MARINE	12/1/2026	$51.75	$10.15	$9.50	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
CAISSON & UNDERPINNING TOP MAN	12/1/2025	$49.03	$10.15	$9.50	$9.80	$0.00	$78.48
LABORERS	6/1/2026	$50.58	$10.15	$9.50	$9.80	$0.00	$80.03
LABORERS - FOUNDATION AND MARINE	12/1/2026	$52.08	$10.15	$9.50	$9.80	$0.00	$81.53
For apprentice rates see "Apprentice- LABORER"							
CARBIDE CORE DRILL OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
CARPENTER	9/1/2025	$50.35	$10.33	$11.47	$8.50	$0.00	$80.65
CARPENTERS	3/1/2026	$51.60	$10.33	$11.47	$8.50	$0.00	$81.90
CARPENTERS -ZONE 2 (Eastern Massachusetts)	9/1/2026	$52.85	$10.33	$11.47	$8.50	$0.00	$83.15
	3/1/2027	$54.10	$10.33	$11.47	$8.50	$0.00	$84.40

Apprentice: CARPENTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$22.66	$10.33	$0.00	$1.73	$0.00	$34.72
2	45.00	$22.66	$10.33	$0.00	$1.73	$0.00	$34.72
3	55.00	$27.69	$10.33	$0.00	$3.40	$0.00	$41.42
4	55.00	$27.69	$10.33	$0.00	$3.40	$0.00	$41.42
5	70.00	$35.25	$10.33	$11.41	$5.10	$0.00	$62.09
6	70.00	$35.25	$10.33	$11.41	$5.10	$0.00	$62.09
7	80.00	$40.28	$10.33	$11.44	$6.80	$0.00	$68.85
8	80.00	$40.28	$10.33	$11.44	$6.80	$0.00	$68.85

Apprentice: CARPENTER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$23.22	$10.33	$0.00	$1.73	$0.00	$35.28
2	45.00	$23.22	$10.33	$0.00	$1.73	$0.00	$35.28
3	55.00	$28.38	$10.33	$0.00	$3.40	$0.00	$42.11
4	55.00	$28.38	$10.33	$0.00	$3.40	$0.00	$42.11

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME	10/1/2025	$27.75	$7.02	$3.80	$1.00	$0.00	$39.57
CARPENTERS	10/1/2026	$28.85	$7.02	$3.80	$1.00	$0.00	$40.67
CARPENTERS-ZONE 3 (Wood Frame)							

All Aspects of New Wood Frame Work

Apprentice: CARPENTER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	70.00	$36.12	$10.33	$11.41	$5.10	$0.00	$62.96
6	70.00	$36.12	$10.33	$11.41	$5.10	$0.00	$62.96
7	80.00	$41.28	$10.33	$11.44	$6.80	$0.00	$69.85
8	80.00	$41.28	$10.33	$11.44	$6.80	$0.00	$69.85

Apprentice to Journeyworker Ratio: 1:5

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
2	60.00	$16.65	$7.02	$0.00	$0.00	$0.00	$23.67
3	65.00	$18.04	$7.02	$0.00	$1.00	$0.00	$26.06
4	70.00	$19.43	$7.02	$0.00	$1.00	$0.00	$27.45
5	75.00	$20.81	$7.02	$3.80	$1.00	$0.00	$32.63
6	80.00	$22.20	$7.02	$3.80	$1.00	$0.00	$34.02
7	85.00	$23.59	$7.02	$3.80	$1.00	$0.00	$35.41
8	90.00	$24.98	$7.02	$3.80	$1.00	$0.00	$36.80

Apprentice: CARPENTER WOOD FRAME

Effective Date: 10/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$17.31	$7.02	$0.00	$0.00	$0.00	$24.33
2	60.00	$17.31	$7.02	$0.00	$0.00	$0.00	$24.33
3	65.00	$18.75	$7.02	$0.00	$1.00	$0.00	$26.77
4	70.00	$20.20	$7.02	$0.00	$1.00	$0.00	$28.22
5	75.00	$21.64	$7.02	$3.80	$1.00	$0.00	$33.46
6	80.00	$23.08	$7.02	$3.80	$1.00	$0.00	$34.90
7	85.00	$24.52	$7.02	$3.80	$1.00	$0.00	$36.34
8	90.00	$25.97	$7.02	$3.80	$1.00	$0.00	$37.79

Apprentice to Journeyworker Ratio: 1:5

CEMENT MASONRY/PLASTERING	7/1/2024	$49.19	$13.35	$16.43	$7.78	$1.80	$88.55
BRICKLAYERS LOCAL 3							
BRICKLAYERS LOCAL 3 (WORCESTER)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: CEMENT MASONRY/PLASTERING

Effective Date: 7/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.60	$13.35	$16.43	$0.00	$0.00	$54.38
2	60.00	$29.51	$13.35	$16.43	$2.78	$1.80	$63.87
3	65.00	$31.97	$13.35	$16.43	$3.78	$1.80	$67.33
4	70.00	$34.43	$13.35	$16.43	$4.78	$1.80	$70.79
5	75.00	$36.89	$13.35	$16.43	$5.78	$1.80	$74.25
6	80.00	$39.35	$13.35	$16.43	$6.78	$1.80	$77.71
7	90.00	$44.27	$13.35	$16.43	$7.78	$1.80	$83.63

Apprentice to Journeyworker Ratio: 1:3

CHAIN SAW OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$60.48	$16.05	$13.25	$3.25	$0.00	$93.03
	6/1/2026	$61.81	$16.05	$13.25	$3.25	$0.00	$94.36
	12/1/2026	$63.29	$16.05	$13.25	$3.25	$0.00	$95.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$37.97	$16.05	$13.25	$3.25	$0.00	$70.52
	6/1/2026	$38.83	$16.05	$13.25	$3.25	$0.00	$71.38
	12/1/2026	$39.78	$16.05	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DELEADER (BRIDGE) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$58.51	$10.30	$11.95	$12.50	$0.00	$93.26
	1/1/2026	$59.56	$10.35	$12.00	$12.60	$0.00	$94.51

Apprentice: DELEADER (BRIDGE)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.26	$10.30	$0.00	$0.00	$0.00	$39.56
2	55.00	$32.18	$10.30	$0.00	$6.88	$0.00	$49.36
3	60.00	$35.11	$10.30	$0.00	$7.50	$0.00	$52.91
4	65.00	$38.03	$10.30	$0.00	$8.13	$0.00	$56.46
5	70.00	$40.96	$10.30	$11.95	$8.75	$0.00	$71.96
6	75.00	$43.88	$10.30	$11.95	$9.38	$0.00	$75.51

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: DELEADER (BRIDGE)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
7	80.00	$46.81	$10.30	$11.95	$10.00	$0.00	$79.06
8	90.00	$52.66	$10.30	$11.95	$11.25	$0.00	$86.16

Apprentice: DELEADER (BRIDGE)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2	55.00	$32.76	$10.35	$0.00	$6.93	$0.00	$50.04
3	60.00	$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4	65.00	$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5	70.00	$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6	75.00	$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7	80.00	$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8	90.00	$53.60	$10.35	$12.00	$11.34	$0.00	$87.29

Apprentice to Journeyworker Ratio: 1:1

DEMO: ADZEMAN LABORERS LABORERS - ZONE 2	12/1/2025	$48.75	$10.15	$9.50	$9.65	$0.00	$78.05
	6/1/2026	$50.30	$10.15	$9.50	$9.65	$0.00	$79.60
	12/7/2026	$51.80	$10.15	$9.50	$9.65	$0.00	$81.10
	6/7/2027	$53.40	$10.15	$9.50	$9.65	$0.00	$82.70
	12/6/2027	$55.00	$10.15	$9.50	$9.65	$0.00	$84.30
	6/5/2028	$56.68	$10.15	$9.50	$9.65	$0.00	$85.98
	12/4/2028	$58.35	$10.15	$9.50	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$49.75	$10.15	$9.50	$9.65	$0.00	$79.05
	6/1/2026	$51.30	$10.15	$9.50	$9.65	$0.00	$80.60
	12/7/2026	$52.80	$10.15	$9.50	$9.65	$0.00	$82.10
	6/7/2027	$54.40	$10.15	$9.50	$9.65	$0.00	$83.70
	12/6/2027	$56.00	$10.15	$9.50	$9.65	$0.00	$85.30
	6/5/2028	$57.68	$10.15	$9.50	$9.65	$0.00	$86.98
	12/4/2028	$59.35	$10.15	$9.50	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: BURNERS LABORERS LABORERS - ZONE 2	12/1/2025	$49.50	$10.15	$9.50	$9.65	$0.00	$78.80
	6/1/2026	$51.05	$10.15	$9.50	$9.65	$0.00	$80.35
	12/7/2026	$52.55	$10.15	$9.50	$9.65	$0.00	$81.85
	6/7/2027	$54.15	$10.15	$9.50	$9.65	$0.00	$83.45
	12/6/2027	$55.75	$10.15	$9.50	$9.65	$0.00	$85.05
	6/5/2028	$57.43	$10.15	$9.50	$9.65	$0.00	$86.73
	12/4/2028	$59.10	$10.15	$9.50	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER	12/1/2025	$49.75	$10.15	$9.50	$9.65	$0.00	$79.05
LABORERS	6/1/2026	$51.30	$10.15	$9.50	$9.65	$0.00	$80.60
LABORERS - ZONE 2	12/7/2026	$52.80	$10.15	$9.50	$9.65	$0.00	$82.10
	6/7/2027	$54.40	$10.15	$9.50	$9.65	$0.00	$83.70
	12/6/2027	$56.00	$10.15	$9.50	$9.65	$0.00	$85.30
	6/5/2028	$57.68	$10.15	$9.50	$9.65	$0.00	$86.98
	12/4/2028	$59.35	$10.15	$9.50	$9.65	$0.00	$88.65
For apprentice rates see "Apprentice- LABORER"							
DEMO: JACKHAMMER OPERATOR	12/1/2025	$49.50	$10.15	$9.50	$9.65	$0.00	$78.80
LABORERS	6/1/2026	$51.05	$10.15	$9.50	$9.65	$0.00	$80.35
LABORERS - ZONE 2	12/7/2026	$52.55	$10.15	$9.50	$9.65	$0.00	$81.85
	6/7/2027	$54.15	$10.15	$9.50	$9.65	$0.00	$83.45
	12/6/2027	$55.75	$10.15	$9.50	$9.65	$0.00	$85.05
	6/5/2028	$57.43	$10.15	$9.50	$9.65	$0.00	$86.73
	12/4/2028	$59.10	$10.15	$9.50	$9.65	$0.00	$88.40
For apprentice rates see "Apprentice- LABORER"							
DEMO: WRECKING LABORER	12/1/2025	$48.75	$10.15	$9.50	$9.65	$0.00	$78.05
LABORERS	6/1/2026	$50.30	$10.15	$9.50	$9.65	$0.00	$79.60
LABORERS - ZONE 2	12/7/2026	$51.80	$10.15	$9.50	$9.65	$0.00	$81.10
	6/7/2027	$53.40	$10.15	$9.50	$9.65	$0.00	$82.70
	12/6/2027	$55.00	$10.15	$9.50	$9.65	$0.00	$84.30
	6/5/2028	$56.68	$10.15	$9.50	$9.65	$0.00	$85.98
	12/4/2028	$58.35	$10.15	$9.50	$9.65	$0.00	$87.65
For apprentice rates see "Apprentice- LABORER"							
DIRECTIONAL DRILL MACHINE OPERATOR	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
DIVER	8/1/2024	$78.11	$10.08	$11.62	$12.67	$0.00	$112.48
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Diver wage 70/80/90 2A $69.83, 3A $91.79,4A $102.14 Total Rate							
DIVER TENDER	8/1/2024	$51.97	$10.08	$11.62	$12.67	$0.00	$86.34
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
as of 8-1-24, Apprentices with diving licenses begin at second year. % of Piledriver wage 70/80/90 2A $54.20, 3A $73.93,4A $82.05 Total Rate							
DIVER TENDER (EFFLUENT)	8/1/2024	$83.69	$10.08	$11.62	$12.67	$0.00	$118.06
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
For apprentice rates see "Apprentice- PILE DRIVER"							
DIVER/SLURRY (EFFLUENT)	8/1/2024	$117.16	$10.08	$11.62	$12.67	$0.00	$151.53
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							
For apprentice rates see "Apprentice- PILE DRIVER"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888 DRAWBRIDGE - SEIU LOCAL 888	7/1/2020	$26.77	$6.67	$3.93	$0.00	$0.16	$37.53
ELECTRICIAN ELECTRICIANS LOCAL 96 ELECTRICIANS LOCAL 96	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34

Apprentice: ELECTRICIAN

Effective Date: 9/7/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$19.26	$14.98	$0.58	$0.00	$0.00	$34.82
2	45.00	$21.67	$14.98	$0.65	$0.00	$0.00	$37.30
3	48.00	$23.12	$14.98	$13.55	$2.54	$0.00	$54.19
4	55.00	$26.49	$14.98	$13.65	$2.92	$0.00	$58.04
5	65.00	$31.30	$14.98	$13.80	$3.45	$0.00	$63.53
6	80.00	$38.53	$14.98	$14.02	$4.24	$0.00	$71.77

Apprentice: ELECTRICIAN

Effective Date: 9/6/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$19.75	$15.96	$0.59	$0.00	$0.00	$36.30
2	45.00	$22.22	$15.96	$0.67	$0.00	$0.00	$38.85
3	48.00	$23.70	$15.96	$13.80	$2.61	$0.00	$56.07
4	55.00	$27.16	$15.96	$13.90	$2.99	$0.00	$60.01
5	65.00	$32.10	$15.96	$14.05	$3.53	$0.00	$65.64
6	80.00	$39.50	$15.96	$14.28	$4.35	$0.00	$74.09

Apprentice to Journeyworker Ratio: 2:3

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 41 ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2025	$66.41	$16.28	$10.96	$10.40	$0.00	$104.05
	1/1/2026	$69.23	$16.38	$11.06	$10.70	$0.00	$107.37
	1/1/2027	$72.23	$16.48	$11.16	$11.00	$0.00	$110.87

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.21	$16.28	$0.00	$0.00	$0.00	$49.49
2	55.00	$36.53	$16.28	$10.96	$10.40	$0.00	$74.17
3	65.00	$43.17	$16.28	$10.96	$10.40	$0.00	$80.81
4	70.00	$46.49	$16.28	$10.96	$10.40	$0.00	$84.13
5	80.00	$53.13	$16.28	$10.96	$10.40	$0.00	$90.77

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: ELEVATOR CONSTRUCTOR

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$34.62	$16.38	$0.00	$0.00	$0.00	$51.00
2	55.00	$38.08	$16.38	$11.06	$10.70	$0.00	$76.22
3	65.00	$45.00	$16.38	$11.06	$10.70	$0.00	$83.14
4	70.00	$48.46	$16.38	$11.06	$10.70	$0.00	$86.60
5	80.00	$55.38	$16.38	$11.06	$10.70	$0.00	$93.52

Apprentice to Journeyworker Ratio: 1:1

ELEVATOR CONSTRUCTOR HELPER	1/1/2025	$46.49	$16.28	$10.96	$10.40	$0.00	$84.13
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2026	$48.46	$16.38	$11.06	$10.70	$0.00	$86.60
ELEVATOR CONSTRUCTORS LOCAL 41	1/1/2027	$50.56	$16.48	$11.16	$11.00	$0.00	$89.20
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"							
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	11/1/2025	$53.56	$16.05	$13.25	$3.25	$0.00	$86.11
OPERATING ENGINEERS LOCAL 4	5/1/2026	$55.00	$16.05	$13.25	$3.25	$0.00	$87.55
OPERATING ENGINEERS LOCAL 4	11/1/2026	$56.29	$16.05	$13.25	$3.25	$0.00	$88.84
	5/1/2027	$57.72	$16.05	$13.25	$3.25	$0.00	$90.27
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	11/1/2025	$55.17	$16.05	$13.25	$3.25	$0.00	$87.72
OPERATING ENGINEERS LOCAL 4	5/1/2026	$56.62	$16.05	$13.25	$3.25	$0.00	$89.17
OPERATING ENGINEERS LOCAL 4	11/1/2026	$57.92	$16.05	$13.25	$3.25	$0.00	$90.47
	5/1/2027	$59.37	$16.05	$13.25	$3.25	$0.00	$91.92
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	11/1/2025	$26.03	$16.05	$13.25	$3.25	$0.00	$58.58
OPERATING ENGINEERS LOCAL 4	5/1/2026	$26.88	$16.05	$13.25	$3.25	$0.00	$59.43
OPERATING ENGINEERS LOCAL 4	11/1/2026	$27.64	$16.05	$13.25	$3.25	$0.00	$60.19
	5/1/2027	$28.49	$16.05	$13.25	$3.25	$0.00	$61.04
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FIRE ALARM INSTALLER	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
ELECTRICIANS LOCAL 96	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34
ELECTRICIANS LOCAL 96							
For apprentice rates see "Apprentice- ELECTRICIAN"							
FIRE ALARM REPAIR / MAINT/COMMISSIONING	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
ELECTRICIANS LOCAL 96	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34
ELECTRICIANS LOCAL 96							
For apprentice rates see "Apprentice- ELECTRICIAN"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
FIREMAN (ASST. ENGINEER)	12/1/2025	$47.69	$16.05	$13.25	$3.25	$0.00	$80.24
OPERATING ENGINEERS LOCAL 4	6/1/2026	$48.75	$16.05	$13.25	$3.25	$0.00	$81.30
OPERATING ENGINEERS LOCAL 4	12/1/2026	$49.93	$16.05	$13.25	$3.25	$0.00	$82.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
FLAGGER & SIGNALER (HEAVY & HIGHWAY)	12/1/2025	$28.09	$10.15	$9.50	$9.21	$0.00	$56.95
LABORERS	6/1/2026	$29.21	$10.15	$9.50	$9.21	$0.00	$58.07
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$29.21	$10.15	$9.50	$9.21	$0.00	$58.07
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
FLOORCOVERER	3/1/2024	$48.93	$10.33	$11.47	$8.80	$0.00	$79.53
FLOORCOVERERS LOCAL 2168							
FLOORCOVERERS LOCAL 2168 ZONE II							

Apprentice: FLOORCOVERER

Effective Date: 3/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.47	$10.33	$0.00	$1.76	$0.00	$36.56
2	55.00	$26.91	$10.33	$0.00	$1.76	$0.00	$39.00
3	60.00	$29.36	$10.33	$0.00	$3.52	$0.00	$43.21
4	65.00	$31.80	$10.33	$0.00	$3.52	$0.00	$45.65
5	70.00	$34.25	$10.33	$11.47	$5.28	$0.00	$61.33
6	75.00	$36.70	$10.33	$11.47	$5.28	$0.00	$63.78
7	80.00	$39.14	$10.33	$11.47	$7.04	$0.00	$67.98
8	85.00	$41.59	$10.33	$11.47	$7.04	$0.00	$70.43

Apprentice Notes

Steps are 750 hrs.

Apprentice to Journeyworker Ratio: 1:1

FORK LIFT/CHERRY PICKER	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GENERATOR/LIGHTING PLANT/HEATERS	12/1/2025	$37.97	$16.05	$13.25	$3.25	$0.00	$70.52
OPERATING ENGINEERS LOCAL 4	6/1/2026	$38.83	$16.05	$13.25	$3.25	$0.00	$71.38
OPERATING ENGINEERS LOCAL 4	12/1/2026	$39.78	$16.05	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	7/1/2025	$48.01	$10.30	$11.95	$12.50	$0.00	$82.76
GLAZIERS LOCAL 35	1/1/2026	$49.06	$10.35	$12.00	$12.60	$0.00	$84.01
GLAZIERS LOCAL 35 (ZONE 2)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.01	$10.30	$0.00	$0.00	$0.00	$34.31
2	55.00	$26.41	$10.30	$0.00	$6.88	$0.00	$43.59
3	60.00	$28.81	$10.30	$0.00	$7.50	$0.00	$46.61
4	65.00	$31.21	$10.30	$0.00	$8.13	$0.00	$49.64
5	70.00	$33.61	$10.30	$11.95	$8.75	$0.00	$64.61
6	75.00	$36.01	$10.30	$11.95	$9.38	$0.00	$67.64
7	80.00	$38.41	$10.30	$11.95	$10.00	$0.00	$70.66
8	90.00	$43.21	$10.30	$11.95	$11.25	$0.00	$76.71

Apprentice: GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.53	$10.30	$0.00	$0.00	$0.00	$34.83
2	55.00	$26.98	$10.30	$0.00	$6.88	$0.00	$44.16
3	60.00	$29.44	$10.30	$0.00	$7.50	$0.00	$47.24
4	65.00	$31.89	$10.30	$0.00	$8.13	$0.00	$50.32
5	70.00	$34.34	$10.30	$11.95	$8.75	$0.00	$65.34
6	75.00	$36.80	$10.30	$11.95	$9.38	$0.00	$68.43
7	80.00	$39.25	$10.30	$11.95	$10.00	$0.00	$71.50
8	90.00	$44.15	$10.30	$11.95	$11.25	$0.00	$77.65

Apprentice to Journeyworker Ratio: 1:1

HOISTING ENGINEER/CRANES/GRADALLS	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$32.88	$0.00	$0.00	$0.00	$0.00	$32.88
2	60.00	$35.87	$16.05	$13.25	$3.25	$0.00	$68.42
3	65.00	$38.86	$16.05	$13.25	$3.25	$0.00	$71.41
4	70.00	$41.85	$16.05	$13.25	$3.25	$0.00	$74.40
5	75.00	$44.84	$16.05	$13.25	$3.25	$0.00	$77.39
6	80.00	$47.82	$16.05	$13.25	$3.25	$0.00	$80.37
7	85.00	$50.81	$16.05	$13.25	$3.25	$0.00	$83.36
8	90.00	$53.80	$16.05	$13.25	$3.25	$0.00	$86.35

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: HOISTING ENGINEER/CRANES/GRADALLS

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$33.32	$0.00	$0.00	$0.00	$0.00	$33.32
2	60.00	$36.35	$16.05	$13.25	$3.25	$0.00	$68.90
3	65.00	$39.38	$16.05	$13.25	$3.25	$0.00	$71.93
4	70.00	$42.41	$16.50	$13.25	$3.25	$0.00	$75.41
5	75.00	$45.44	$16.50	$13.25	$3.25	$0.00	$78.44
6	80.00	$48.46	$16.50	$13.25	$3.25	$0.00	$81.46
7	85.00	$51.49	$16.50	$13.25	$3.25	$0.00	$84.49
8	90.00	$54.52	$16.50	$13.25	$3.25	$0.00	$87.52

Apprentice to Journeyworker Ratio: 1:6

HVAC (DUCTWORK)	7/1/2025	$43.48	$12.94	$11.01	$8.72	$2.13	$78.28
SHEETMETAL WORKERS LOCAL 63	7/1/2026	$43.48	$13.24	$11.01	$9.92	$2.13	$79.78
SHEETMETAL WORKERS LOCAL 63	1/1/2027	$43.48	$13.54	$11.01	$11.12	$2.13	$81.28
	7/1/2027	$44.98	$13.54	$11.01	$11.12	$2.13	$82.78
	1/1/2028	$46.48	$13.54	$11.01	$11.12	$2.13	$84.28
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (ELECTRICAL CONTROLS)	9/7/2025	$48.16	$14.98	$14.30	$5.30	$0.00	$82.74
ELECTRICIANS LOCAL 96	9/6/2026	$49.38	$15.96	$14.57	$5.43	$0.00	$85.34
ELECTRICIANS LOCAL 96							
For apprentice rates see "Apprentice- ELECTRICIAN"							
HVAC (TESTING AND BALANCING - AIR)	7/1/2025	$43.48	$12.94	$11.01	$8.72	$2.13	$78.28
SHEETMETAL WORKERS LOCAL 63	7/1/2026	$43.48	$13.24	$11.01	$9.92	$2.13	$79.78
SHEETMETAL WORKERS LOCAL 63	1/1/2027	$43.48	$13.54	$11.01	$11.12	$2.13	$81.28
	7/1/2027	$44.98	$13.54	$11.01	$11.12	$2.13	$82.78
	1/1/2028	$46.48	$13.54	$11.01	$11.12	$2.13	$84.28
For apprentice rates see "Apprentice- SHEET METAL WORKER"							
HVAC (TESTING AND BALANCING -WATER)	9/1/2025	$55.00	$12.70	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87
PLUMBERS LOCAL 4							
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HVAC MECHANIC	9/1/2025	$55.00	$12.70	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87
PLUMBERS LOCAL 4							
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
HYDRAULIC DRILLS	12/1/2025	$41.97	$10.15	$9.50	$9.11	$0.00	$70.73
LABORERS	6/1/2026	$43.41	$10.15	$9.50	$9.11	$0.00	$72.17
LABORERS - ZONE 2	12/1/2026	$44.85	$10.15	$9.50	$9.11	$0.00	$73.61
	6/1/2027	$46.30	$10.15	$9.50	$9.11	$0.00	$75.06
	12/1/2027	$47.75	$10.15	$9.50	$9.11	$0.00	$76.51
	6/1/2028	$49.25	$10.15	$9.50	$9.11	$0.00	$78.01

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
	12/1/2028	$50.75	$10.15	$9.50	$9.11	$0.00	$79.51
For apprentice rates see "Apprentice- LABORER"							
HYDRAULIC DRILLS (HEAVY & HIGHWAY)	12/1/2025	$41.97	$10.15	$9.50	$9.21	$0.00	$70.83
LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	6/1/2026	$43.41	$10.15	$9.50	$9.21	$0.00	$72.27
	12/1/2026	$44.85	$10.15	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
INSULATOR (PIPES & TANKS)	9/1/2025	$54.31	$14.75	$9.52	$10.09	$0.00	$88.67
HEAT & FROST INSULATORS LOCAL 6 HEAT & FROST INSULATORS LOCAL 6 (WORCESTER)	9/1/2026	$57.38	$14.75	$9.52	$10.09	$0.00	$91.74

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.16	$14.75	$9.27	$5.05	$0.00	$56.23
2	60.00	$32.59	$14.75	$9.32	$6.05	$0.00	$62.71
3	70.00	$38.02	$14.75	$9.37	$7.06	$0.00	$69.20
4	80.00	$43.45	$14.75	$9.42	$8.07	$0.00	$75.69

Apprentice: INSULATOR (PIPES & TANKS)

Effective Date: 9/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$28.69	$14.75	$9.27	$5.05	$0.00	$57.76
2	60.00	$34.43	$14.75	$9.32	$6.05	$0.00	$64.55
3	70.00	$40.17	$14.75	$9.37	$7.06	$0.00	$71.35
4	80.00	$45.90	$14.75	$9.42	$8.07	$0.00	$78.14

Apprentice to Journeyworker Ratio: 1:4

IRONWORKER/WELDER IRONWORKERS LOCAL 7 IRONWORKERS LOCAL 7 (WORCESTER AREA)	9/16/2025	$57.57	$9.05	$12.75	$14.50	$0.00	$93.87

Apprentice: IRONWORKER/WELDER

Effective Date: 9/16/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$34.54	$9.05	$12.75	$4.50	$0.00	$60.84
2	75.00	$43.18	$9.05	$12.75	$4.50	$0.00	$69.48
3	85.00	$48.93	$9.05	$12.75	$4.50	$0.00	$75.23

Apprentice to Journeyworker Ratio: 1:4

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS LABORERS - ZONE 2	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76

Apprentice: LABORER

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.03	$10.15	$9.50	$9.11	$0.00	$53.79
2	70.00	$29.20	$10.15	$9.50	$9.11	$0.00	$57.96
3	80.00	$33.38	$10.15	$9.50	$9.11	$0.00	$62.14
4	90.00	$37.55	$10.15	$9.50	$9.11	$0.00	$66.31

Apprentice: LABORER

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.60	$10.15	$9.50	$9.11	$0.00	$54.36
2	70.00	$29.86	$10.15	$9.50	$9.11	$0.00	$58.62
3	80.00	$34.13	$10.15	$9.50	$9.11	$0.00	$62.89
4	90.00	$38.39	$10.15	$9.50	$9.11	$0.00	$67.15

Apprentice to Journeyworker Ratio: 1:5

LABORER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.22	$10.15	$9.50	$9.21	$0.00	$70.08
	6/1/2026	$42.66	$10.15	$9.50	$9.21	$0.00	$71.52
	12/1/2026	$44.10	$10.15	$9.50	$9.21	$0.00	$72.96

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 12/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.03	$10.15	$9.50	$9.21	$0.00	$53.89
2	70.00	$29.20	$10.15	$9.50	$9.21	$0.00	$58.06
3	80.00	$33.38	$10.15	$9.50	$9.21	$0.00	$62.24
4	90.00	$37.55	$10.15	$9.50	$9.21	$0.00	$66.41

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: LABORER (HEAVY & HIGHWAY)

Effective Date: 6/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	60.00	$25.60	$10.15	$9.50	$9.21	$0.00	$54.46
2	70.00	$29.86	$10.15	$9.50	$9.21	$0.00	$58.72
3	80.00	$34.13	$10.15	$9.50	$9.21	$0.00	$62.99
4	90.00	$38.39	$10.15	$9.50	$9.10	$0.00	$67.14

Apprentice to Journeyworker Ratio: 1:5

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER LABORERS LABORERS - ZONE 2	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: CEMENT FINISHER TENDER LABORERS LABORERS - ZONE 2	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS LABORERS - ZONE 2	12/1/2025	$41.31	$10.15	$9.50	$9.65	$0.00	$70.61
	6/1/2026	$42.75	$10.15	$9.50	$9.65	$0.00	$72.05
	12/7/2026	$44.19	$10.15	$9.50	$9.65	$0.00	$73.49
	6/7/2027	$45.64	$10.15	$9.50	$9.65	$0.00	$74.94
	12/6/2027	$47.09	$10.15	$9.50	$9.65	$0.00	$76.39
	6/5/2028	$48.59	$10.15	$9.50	$9.65	$0.00	$77.89
	12/4/2028	$50.09	$10.15	$9.50	$9.65	$0.00	$79.39
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
LABORER: MASON TENDER (HEAVY & HIGHWAY) LABORERS	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
LABORER: MULTI-TRADE TENDER	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
LABORERS	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
LABORERS - ZONE 2	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76
For apprentice rates see "Apprentice- LABORER"							
LABORER: TREE REMOVER	12/1/2025	$41.22	$10.15	$9.50	$9.11	$0.00	$69.98
LABORERS	6/1/2026	$42.66	$10.15	$9.50	$9.11	$0.00	$71.42
LABORERS - ZONE 2	12/1/2026	$44.10	$10.15	$9.50	$9.11	$0.00	$72.86
	6/1/2027	$45.55	$10.15	$9.50	$9.11	$0.00	$74.31
	12/1/2027	$47.00	$10.15	$9.50	$9.11	$0.00	$75.76
	6/1/2028	$48.50	$10.15	$9.50	$9.11	$0.00	$77.26
	12/1/2028	$50.00	$10.15	$9.50	$9.11	$0.00	$78.76
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
LASER BEAM OPERATOR (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
MARBLE & TILE FINISHERS	8/1/2025	$52.08	$11.49	$15.57	$6.05	$0.00	$85.19
BRICKLAYERS LOCAL 3	2/1/2026	$53.16	$11.49	$15.57	$6.05	$0.00	$86.27
BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2026	$54.92	$11.49	$15.57	$6.05	$0.00	$88.03
	2/1/2027	$56.04	$11.49	$15.57	$6.05	$0.00	$89.15

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.04	$11.49	$15.57	$6.05	$0.00	$59.15
2	60.00	$31.25	$11.49	$15.57	$6.05	$0.00	$64.36
3	70.00	$36.46	$11.49	$15.57	$6.05	$0.00	$69.57
4	80.00	$41.66	$11.49	$15.57	$6.05	$0.00	$74.77

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	90.00	$46.87	$11.49	$15.57	$6.05	$0.00	$79.98

Apprentice: MARBLE & TILE FINISHERS

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.58	$11.49	$15.57	$6.05	$0.00	$59.69
2	60.00	$31.90	$11.49	$15.57	$6.05	$0.00	$65.01
3	70.00	$37.21	$11.49	$15.57	$6.05	$0.00	$70.32
4	80.00	$42.53	$11.49	$15.57	$6.05	$0.00	$75.64
5	90.00	$47.84	$11.49	$15.57	$6.05	$0.00	$80.95

Apprentice to Journeyworker Ratio: 1:5

MARBLE MASONS,TILELAYERS & TERRAZZO MECH BRICKLAYERS LOCAL 3 BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2025	$67.97	$11.49	$15.57	$7.99	$0.00	$103.02
	2/1/2026	$69.32	$11.49	$15.57	$7.99	$0.00	$104.37
	8/1/2026	$71.52	$11.49	$15.57	$7.99	$0.00	$106.57
	2/1/2027	$72.92	$11.49	$15.57	$7.99	$0.00	$107.97

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.99	$11.49	$15.57	$7.99	$0.00	$69.04
2	60.00	$40.78	$11.49	$15.57	$7.99	$0.00	$75.83
3	70.00	$47.58	$11.49	$15.57	$7.99	$0.00	$82.63
4	80.00	$54.38	$11.49	$15.57	$7.99	$0.00	$89.43
5	90.00	$61.17	$11.49	$15.57	$7.99	$0.00	$96.22

Apprentice: MARBLE MASONS,TILELAYERS & TERRAZZO MECH

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$34.66	$11.49	$15.57	$7.99	$0.00	$69.71
2	60.00	$41.59	$11.49	$15.57	$7.99	$0.00	$76.64
3	70.00	$48.52	$11.49	$15.57	$7.99	$0.00	$83.57
4	80.00	$55.46	$11.49	$15.57	$7.99	$0.00	$90.51
5	90.00	$62.39	$11.49	$15.57	$7.99	$0.00	$97.44

Apprentice to Journeyworker Ratio: 1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES)	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MECHANICS MAINTENANCE	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
MILLWRIGHT (Zone 3)	1/6/2025	$43.42	$10.08	$11.47	$9.75	$0.00	$74.72
MILLWRIGHTS LOCAL 1121	1/5/2026	$45.70	$10.08	$11.47	$9.75	$0.00	$77.00
MILLWRIGHTS LOCAL 1121 - Zone 3							

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/6/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$23.88	$10.08	$0.00	$5.36	$0.00	$39.32
2	65.00	$28.22	$10.08	$0.00	$6.34	$0.00	$44.64
3	75.00	$32.57	$10.08	$11.47	$7.31	$0.00	$61.43
4	85.00	$36.91	$10.08	$11.47	$8.29	$0.00	$66.75

Apprentice: MILLWRIGHT (Zone 3)

Effective Date: 1/5/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	55.00	$25.14	$10.08	$0.00	$5.36	$0.00	$40.58
2	65.00	$29.71	$10.08	$0.00	$6.34	$0.00	$46.13
3	75.00	$34.28	$10.08	$11.47	$7.31	$0.00	$63.14
4	85.00	$38.85	$10.08	$11.47	$8.29	$0.00	$68.69

Apprentice Notes

Step 1&2 Appr. indentured after 1/6/2020 receive no pension,

Apprentice to Journeyworker Ratio: 1:4

MORTAR MIXER	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
OILER (OTHER THAN TRUCK CRANES,GRADALLS)	12/1/2025	$25.68	$16.05	$13.25	$3.25	$0.00	$58.23
OPERATING ENGINEERS LOCAL 4	6/1/2026	$26.27	$16.05	$13.25	$3.25	$0.00	$58.82
OPERATING ENGINEERS LOCAL 4	12/1/2026	$26.94	$16.05	$13.25	$3.25	$0.00	$59.49

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OILER (TRUCK CRANES, GRADALLS) OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$31.65	$16.05	$13.25	$3.25	$0.00	$64.20
	6/1/2026	$32.37	$16.05	$13.25	$3.25	$0.00	$64.92
	12/1/2026	$33.17	$16.05	$13.25	$3.25	$0.00	$65.72
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS II OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$58.51	$10.30	$11.95	$12.50	$0.00	$93.26
	1/1/2026	$59.56	$10.35	$12.00	$12.50	$0.00	$94.41

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.26	$10.30	$0.00	$0.00	$0.00	$39.56
2	55.00	$32.18	$10.30	$0.00	$6.88	$0.00	$49.36
3	60.00	$35.11	$10.30	$0.00	$7.50	$0.00	$52.91
4	65.00	$38.03	$10.30	$0.00	$8.13	$0.00	$56.46
5	70.00	$40.96	$10.30	$11.95	$8.75	$0.00	$71.96
6	75.00	$43.88	$10.30	$11.95	$9.38	$0.00	$75.51
7	80.00	$46.81	$10.30	$11.95	$10.00	$0.00	$79.06
8	90.00	$52.66	$10.30	$11.95	$11.25	$0.00	$86.16

Apprentice: PAINTER (BRIDGES/TANKS)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$29.78	$10.35	$0.00	$0.00	$0.00	$40.13
2	55.00	$32.76	$10.35	$0.00	$6.93	$0.00	$50.04
3	60.00	$35.74	$10.35	$0.00	$7.56	$0.00	$53.65
4	65.00	$38.71	$10.35	$0.00	$8.19	$0.00	$57.25
5	70.00	$41.69	$10.35	$12.00	$8.82	$0.00	$72.86
6	75.00	$44.67	$10.35	$12.00	$9.45	$0.00	$76.47
7	80.00	$47.65	$10.35	$12.00	$10.08	$0.00	$80.08
8	90.00	$53.60	$10.35	$12.00	$11.34	$0.00	$87.29

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$49.41	$10.30	$11.95	$12.50	$0.00	$84.16
	1/1/2026	$50.46	$10.35	$12.00	$12.60	$0.00	$85.41

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.71	$10.30	$0.00	$0.00	$0.00	$35.01
2	55.00	$27.18	$10.30	$0.00	$6.88	$0.00	$44.36
3	60.00	$29.65	$10.30	$0.00	$7.50	$0.00	$47.45
4	65.00	$32.12	$10.30	$0.00	$8.13	$0.00	$50.55
5	70.00	$34.59	$10.30	$11.95	$8.75	$0.00	$65.59
6	75.00	$37.06	$10.30	$11.95	$9.38	$0.00	$68.69
7	80.00	$39.53	$10.30	$11.95	$10.00	$0.00	$71.78
8	90.00	$44.47	$10.30	$11.95	$11.25	$0.00	$77.97

Apprentice: PAINTER (SPRAY OR SANDBLAST, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$25.23	$10.35	$0.00	$0.00	$0.00	$35.58
2	55.00	$27.75	$10.35	$0.00	$6.93	$0.00	$45.03
3	60.00	$30.28	$10.35	$0.00	$7.56	$0.00	$48.19
4	65.00	$32.80	$10.35	$0.00	$8.19	$0.00	$51.34
5	70.00	$35.32	$10.35	$12.00	$8.82	$0.00	$66.49
6	75.00	$37.85	$10.35	$12.00	$9.45	$0.00	$69.65
7	80.00	$40.37	$10.35	$12.00	$10.08	$0.00	$72.80
8	90.00	$45.41	$10.35	$12.00	$11.34	$0.00	$79.10

Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) PAINTERS LOCAL 35 PAINTERS LOCAL 35 - ZONE 2	7/1/2025	$47.47	$10.30	$11.95	$12.50	$0.00	$82.22
	1/1/2026	$48.52	$10.35	$12.00	$12.60	$0.00	$83.47

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.74	$10.30	$0.00	$0.00	$0.00	$34.04
2	55.00	$26.11	$10.30	$0.00	$6.88	$0.00	$43.29
3	60.00	$28.48	$10.30	$0.00	$7.50	$0.00	$46.28
4	65.00	$30.86	$10.30	$0.00	$8.13	$0.00	$49.29
5	70.00	$33.23	$10.30	$11.95	$8.75	$0.00	$64.23
6	75.00	$35.60	$10.30	$11.95	$9.38	$0.00	$67.23
7	80.00	$37.98	$10.30	$11.95	$10.00	$0.00	$70.23
8	90.00	$42.72	$10.30	$11.95	$11.25	$0.00	$76.22

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PAINTER / TAPER (BRUSH, NEW) *	7/1/2025	$48.01	$10.30	$11.95	$12.50	$0.00	$82.76
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.	1/1/2026	$49.06	$10.35	$12.00	$12.60	$0.00	$84.01
PAINTERS LOCAL 35							
PAINTERS LOCAL 35 - ZONE 2							

Apprentice: PAINTER (SPRAY OR SANDBLAST, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.26	$10.35	$0.00	$0.00	$0.00	$34.61
2	55.00	$26.69	$10.35	$0.00	$6.93	$0.00	$43.97
3	60.00	$29.11	$10.35	$0.00	$7.56	$0.00	$47.02
4	65.00	$31.54	$10.35	$0.00	$8.19	$0.00	$50.08
5	70.00	$33.96	$10.35	$12.00	$8.82	$0.00	$65.13
6	75.00	$36.39	$10.35	$12.00	$9.45	$0.00	$68.19
7	80.00	$38.82	$10.35	$12.00	$10.08	$0.00	$71.25
8	90.00	$43.67	$10.35	$12.00	$11.34	$0.00	$77.36

Apprentice to Journeyworker Ratio: 1:1

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.01	$10.30	$0.00	$0.00	$0.00	$34.31
2	55.00	$26.41	$10.30	$0.00	$6.88	$0.00	$43.59
3	60.00	$28.81	$10.30	$0.00	$7.50	$0.00	$46.61
4	65.00	$31.21	$10.30	$0.00	$8.13	$0.00	$49.64
5	70.00	$33.61	$10.30	$11.95	$8.75	$0.00	$64.61
6	75.00	$36.01	$10.30	$11.95	$9.38	$0.00	$67.64
7	80.00	$38.41	$10.30	$11.95	$10.00	$0.00	$70.66
8	90.00	$43.21	$10.30	$11.95	$11.25	$0.00	$76.71

Apprentice: PAINTER / TAPER (BRUSH, NEW) *

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$24.53	$10.35	$0.00	$0.00	$0.00	$34.88
2	55.00	$26.98	$10.35	$0.00	$6.93	$0.00	$44.26
3	60.00	$29.44	$10.35	$0.00	$7.56	$0.00	$47.35
4	65.00	$31.89	$10.35	$0.00	$8.19	$0.00	$50.43
5	70.00	$34.34	$10.35	$12.00	$8.82	$0.00	$65.51
6	75.00	$36.80	$10.35	$12.00	$9.45	$0.00	$68.60
7	80.00	$39.25	$10.35	$12.00	$10.08	$0.00	$71.68
8	90.00	$44.15	$10.35	$12.00	$11.34	$0.00	$77.84

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice to Journeyworker Ratio: 1:1							
PAINTER / TAPER (BRUSH, REPAINT)	7/1/2025	$46.07	$10.30	$11.95	$12.50	$0.00	$80.82
PAINTERS LOCAL 35	1/1/2026	$47.12	$10.35	$12.00	$12.60	$0.00	$82.07
PAINTERS LOCAL 35 - ZONE 2							

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.04	$10.30	$0.00	$0.00	$0.00	$33.34
2	55.00	$25.34	$10.30	$0.00	$6.88	$0.00	$42.52
3	60.00	$27.64	$10.30	$0.00	$7.50	$0.00	$45.44
4	65.00	$29.95	$10.30	$0.00	$8.13	$0.00	$48.38
5	70.00	$32.25	$10.30	$11.95	$8.75	$0.00	$63.25
6	75.00	$34.55	$10.30	$11.95	$9.38	$0.00	$66.18
7	80.00	$36.86	$10.30	$11.95	$10.00	$0.00	$69.11
8	90.00	$41.46	$10.30	$11.95	$11.25	$0.00	$74.96

Apprentice: PAINTER / TAPER (BRUSH, REPAINT)

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$23.56	$10.35	$0.00	$0.00	$0.00	$33.91
2	55.00	$25.92	$10.35	$0.00	$6.93	$0.00	$43.20
3	60.00	$28.27	$10.35	$0.00	$7.56	$0.00	$46.18
4	65.00	$30.63	$10.35	$0.00	$8.19	$0.00	$49.17
5	70.00	$32.98	$10.35	$12.00	$8.82	$0.00	$64.15
6	75.00	$35.34	$10.35	$12.00	$9.45	$0.00	$67.14
7	80.00	$37.70	$10.35	$12.00	$10.08	$0.00	$70.13
8	90.00	$42.41	$10.35	$12.00	$11.34	$0.00	$76.10

Apprentice to Journeyworker Ratio: 1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	12/1/2025	$41.22	$10.15	$9.50	$9.21	$0.00	$70.08
LABORERS	6/1/2026	$42.66	$10.15	$9.50	$9.21	$0.00	$71.52
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.10	$10.15	$9.50	$9.21	$0.00	$72.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)							
PANEL & PICKUP TRUCKS DRIVER	12/1/2025	$40.78	$15.57	$21.78	$0.00	$0.00	$78.13
TEAMSTERS JOINT COUNCIL NO. 10	1/1/2026	$40.78	$16.17	$21.78	$0.00	$0.00	$78.73
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$41.78	$16.17	$21.78	$0.00	$0.00	$79.73
	12/1/2026	$41.78	$16.17	$23.52	$0.00	$0.00	$81.47
	1/1/2027	$41.78	$16.77	$23.52	$0.00	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)	8/1/2024	$51.97	$10.08	$11.62	$12.67	$0.00	$86.34
PILE DRIVER LOCAL 56							
PILE DRIVER LOCAL 56 (ZONE 2)							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PILE DRIVER"							
PILE DRIVER PILE DRIVER LOCAL 56 PILE DRIVER LOCAL 56 (ZONE 2)	8/1/2024	$51.97	$10.08	$11.62	$12.67	$0.00	$86.34

Apprentice: PILE DRIVER

Effective Date: 8/1/2024

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$23.39	$10.08	$0.00	$2.53	$0.00	$36.00
2	55.00	$28.58	$10.08	$0.00	$5.07	$0.00	$43.73
3	70.00	$36.38	$10.08	$11.62	$7.60	$0.00	$65.68
4	80.00	$41.58	$10.08	$11.62	$10.14	$0.00	$73.42

Apprentice to Journeyworker Ratio: 1:5

PIPELAYER LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
PIPELAYER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
PLUMBER & PIPEFITTER PLUMBERS LOCAL 4 PLUMBERS LOCAL 4	9/1/2025	$55.00	$12.70	$9.71	$8.06	$0.00	$85.47
	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 9/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$22.00	$12.70	$0.00	$0.00	$0.00	$34.70
2	50.00	$27.50	$12.70	$0.00	$0.00	$0.00	$40.20
3	60.00	$33.00	$12.70	$0.00	$0.00	$0.00	$45.70
4	70.00	$38.50	$12.70	$0.00	$8.06	$0.00	$59.26
5	80.00	$44.00	$12.70	$0.00	$8.06	$0.00	$64.76

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: PLUMBER & PIPEFITTER

Effective Date: 3/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	40.00	$23.12	$11.30	$0.00	$0.00	$0.00	$34.42
2	50.00	$28.90	$11.30	$0.00	$0.00	$0.00	$40.20
3	60.00	$34.68	$11.30	$0.00	$0.00	$0.00	$45.98
4	70.00	$40.46	$11.30	$0.00	$8.06	$0.00	$59.82
5	80.00	$46.24	$11.30	$0.00	$8.06	$0.00	$65.60

Apprentice to Journeyworker Ratio: 1:3

PNEUMATIC CONTROLS (TEMP.) PLUMBERS LOCAL 4 PLUMBERS LOCAL 4	9/1/2025	$55.00	$12.70	$9.71	$8.06	$0.00	$85.47
	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"							
PNEUMATIC DRILL/TOOL OPERATOR LABORERS LABORERS - ZONE 2	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWDERMAN & BLASTER LABORERS LABORERS - ZONE 2	12/1/2025	$42.22	$10.15	$9.50	$9.11	$0.00	$70.98
	6/1/2026	$43.66	$10.15	$9.50	$9.11	$0.00	$72.42
	12/1/2026	$45.10	$10.15	$9.50	$9.11	$0.00	$73.86
	6/1/2027	$46.55	$10.15	$9.50	$9.11	$0.00	$75.31
	12/1/2027	$48.00	$10.15	$9.50	$9.11	$0.00	$76.76
	6/1/2028	$49.50	$10.15	$9.50	$9.11	$0.00	$78.26
	12/1/2028	$51.00	$10.15	$9.50	$9.11	$0.00	$79.76
For apprentice rates see "Apprentice- LABORER"							
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2025	$42.22	$9.90	$9.50	$9.21	$0.00	$70.83
	6/1/2026	$43.66	$9.90	$9.50	$9.21	$0.00	$72.27
	12/1/2026	$45.10	$9.90	$9.50	$9.21	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"							
POWER SHOVEL/DERRICK/TRENCHING MACHINE OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
PUMP OPERATOR (CONCRETE)	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PUMP OPERATOR (DEWATERING, OTHER)	12/1/2025	$37.97	$16.05	$13.25	$3.25	$0.00	$70.52
OPERATING ENGINEERS LOCAL 4	6/1/2026	$38.83	$16.05	$13.25	$3.25	$0.00	$71.38
OPERATING ENGINEERS LOCAL 4	12/1/2026	$39.78	$16.05	$13.25	$3.25	$0.00	$72.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
READY-MIX CONCRETE DRIVER	1/1/2025	$27.60	$11.26	$6.15	$0.00	$0.00	$45.01
TEAMSTERS 170							
TEAMSTERS 170 - Dauphinais (Bellingham)							
RECLAIMERS	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
RIDE-ON MOTORIZED BUGGY OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01
For apprentice rates see "Apprentice- LABORER"							
ROLLER/SPREADER/MULCHING MACHINE	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)	8/1/2025	$53.53	$13.28	$12.67	$9.03	$0.00	$88.51
ROOFERS LOCAL 33	2/1/2026	$54.78	$13.28	$12.67	$9.03	$0.00	$89.76
ROOFERS LOCAL 33							

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$26.77	$13.28	$6.52	$9.03	$0.00	$55.60
2	60.00	$32.12	$13.28	$12.67	$9.03	$0.00	$67.10
3	65.00	$34.79	$13.28	$12.67	$9.03	$0.00	$69.77
4	75.00	$40.15	$13.28	$12.67	$9.03	$0.00	$75.13
5	85.00	$45.50	$13.28	$12.67	$9.03	$0.00	$80.48

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$27.39	$13.28	$6.52	$9.03	$0.00	$56.22
2	60.00	$32.87	$13.28	$12.67	$9.03	$0.00	$67.85
3	65.00	$35.61	$13.28	$12.67	$9.03	$0.00	$70.59
4	75.00	$41.09	$13.28	$12.67	$9.03	$0.00	$76.07
5	85.00	$46.56	$13.28	$12.67	$9.03	$0.00	$81.54

Apprentice Notes

** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1

Apprentice to Journeyworker Ratio: 1:5

ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 33 ROOFERS LOCAL 33	8/1/2025	$53.78	$13.28	$12.67	$9.03	$0.00	$88.76
	2/1/2026	$55.03	$13.28	$12.67	$9.03	$0.00	$90.01

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 63 SHEETMETAL WORKERS LOCAL 63	7/1/2025	$43.48	$12.94	$11.01	$8.72	$2.13	$78.28
	7/1/2026	$43.48	$13.24	$11.01	$9.92	$2.13	$79.78
	1/1/2027	$43.48	$13.54	$11.01	$11.12	$2.13	$81.28
	7/1/2027	$44.98	$13.54	$11.01	$11.12	$2.13	$82.78
	1/1/2028	$46.48	$13.54	$11.01	$11.12	$2.13	$84.28

Apprentice: SHEETMETAL WORKER

Effective Date: 7/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	45.00	$19.57	$5.82	$4.95	$0.00	$0.85	$31.19
2	50.00	$21.74	$6.47	$5.51	$0.00	$0.94	$34.66
3	55.00	$23.91	$7.12	$9.91	$0.00	$1.15	$42.09
4	60.00	$26.09	$7.76	$9.91	$0.00	$1.23	$44.99
5	65.00	$28.26	$8.41	$9.91	$0.00	$1.31	$47.89
6	70.00	$30.44	$9.06	$9.91	$0.00	$1.39	$50.80
7	75.00	$32.61	$9.71	$9.91	$0.00	$1.47	$53.70
8	80.00	$34.78	$10.35	$9.91	$8.72	$1.78	$65.54
9	85.00	$36.96	$11.00	$9.91	$8.72	$1.86	$68.45
10	90.00	$39.13	$11.65	$9.91	$8.72	$1.94	$71.35

Apprentice: SHEETMETAL WORKER

Effective Date: 7/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
Apprentice: SHEETMETAL WORKER							
Effective Date: 7/1/2026							
Step / Percent		**Apprentice Base Wage**					
1 / 45.00		$19.57	$5.96	$4.95	$0.00	$0.85	$31.33
2 / 50.00		$21.74	$6.62	$5.51	$0.00	$0.94	$34.81
3 / 55.00		$23.91	$7.28	$9.91	$0.00	$1.15	$42.25
4 / 60.00		$26.09	$7.94	$9.91	$0.00	$1.23	$45.17
5 / 65.00		$28.26	$8.60	$9.91	$0.00	$1.31	$48.08
6 / 70.00		$30.44	$9.27	$9.91	$0.00	$1.39	$51.01
7 / 75.00		$32.61	$9.93	$9.91	$0.00	$1.47	$53.92
8 / 80.00		$34.78	$10.59	$9.91	$9.92	$1.78	$66.98
9 / 85.00		$36.96	$11.25	$9.91	$9.92	$1.86	$69.90
10 / 90.00		$39.13	$11.92	$9.91	$9.92	$1.94	$72.82
Apprentice to Journeyworker Ratio: 1:3							
SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.53	$15.57	$21.78	$0.00	$0.00	$78.88
	1/1/2026	$41.53	$16.17	$21.78	$0.00	$0.00	$79.48
	6/1/2026	$42.53	$16.17	$21.78	$0.00	$0.00	$80.48
	12/1/2026	$42.53	$16.17	$23.52	$0.00	$0.00	$82.22
	1/1/2027	$42.53	$16.77	$23.52	$0.00	$0.00	$82.82
SPRINKLER FITTER SPRINKLER FITTERS LOCAL 669 SPRINKLER FITTERS LOCAL 669	10/1/2025	$53.25	$12.40	$7.40	$9.41	$0.00	$82.46
	1/1/2026	$53.25	$13.60	$7.45	$9.41	$0.00	$83.71
	4/1/2026	$56.54	$13.60	$7.45	$9.41	$0.00	$87.00
	7/1/2026	$56.54	$13.60	$7.45	$9.41	$0.00	$87.00
	10/1/2026	$56.54	$13.60	$7.45	$9.41	$0.00	$87.00
	1/1/2027	$56.54	$14.55	$7.50	$9.41	$0.00	$88.00
	4/1/2027	$59.83	$14.55	$7.50	$9.41	$0.00	$91.29
	7/1/2027	$59.83	$14.55	$7.50	$9.41	$0.00	$91.29
	10/1/2027	$59.83	$14.55	$7.50	$9.41	$0.00	$91.29
	1/1/2028	$59.83	$15.50	$7.55	$9.41	$0.00	$92.29
Apprentice: SPRINKLER FITTER							
Effective Date: 10/1/2025							
Step / Percent		**Apprentice Base Wage**					
1 / 43.00		$26.94	$12.40	$0.00	$0.00	$0.00	$39.34
2 / 48.00		$30.08	$12.40	$0.00	$0.00	$0.00	$42.48
3 / 52.00		$32.58	$12.40	$7.40	$1.15	$0.00	$53.53
4 / 56.00		$35.09	$12.40	$7.40	$1.15	$0.00	$56.04

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: SPRINKLER FITTER

Effective Date: 10/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
5	59.00	$36.97	$12.40	$7.40	$1.40	$0.00	$58.17
6	64.00	$40.10	$12.40	$7.40	$1.40	$0.00	$61.30
7	68.00	$42.61	$12.40	$7.40	$1.40	$0.00	$63.81
8	72.00	$45.12	$12.40	$7.40	$1.40	$0.00	$66.32
9	76.00	$47.62	$12.40	$7.40	$1.40	$0.00	$68.82
10	80.00	$50.13	$12.40	$7.40	$1.40	$0.00	$71.33

Apprentice: SPRINKLER FITTER

Effective Date: 1/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	43.00	$26.94	$9.64	$0.00	$0.00	$0.00	$36.58
2	48.00	$30.08	$9.64	$0.00	$0.00	$0.00	$39.72
3	52.00	$32.58	$13.60	$7.45	$1.15	$0.00	$54.78
4	56.00	$35.09	$13.60	$7.45	$1.15	$0.00	$57.29
5	59.00	$36.97	$13.60	$7.45	$1.40	$0.00	$59.42
6	64.00	$40.10	$13.60	$7.45	$1.40	$0.00	$62.55
7	68.00	$42.61	$13.60	$7.45	$1.40	$0.00	$65.06
8	72.00	$45.12	$13.60	$7.45	$1.40	$0.00	$67.57
9	76.00	$47.62	$13.60	$7.45	$1.40	$0.00	$70.07
10	80.00	$50.13	$13.60	$7.45	$1.40	$0.00	$72.58

Apprentice to Journeyworker Ratio: 1:1

STEAM BOILER OPERATOR	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
OPERATING ENGINEERS LOCAL 4	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
OPERATING ENGINEERS LOCAL 4	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TERRAZZO FINISHERS	8/1/2025	$66.89	$11.49	$15.57	$8.02	$0.00	$101.97
BRICKLAYERS LOCAL 3	2/1/2026	$68.24	$11.49	$15.57	$8.02	$0.00	$103.32
BRICKLAYERS LOCAL 3 - MARBLE & TILE	8/1/2026	$70.44	$11.49	$15.57	$8.02	$0.00	$105.52
	2/1/2027	$71.84	$11.49	$15.57	$8.02	$0.00	$106.92

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: TERRAZZO FINISHERS

Effective Date: 8/1/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$33.45	$11.49	$15.57	$8.02	$0.00	$68.53
2	60.00	$40.13	$11.49	$15.57	$8.02	$0.00	$75.21
3	70.00	$46.82	$11.49	$15.57	$8.02	$0.00	$81.90
4	80.00	$53.51	$11.49	$15.57	$8.02	$0.00	$88.59
5	90.00	$60.20	$11.49	$15.57	$8.02	$0.00	$95.28

Apprentice: TERRAZZO FINISHERS

Effective Date: 2/1/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$34.12	$11.49	$15.57	$8.02	$0.00	$69.20
2	60.00	$40.94	$11.49	$15.57	$8.02	$0.00	$76.02
3	70.00	$47.77	$11.49	$15.57	$8.02	$0.00	$82.85
4	80.00	$54.59	$11.49	$15.57	$8.02	$0.00	$89.67
5	90.00	$61.42	$11.49	$15.57	$8.02	$0.00	$96.50

Apprentice to Journeyworker Ratio: 1:5

TEST BORING DRILLER LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2025	$52.70	$10.15	$9.50	$9.80	$0.00	$82.15
	6/1/2026	$54.25	$10.15	$9.50	$9.80	$0.00	$83.70
	12/1/2026	$55.75	$10.15	$9.50	$9.80	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"							
TEST BORING DRILLER HELPER LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2025	$48.82	$10.15	$9.50	$9.80	$0.00	$78.27
	6/1/2026	$50.37	$10.15	$9.50	$9.80	$0.00	$79.82
	12/1/2026	$51.87	$10.15	$9.50	$9.80	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"							
TEST BORING LABORER LABORERS LABORERS - FOUNDATION AND MARINE	12/1/2025	$48.70	$10.15	$9.50	$9.80	$0.00	$78.15
	6/1/2026	$50.25	$10.15	$9.50	$9.80	$0.00	$79.70
	12/1/2026	$51.75	$10.15	$9.50	$9.80	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"							
TRACTORS/PORTABLE STEAM GENERATORS OPERATING ENGINEERS LOCAL 4 OPERATING ENGINEERS LOCAL 4	12/1/2025	$58.62	$16.05	$13.25	$3.25	$0.00	$91.17
	6/1/2026	$59.90	$16.05	$13.25	$3.25	$0.00	$92.45
	12/1/2026	$61.34	$16.05	$13.25	$3.25	$0.00	$93.89
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
TRAILERS FOR EARTH MOVING EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/1/2025	$41.82	$15.57	$21.78	$0.00	$0.00	$79.17
	1/1/2026	$41.82	$16.17	$21.78	$0.00	$0.00	$79.77
	6/1/2026	$42.82	$16.17	$21.78	$0.00	$0.00	$80.77
	12/1/2026	$42.82	$16.17	$23.52	$0.00	$0.00	$82.51
	1/1/2027	$42.82	$16.77	$23.52	$0.00	$0.00	$83.11

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
TUNNEL WORK - COMPRESSED AIR	12/1/2025	$60.93	$10.15	$9.50	$10.25	$0.00	$90.83
LABORERS	6/1/2026	$62.48	$10.15	$9.50	$10.25	$0.00	$92.38
LABORERS (COMPRESSED AIR)	12/1/2026	$63.98	$10.15	$9.50	$10.25	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	12/1/2025	$62.93	$10.15	$9.50	$10.25	$0.00	$92.83
LABORERS	6/1/2026	$64.48	$10.15	$9.50	$10.25	$0.00	$94.38
LABORERS (COMPRESSED AIR)	12/1/2026	$65.98	$10.15	$9.50	$10.25	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR	12/1/2025	$53.00	$10.15	$9.50	$10.25	$0.00	$82.90
LABORERS	6/1/2026	$54.55	$10.15	$9.50	$10.25	$0.00	$84.45
LABORERS (FREE AIR TUNNEL)	12/1/2026	$56.05	$10.15	$9.50	$10.25	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"							
TUNNEL WORK - FREE AIR (HAZ. WASTE)	12/1/2025	$55.00	$10.15	$9.50	$10.25	$0.00	$84.90
LABORERS	6/1/2026	$56.55	$10.15	$9.50	$10.25	$0.00	$86.45
LABORERS (FREE AIR TUNNEL)	12/1/2026	$58.05	$10.15	$9.50	$10.25	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"							
VAC-HAUL	12/1/2025	$41.24	$15.57	$21.78	$0.00	$0.00	$78.59
TEAMSTERS JOINT COUNCIL NO. 10	1/1/2026	$41.24	$16.17	$21.78	$0.00	$0.00	$79.19
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	6/1/2026	$42.24	$16.17	$21.78	$0.00	$0.00	$80.19
	12/1/2026	$42.24	$16.17	$23.52	$0.00	$0.00	$81.93
	1/1/2027	$42.24	$16.77	$23.52	$0.00	$0.00	$82.53
VOICE-DATA-VIDEO TECHNICIAN	9/7/2025	$36.12	$14.98	$13.94	$3.97	$0.00	$69.01
ELECTRICIANS LOCAL 96	9/6/2026	$37.04	$15.96	$14.20	$4.07	$0.00	$71.27
ELECTRICIANS LOCAL 96							

Apprentice: VOICE-DATA-VIDEO TECHNICIAN

Effective Date: 9/7/2025

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$18.06	$14.98	$0.54	$3.97	$0.00	$37.55
2	55.00	$19.87	$14.98	$0.60	$3.97	$0.00	$39.42
3	60.00	$21.67	$14.98	$13.51	$3.97	$0.00	$54.13
4	65.00	$23.48	$14.98	$13.56	$3.97	$0.00	$55.99
5	70.00	$25.28	$14.98	$13.62	$3.97	$0.00	$57.85
6	75.00	$27.09	$14.98	$13.67	$3.97	$0.00	$59.71
7	80.00	$28.90	$14.98	$13.73	$3.97	$0.00	$61.58
8	85.00	$30.70	$14.98	$13.78	$3.97	$0.00	$63.43

Apprentice: VOICE-DATA-VIDEO TECHNICIAN

Effective Date: 9/6/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
1	50.00	$18.52	$15.96	$0.56	$4.07	$0.00	$39.11

Construction

Classification	Effective Date	Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate

Apprentice: VOICE-DATA-VIDEO TECHNICIAN

Effective Date: 9/6/2026

Step	Percent	Apprentice Base Wage	Health	Pension	Annuity	Supplemental Unemployment	Total Rate
2	55.00	$20.37	$15.96	$0.61	$4.07	$0.00	$41.01
3	60.00	$22.22	$15.96	$13.76	$4.07	$0.00	$56.01
4	65.00	$24.08	$15.96	$13.81	$4.07	$0.00	$57.92
5	70.00	$25.93	$15.96	$13.87	$4.07	$0.00	$59.83
6	75.00	$27.78	$15.96	$13.92	$4.07	$0.00	$61.73
7	80.00	$29.63	$15.96	$13.98	$4.07	$0.00	$63.64
8	85.00	$31.48	$15.96	$14.03	$4.07	$0.00	$65.54

Apprentice to Journeyworker Ratio: 1:1

WAGON DRILL OPERATOR	12/1/2025	$41.47	$10.15	$9.50	$9.11	$0.00	$70.23
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.11	$0.00	$71.67
LABORERS - ZONE 2	12/1/2026	$44.35	$10.15	$9.50	$9.11	$0.00	$73.11
	6/1/2027	$45.80	$10.15	$9.50	$9.11	$0.00	$74.56
	12/1/2027	$47.25	$10.15	$9.50	$9.11	$0.00	$76.01
	6/1/2028	$48.75	$10.15	$9.50	$9.11	$0.00	$77.51
	12/1/2028	$50.25	$10.15	$9.50	$9.11	$0.00	$79.01

For apprentice rates see "Apprentice- LABORER"

WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	12/1/2025	$41.47	$10.15	$9.50	$9.21	$0.00	$70.33
LABORERS	6/1/2026	$42.91	$10.15	$9.50	$9.21	$0.00	$71.77
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	12/1/2026	$44.35	$10.15	$9.50	$9.21	$0.00	$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

WASTE WATER PUMP OPERATOR	12/1/2025	$59.28	$16.05	$13.25	$3.25	$0.00	$91.83
OPERATING ENGINEERS LOCAL 4	6/1/2026	$60.58	$16.05	$13.25	$3.25	$0.00	$93.13
OPERATING ENGINEERS LOCAL 4	12/1/2026	$62.03	$16.05	$13.25	$3.25	$0.00	$94.58

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

WATER METER INSTALLER	9/1/2025	$55.00	$12.70	$9.71	$8.06	$0.00	$85.47
PLUMBERS LOCAL 4	3/1/2026	$57.80	$11.30	$9.71	$8.06	$0.00	$86.87
PLUMBERS LOCAL 4							

For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"

Additional Apprentice Information

All apprentices must be registered with the Division of Apprenticeship Training(DAS) in accordance with M.G.L.c. 23, §§ 11E-11L. Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the hourly prevailing wage rate established by the Commissioner under the provisions of M.G.L.c. 149, §§ 26-27D.

Apprentice ratios are established by DAS pursuant to M.G.L.c. 23, §§ 11E-11L. Ratios are expressed as the allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified. The ratios listed herein have been taken from relevant private collective bargaining agreements(CBAs) and are provided for illustrative purposes only. They have not been independently verified as being accurate or continuing to be accurate.

Parties having questions regarding what ratio to use should contact DAS.

SECTION 00 73 73
STATUTORY REQUIREMENTS

SECTION	SUBJECT	REFERENCE
1.1	"Or Equal" Clause	M.G.L. c. 30, § 39M(b)
1.2	Delays	M.G.L. c. 30, § 39O
1.3	Deviations	M.G.L. c. 30, § 39I
1.4	Finality of Decisions	M.G.L. c. 30. § 39J
1.5	Differing Site Conditions	M.G.L. c. 30, § 39N
1.6	Timely Decisions	M.G.L. c. 30, § 39P
1.7	Method of Payment	M.G.L. c. 30, § 39K
1.8	Direct Payment	M.G.L. c. 30, § 39F
1.9	Completion of Public Work	M.G.L. c. 30, § 39G
2.1	Preference to Veterans and Citizens	M.G.L. c. 149, § 26
2.2	Determination of Wage Rates	M.G.L. c. 149, § 27
2.3	Employment Records	M.G.L. c. 149, § 27B
2.4	Wages Paid to Operators of Trucks and Other Equipment	M.G.L. c. 149, § 27F
2.5	Reserve Police Officers	M.G.L. c. 149, § 34B
2.6	Eight-Hour Day, etc.	M.G.L. c. 149, §§ 30, 34 & 34A
2.7	Lodging, etc.	M.G.L. c. 149, § 25
2.8	Access to Contractor's Records	Executive Order No. 195
2.9	Worker's Compensation Insurance	M.G.L. c. 149, § 34A
3.1-3.5	Contractor's Accounting Method Requirements	M.G.L. c. 30, § 39R
4.1	Weather Protection	M.G.L. c. 149, § 44F(1)
4.2	Form for Sub-Contract	M.G.L. c. 149, § 44F(4)(c)
4.3	Foreign Corporations	M.G.L. c. 30, § 39L

4.4	Shoring	M.G.L. c. 149, § 129A
4.5	Compliance with Tax Laws	M.G.L. c. 62C, § 49A
4.6	Debarment or Suspension of Public Contractors	M.G.L. c.29, § 29F
4.7	False, Fictitious, or Fraudulent Claims Made to Commonwealth or Municipality.	M.G.L. c. 266, § 67B
4.8	Public Construction – Health and Safety	M.G.L. c. 30, § 39S
4.9	Security for Payment of Labor, Materials, Charges, etc., on Certain Public Works	M.G.L. c. 149, § 29

The provisions set forth in this section may be applicable to this Project and are intended to be consistent with the official versions of laws, regulations, and executive orders currently in effect as of the date of the Contract Documents. The following provisions are included for the convenience of the bidders only and the Owner shall bear no responsibility for omitted statutory or other references that apply to this Project, all such references shall be deemed to be incorporated herein even if not transcribed in this section. In addition, the parties recognize that other rights, duties, and obligations with respect to public construction are provided for by law, notwithstanding the fact that they are not provided for in the Contract Documents. Where the term "awarding authority" appears in the following paragraphs, it shall be taken as meaning the Owner.

1.1 "Or Equal" Clause. (Statutory reference: M.G.L. c. 30, § 39M(b)) This Section 1.1 applies to every contract for the construction, reconstruction or repair of any public work or for the purchase of any material by the Commonwealth, any political subdivision thereof, or any county, city, town, district or housing authority (above certain dollar limits, as stated in the statute), and to contracts awarded pursuant to M.G.L. c. 149, §§ 44A through 44 H. The said §§
44A through 44H apply to every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a department, agency, board, commission, authority, or other instrumentality of the Commonwealth or political subdivision thereof, or two or more subdivisions thereof, but not including the Massachusetts Bay Transportation Authority, estimated to cost more than a dollar amount set forth in M.G.L. c. 149, § 44A.

Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the word "or approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if, in the opinion of the Engineer:

(a) it is at least equal in quality, durability, appearance, strength and design;

(b) it performs at least equally the function imposed in the general design for the work;

(c) it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the specifications.

Any structural or mechanical changes made necessary to accommodate substituted Equipment under this paragraph shall be at the expense of the Contractor or Subcontractor responsible for the work item. See other paragraphs of specifications for procedures to be used in determining compliance with the standards of this paragraph.

1.2 Delays. (Statutory reference: c. 30, § 39O). This Section 1.2 applies to every contract subject to M.G.L. c. 30, § 39M and to every contract subject to c. 149, § 44A. Except as otherwise provided by law and by this Section 1.2, the Contractor shall not be entitled to damages on account of any hindrances or delays, avoidable or unavoidable; but if such delay be occasioned by the awarding authority, the Contractor may be entitled to an extension of time only, in which to complete the work, to be determined by the Engineer.

(a) The awarding authority may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided, however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the Contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The Contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract, and except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the Contractor notified the awarding authority in writing of the act or failure to act involved in the claim. In the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the Contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the Contractor or the Subcontractor may have against each other.

1.3 Deviations. (Statutory reference: M.G.L. c. 30, § 39I) This Section 1.3 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the Commonwealth or any political subdivision thereof. The Contractor shall perform all the work required by this contract in conformity with the plans and specifications contained herein, No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the Engineer or Engineer in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such Engineer or Engineer so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1)

If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the awarding authority and the Contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the awarding authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

1.4 Finality of Decisions by Awarding Authority or Engineer (Statutory reference: M.G.L. c. 30, §39J). This Section 1.4 applies to every contract for the construction. reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the Commonwealth or by any county, city, district, board, commission, or other public body, when the amount of the contract exceeds the amount stated in M.G.L. c. 30, § 39J.

Notwithstanding any contrary provision of this contract, no decision by the awarding authority or by the Engineer on a dispute, whether of fact or of law, arising under said contract shall be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily, is unsupported by substantial evidence, or is based upon error of law.

1.5 Differing Site Conditions (Statutory reference: M.G.L. c. 30, § 39N). This Section 1.5 applies to every contract subject to M.G.L. c. 30, § 39M and to every contract subject to M.G.L. c. 149, §§ 44A through 44H.

If, during the progress of the work, the Contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the Contract Documents, either the Contractor or the awarding authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the awarding authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and Contract Documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the awarding authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

1.6 Timely Decision by Awarding Authority (Statutory reference: M.G.L. c. 30, § 39P). This Section 1.6 applies to every contract subject to M.G.L. c. 30, § 39 M. and to every contract subject to M.G.L. c. 149, §§ 44A through 44H.

In every case in which this contract requires the awarding authority, any official, its Engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, the decision shall be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, Engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty-day period and the date by which the decision will be made.

1.7 Method of Payment (Statutory reference: M.G.L. c. 30, § 39K) This Section 1.7 applied to every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the Commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract exceeds the amount stated in M.G.L. c. 30, § 39K.

1.7.1 Within fifteen days (forty-five days in the case of the Commonwealth) after receipt from the Contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the Contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the Site (or at some location agreed upon in writing) to which the Contractor has title or to which a Subcontractor has title and has authorized the Contractor to transfer title to the awarding authority, less (1) a retention based on its estimate of the fair value of its claims against the Contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of Section 1.8 of these specifications, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the Contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the Contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the Contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Section 1.8 of these specifications, or based on the record of payments by the Contractor to the Subcontractors under this contract if such record of payment indicates that the Contractor has not paid Subcontractors as provided in Section 1.8. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days

(twenty-four days in the case of the Commonwealth) after receipt of such periodic estimate from the Contractor, at the place designated by the awarding authority if such a place is so designated. The Contractor agrees to pay to each Subcontractor a` portion of any such interest paid in accordance with the amount due each Subcontractor.

1.7.2 The awarding authority may make changes in any periodic estimate submitted by the Contractor, and the payment due on said periodic estimate shall be computed in accordance with the change so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the Contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

1.7.3. All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the Contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in the sub-bid form as required by the specifications and a column listing the amount paid to each Subcontractor and Sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

1.7.4 A certificate of the Engineer to the effect that the Contractor has fully or substantially completed the work shall, subject to the provisions of Section 1.4 of these Specifications, be conclusive for the purposes of this Section 1.7.

1.8 Direct Payment (Statutory reference: M.G.L. c. 30, § 39F) This Section 1.8 applies to every contract awarded pursuant to M.G.L. c. 149, §§ 44A through 44H, and (with the exception of Subparagraph 1.8.9) to every contract awarded pursuant to M.G.L. c. 30, § 39M.

1.8.1 Forthwith after the Contractor receives payment on account of a periodic estimate, the Contractor shall pay to each Subcontractor the amount paid for the labor performed and the materials furnished by that Subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

1.8.2 Not later than the sixty-fifth day after each Subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract, less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the Subcontractor; and the awarding authority shall pay that amount to the

Contractor. The Contractor shall forthwith pay to the Subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the Contractor.

1.8.3 Each payment made by the awarding authority to the Contractor pursuant to Subparagraphs 1.8.1 and 1.8.2 of this Section 1.8 for the labor performed and the materials furnished by a Subcontractor shall be made to the Contractor for the account of that Subcontractor; and the awarding authority shall take reasonable steps to compel the Contractor to make each such payment to each such Subcontractor. If the awarding authority has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the Contractor or which is to be included in a payment to the Contractor for payment to the Subcontractor as provided in subparagraphs 1.8.1 and 1.8.2, the awarding authority shall act upon the demand as provided in this Section 1.8.

1.8.4 If, within seventy days after the Subcontractor has substantially completed the subcontract work, the Subcontractor has not received from the Contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the Subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the Subcontractor has substantially completed the subcontract work. Within ten days after the Subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the Subcontractor.

1.8.5 Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the Subcontractor of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the Contractor in the sworn reply; provided that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by Subparagraph 1.8.4. The awarding authority shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deduction from direct payments made as provided in parts (i) and (ii) of this subparagraph.

1.8.6 The awarding authority shall forthwith deposit the amounts deducted from a direct payment as provided in part (iii) of subparagraph 1.8.5 in an interest-bearing joint account in the names of the Contractor and the Subcontractor in bank in Massachusetts selected by the awarding authority or agreed upon by the Contractor and the Subcontractor and shall notify the Contractor and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the Subcontractor or as determined by decree of a court of competent jurisdiction.

1.8.7 All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to Subparagraph 1.8.6 shall be made out of amounts payable to the Contractor at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts which later become payable to the Contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the Contractor to the extent of such payment.

1.8.8 The awarding authority shall deduct from payments to a Contractor amount which, together with the deposits in interest-bearing accounts pursuant to subparagraph 1.8.6, are sufficient to satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.

1.8.9 If the Subcontractor does not receive payment as provided in Subparagraph 1.8.1 or if the Contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the Subcontractor and the Subcontractor does not receive payment for same when due less the deductions provided for in Subparagraph 1.8.1, the Subcontractor may demand direct payment by following the procedure in subparagraph 1.8.4 and the Contractor may file a sworn reply as provided in that same Subparagraph. A demand made after the first day of the month following that for which the Subcontractor performed or furnished the labor and materials for which the Subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the Contractor. Thereafter the awarding authority shall proceed as provided in subparagraphs 1.8.5, 1.8.6, 1.8.7 and 1.8.8.

1.8.10 Any assignment by a Subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of M.G.L. c. 149, § 29 shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority, or which are on deposit pursuant to Subparagraph 1.8.6 shall be subordinate to the rights of all Subcontractors who are entitled to be paid under this, section and who have not been paid in full.

1.8.11 "Subcontractor" as used in this Section 1.8 (1) for contracts awarded as provided in M.G.L. C. 149, §§ 44A - 44H, inclusive, shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the General Contractor, (ii) for contracts

awarded as provided in M.G.L. c. 30, § 39M, paragraph (a) shall mean a person approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the General Contractor, and (iii) for contracts with the Commonwealth not awarded as provided in M.G.L. c. 149, §§44A - 44H. inclusive, shall also mean a person contracting with the General Contractor to supply materials used or employed in a public works project for a price in excess of the amount stated in M.G.L. c. 30. § 39F.

1.8.12 A Contractor or a Subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in subparagraph 1.8.6 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph 1.8.6 by a petition in equity in the superior court against the awarding authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a Subcontractor filing a demand for direct payment for which no funds due the Contractor are available for direct payment shall have a right to file a petition in a court of equity against the awarding authority claiming a demand for direct payment is premature, and such Subcontractor must file the petition before the awarding authority has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of Subparagraph 1.8.5 and in subparagraph 1.8.6.

1.8.13 In any petition to collect any claim for which a Subcontractor has filed a demand for direct payment the court shall, upon motion of the Contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of Subparagraph 1.8.5 and in subparagraph 1.8.6 any amount held under a trustee writ or pursuant to a restraining order or injunction.

1.9 Completion (Statutory reference: M.G.L. c. 30, § 39G) This Section applies to every contract or subcontract for the construction of public works by the Commonwealth or by a county, town or district, or by persons contracting or subcontracting for such works.

1.9.1 Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days

thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

1.9.2 Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one per cent retainage on that work, including the quantity, price and all but one per cent retainage for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

1.9.3 Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

1.9.4 Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a

final estimate for the quantity and price of the work done and all retainage on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

1.9.5 The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

1.9.6 No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

1.9.7 Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one per cent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for

minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.

2.1 Preference To Veterans and Citizens In Public Work; Rate of Wages (Statutory reference: M.G.L. c. 149, §26) This Section applies to every contract or subcontract for the construction of public works by the Commonwealth or by a county, town or district, or by persons contracting or subcontracting for such works.

2.1.1 In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment, who are veterans as defined in M.G.L. c. 4, § 7, clause 43, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect. Each county, town or district in the construction of public works, or persons contracting or subcontracting for such works, shall give preference to veterans and citizens who are residents of such county, town or district.

2.1.2 The rate per hour of the wages paid to said mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works shall not be less than the rate or rates of wages to be determined by the Commissioner of Labor and Industries as hereinafter provided; provided, that the wages paid to laborers employed on said works shall not be less than those paid to laborers in the municipal service of the town or towns where said works are being constructed; provided, further, that where the same public work is to be constructed in two or more towns, the wages paid to laborers shall not be less than those paid to laborers in the municipal service of the town paying the highest rate; provided further, that if, in any of the towns where the works are to be constructed, a wage rate or wage rates have been established in certain trades and occupations by collective agreements or understandings between organized labor and employers, the rate or rates to be paid on said works shall not be less than the rates so established; provided, further, that in towns where no such rate or rates have been so established, the wages paid to mechanics, teamsters, chauffeurs and laborers on public works, shall not be less than the wages paid to the employees in the same trades and occupations by private employers engaged in the construction industry. This section shall also apply to regular employees of the Commonwealth or of a county, town or district, when such employees are employed in the construction, addition to or alteration of public buildings for which special appropriations of more than one thousand dollars are provided. Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

2.2 List of Jobs; Classifications, Determination of Rate of Wages; Schedule. (Statutory reference: M.G.L. c. 149, § 27) This Section applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

The Commissioner of Labor and Industries shall prepare, for the use of such public officials or public bodies whose duty it shall be to cause public works to be constructed, a list of the

several jobs usually performed on various types of public works upon which mechanics and apprentices, teamsters, chauffeurs and laborers are employed, including the transportation of gravel or fill to the site of said public works, or the removal of surplus gravel or fill from such site. The Commissioner shall classify said jobs, and he may revise such classifications from time to time, as he may deem advisable. Prior to awarding a contract for the construction of public works, said public official or public body shall submit to the Commissioner a list of the jobs upon which mechanics and apprentices, teamsters, chauffeurs and laborers are to be employed, and shall request the Commissioner to determine the rate of wages to be paid on each job. Said rates shall apply to all persons engaged in transporting gravel or fill to the site of said public works or removing gravel or fill from such site, regardless of whether such persons are employed by a contractor or subcontractor or are independent contractors or owner operators. The Commissioner; subject to the provisions of Section 2.1 of these Specifications, shall proceed forthwith to determine the same, and shall furnish said official or public body with a schedule of such rate or rates of wages as soon as said determination shall have been made. In advertising or calling for bids for said works, the awarding official or public body shall incorporate said schedule in the advertisement or call for bids by an appropriate reference thereto, and shall furnish a copy of said schedule without cost, to any person requesting the same, said schedule shall be made a part of the contract for said works and shall continue to be the minimum rate or rates of wages for said employees during the life of the contract. Any person engaged in the construction of said works shall cause a legible copy of said schedule to be kept posted in a conspicuous place at the site of said works during the life of the contract.

The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in the previous section, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction. Whoever shall pay less than said rate or rates of wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, on said works to any person performing work within classifications as determined by the commissioner, and whoever, for himself, or as representative, agent or officer of another, shall take or receive for his own use or the use of any other person, as a rebate, refund or gratuity, or in any other guise, any part or portion of the wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, paid to any such person for work done or service rendered on said public works, shall be punished by a fine of not more than ten thousand dollars. Offers of restitution or payment of restitution shall not be considered in imposing such punishment. (Note: The Awarding Authority does not guarantee the accuracy of any schedule of wage rates furnished to the Contractor hereunder, and the Contractor shall be responsible for ascertaining the prevailing wages in the area where the work will be performed.)

When an investigation by the attorney general's office reveals that a contractor or subcontractor has violated this section by failing to pay said rate or rates of wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, on said works to any person performing work within classifications as determined by the commissioner, or that a contractor or subcontractor has, for himself, or

as representative, agent or officer of another, taken or received for his own use or the use of any other person, as a rebate, refund or gratuity, or in any other guise, any portion of the wages, including payments to health and welfare funds, or the equivalent payment in wages, paid to any such person for work done or service rendered on said public works, the attorney general may, upon written notice to the contractor or subcontractor and the sureties of the contractor or subcontractor, and after a hearing thereon, order work halted on the part of the contract on which such wage violations occurred, until the defaulting contractor or subcontractor has filed with the attorney general's office a bond in the amount of such penal sum as the attorney general shall determine, conditioned upon payment of said rate or rates of wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, on said works to any person performing work within classifications as determined by the commissioner.

Any employee claiming to be aggrieved by a violation of this section may, at the expiration of ninety days after the filing of a complaint with the attorney general, or sooner if the attorney general assents in writing, and within three years of such violation, institute and prosecute in his own name and on his own behalf, or for himself and for others similarly situated, a civil action for injunctive relief and any damages incurred, including treble damages for any loss of wages and other benefits. Any employee so aggrieved and who prevails in such an action shall be entitled to an award of the costs of the litigation and reasonable attorneys' fees.

2.3 Employment Records To Be Kept By Contractor. Subcontractors; Statement Of Compliance (Statutory reference: M.G.L. c. 149, § 27B) This Section applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

Every contractor, subcontractor or public body engaged in said public works to which Section 2.2 of these Specifications applies shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each Such employee, and shall furnish to the Commissioner of Labor and Industries, upon his request, a copy of said record, signed by the employer or his authorized agent under the penalties of perjury. Such records shall be open to inspection by any authorized representative of the Department of Labor and Industries at any reasonable time, and as often as may be necessary. Every contractor and subcontractor required to keep such a record shall submit a copy of said record to the awarding authority on a weekly basis.

Each such contractor, subcontractor or public body shall preserve its payroll records for a period of three years from the date of completion of the contract.

Each such contractor, subcontractor or public body shall furnish to the Commissioner of Labor and Industries within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor, or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

I, _____
(Name of signatory party)
(Title)

do hereby state;

That I pay or supervise the payment of the persons employed by

_____
(Contractor, subcontractor or public body)

on the _____
(building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty-nine of the General Laws.

Signature _____

Title _____

The above mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the Commissioner for such inspection.

2.4 Wages Paid to Operators of Trucks and Other Equipment. (Statutory reference: M.G.L. c. 149, § 27F) This Section applies to every contract for the construction of public works by the Commonwealth, or by a county, city, town or district.

Prescribed rates of wages, as determined by the Commissioner of Labor and Industries, shall be paid to the operators of all trucks, vehicles or equipment employed on the Project. Said rates of wages shall be requested of said Commissioner by the awarding authority and shall be furnished by the Commissioner in a schedule containing the classification of jobs, and the rate of wage to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employers and employees, the amount of such payments shall be paid directly to said operators.

Whoever pays less than said rates of wages, including payments to health and welfare funds, or the equivalent in wages, on said works, and whoever accepts for his own use, or for the use of any other person, as a rebate, gratuity or in any other guise, any part or portion of said wages or health and welfare funds, shall be punished by a fine of not less than one thousand nor more than five thousand dollars.

Any employee claiming to be aggrieved by a violation of this section may, at the expiration of ninety days after the filing of a complaint with the attorney general, or sooner if the attorney general assents in writing, and within three years of such violation, institute and prosecute in his own name and on his own behalf, or for himself and for others similarly situated, a civil action for injunctive relief and any damages incurred, including treble damages for any loss of wages and other benefits. Any employee so aggrieved and who prevails in such an action shall be entitled to an award of the costs of the litigation and reasonable attorneys' fees.

2.5 Reserve Police Officers (Statutory reference: M.G.L. c. 149, § 34S) This Section 2.5 applies to every contract for the construction, alteration, maintenance, repair or demolition

of, or addition to, any public works for the Commonwealth or any political subdivision thereof. The Contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wages paid to regular police officers in such city or town.

2.6 Eight-Hour Day, etc. (Statutory reference: M.G.L. c. 149, §§ 30 and 34) This Section 2.6 applies only to contracts which are subject to the provisions of the aforesaid Sections of the Massachusetts General Laws.

No laborer, worker, mechanic, foreman or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of extraordinary emergency.

2.7 Lodging, etc. (Statutory reference: M.G.L. c. 149, § 25) This Section applies to every contract for the doing of public work with the Commonwealth, a county, city, or town, or with a department, board, commission, or officer acting therefor. Every employee under this contract shall lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or other employees shall directly or indirectly require, as a condition of the employment of any person, that the employee shall lodge, board or trade at a particular place or with a particular person.

2.8 Access to Contractor's Records (Executive Order No. 195) This paragraph applies to every contract for the purchase of services or materials by any agency, bureau, board, commission, institution, or department of the Commonwealth.

The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of data of the Contractor which pertain to the performance and requirements of this contract.

2.9 Worker's Compensation Insurance (Statutory reference: M.G.L. c. 149, § 34A) This Section 2.9 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the Commonwealth or any political subdivision thereof.

The Contractor shall, before commencing performance of the contract, provide by insurance for the payment of compensation and the furnishing of other benefits under M.G.L. c. 152 to all persons to be employed under the contract, and the Contractor shall continue such insurance in full force and effect during the term of the contract. Sufficient proof of compliance with this Section 2.9 must be furnished at the time of execution of this contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured. shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the awarding authority at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice.

3.1 Contractor’s Accounting Method Requirements. The words defined herein shall have the meaning stated below whenever they appear in this Article 4:

3.1.1 "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to § 39M of c. 30, §§ 44A - 44H inclusive, of c. 149, and §§ 30B - 30P, inclusive, of c. 7.

3.1.2 "Contract" means any contract awarded or executed pursuant to §§ 30B - 30P, inclusive, of c. 7, and any contract awarded or executed pursuant to § 39M of c. 30, or §§ 44A - 44H, inclusive, of c. 149, which is for an amount or estimated amount that exceeds the dollar amount set forth in M.G.L. c. 30, § 39R.

3.1.3 "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

3.1.4 "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

3.1.5 "Audit," when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

3.1.6 "Accountant's Report," when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which s/he has made and sets forth his/her opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the Contractor.

3.1.7 "Management," when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

3.1.8 Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

3.2 Subparagraph 3.1.2 hereof notwithstanding, every agreement or contract awarded or executed pursuant to §§ 30B - 30P, inclusive, of c. 7, and pursuant to §§ 39M of c. 30 or to §§ 44A - 44H, inclusive, of c. 149, shall provide that:

3.2.1 The Contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor, and

3.2.2 until the expiration of six years after final payment, the awarding authority, office of inspector general, and the deputy commissioner of capital planning and operations shall have the right to examine any books, documents, papers or records of the Contractor or of his/her Subcontractors that directly pertain to, and involve transactions relating to, the Contractor or his/her Subcontractors, and

3.2.3 if the agreement is a contract as defined herein, the Contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his/her description the date of the change and reasons therefor, and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes, and

3.2.4 if the agreement is a contract as defined herein, the Contractor has filed a statement of management on internal accounting controls as set forth in Section 3.3 below prior to the execution of the contract, and

3.2.5 if the agreement is a contract as defined herein, the Contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in Section 3.5 below.

3.3 Every Contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:

3.3.1 transactions are executed in accordance with management's general and specific authorization;

3.3.2 transactions are recorded as necessary;

(i) to permit preparation of financial statements in conformity with generally accepted accounting principles, and

(ii) to maintain accountability for assets

3.3.3 access to assets is permitted only in accordance with management's general or specific authorization, and

3.3.4 the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

3.4 Every Contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that s/he has examined the statement of management on internal accounting controls, and expressing an opinion as to

3.4.1 whether the representations of management in response to this paragraph and Section 3.2 above are consistent with the result of management's evaluation of the system of internal accounting controls; and

3.4.2 whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

3.5 Every Contractor awarded a contract by the Commonwealth or by any political subdivision thereof shall annually file with the Awarding Authority during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report, such statement shall be made available to the Awarding Authority upon request.

3.6 The Office of Inspector General, The Commissioner for Capital Planning And Operations and any other Awarding Authority shall enforce the provisions of this section. The commissioner of capital planning and operations may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all Awarding Authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

3.7 Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b) of M.G.L. c. 30 § 39R.

4.1 Weather Protection. This Section applies to every contract subject to M.G.L. c149, § 44A.

The Contractor shall install weather protection and provide adequate heat in the protected area from November 1 to March 31, as required by M.G.L. c. 149 § 44F(I), and c. 149 § 44G(D).

4.2 Form for Sub-contract. This Section applies to every contract subject to M.G.L. c. 149, § 44A.

The Contractor when sub-contracting with sub-bidders filed pursuant to M.G.L. c. 149 § 44F shall use the form for sub-contract in c. 149, § 44F(4)(c)

4.3 Foreign Corporations. This Section applies to every contract with the Commonwealth, a county, city, town, district, board, commission, or other public body for the construction, reconstruction, alteration. remodeling, repair, or demolition of any public building or other public works,

The Contractor, if a foreign corporation, shall comply with M.G.L. c. 30 § 39L.

4.4 Shoring. (Statutory reference: M.G.L. c. 149, § 129A) This Section applies to every construction project carried on by any city, town, county, or other subdivision of the Commonwealth in which a trench is to be dug to a depth of five feet or more, except for trenches for laying of water pipes dug to a depth of six and one-half feet which will be open less than 48 hours, and except for digging of graves.

Trenches shall be shored and braced in conformity with rules and regulations relating thereto adopted and enforced by the Department of Labor and Industries.

4.5 Certification of Compliance with Tax Laws (Statutory reference: M.G.L. c. 62 C, § 49A) This Section 4.5 applies to contracts for goods or services furnished to any department, board, commission, division, authority, district or other agency of the Commonwealth or any subdivision of the Commonwealth, including a city, town or district.

By executing this contract, the Contractor certifies, under penalties of perjury, that to the best of
his information, knowledge and belief he has complied with all laws of the Commonwealth relating to taxes.

4.6 Debarment or Suspension of Public Contractors; Definitions; List of Contractors; Grounds; Notice; Effect on Affiliates; Mitigating Factors; Effect of Debarment or Suspension (Statutory reference: M.G.L. c.29, § 29F)

(a) As used in this section the following words shall, unless the context requires otherwise, have the following meanings:--

"Affiliates", entities which are affiliates of each other when either directly or indirectly one concern or individual controls or has the power to control another, or when a third party controls or has the power to control both.

"Commissioner", the commissioner of the division of capital asset management and maintenance or his designee within such division.

"Contractor ", any person that has furnished or seeks to furnish supplies or services under a contract with a public agency or with a person under a contract with a public agency.

"Debarment", an exclusion from public contracting or subcontracting for a reasonable, specified period of time commensurate with the seriousness of the offense.

"Public agency", a department, agency, board, commission, authority, activity or instrumentality of the commonwealth, or of any political subdivision of the commonwealth, or of two or more subdivisions thereof.

"Person", any natural person, business, partnership, corporation, union, committee, club or other organization, entity or group of individuals.

"Public contract", a contract for the furnishing of supplies or services to any public agency.

"Secretary", the head of an executive office established under chapter six A or his designee within such executive office, or the secretary of administration appointed pursuant to section four of chapter seven or his designee within the executive office.

"Suspension", the temporary disqualification of a contractor who is suspected upon adequate evidence of engaging or having engaged in conduct which constitutes grounds for debarment.

(b) The secretary of administration shall establish and maintain a consolidated list of contractors to whom public contracts shall not be awarded and from whom offers, bids, or proposals shall not be solicited.

The list shall show at a minimum the following information: (1) the names of those persons debarred or suspended in alphabetical order with appropriate cross reference where more than one name is involved in a single debarment or suspension; (2) the basis of authority for each debarment or suspension, including the secretary or other official who imposed the debarment or suspension; (3) the extent of restrictions imposed; (4) the termination date of each debarment or suspension; and (5) in the case of a suspension, the hearing date, if and when set, for debarment proceedings.

The secretary of administration shall cause the list to be kept current by the issuance of notices of additions and deletions. The list shall be published on a periodic basis, together with notices of additions and deletions therefrom, in the goods and services bulletin and the central register published by the state secretary and in such other publications as the secretary of administration shall designate. The secretary of administration shall also forward said list to the inspector general, the attorney general, and the state auditor. A secretary or the commissioner, as the case may be, upon imposing a debarment or suspension or removing a suspension shall forthwith notify the secretary of administration of all information required for inclusion on such list.

(c) Debarment may be imposed for the following causes; but, debarment shall be imposed in all causes where debarment is required by law:

(1) conviction or final adjudication by a court or administrative agency of competent jurisdiction of any of the following offenses: (i) a criminal offense incident to obtaining or attempting to obtain a public or private contract or subcontract, or in the performance of such contract or subcontract; (ii) a criminal offense involving embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property or any other offense indicating a lack of business integrity or business honesty which seriously and directly affects the contractor's present responsibility as a public contractor; (iii) a violation of state or federal antitrust laws arising out of the submission of bids or proposals; (iv) a violation of state or federal laws regulating campaign contributions; (v) a violation of chapter two hundred and sixty eight A; (vi) a violation of any state or federal law regulating hours of labor, prevailing wages, minimum wages, overtime pay, equal pay, child labor, or worker's compensation; (vii) a violation of any state or federal law prohibiting discrimination in employment; or (viii) repeated or aggravated
violation of any state or federal law regulating labor relations or occupational health or safety; or (ix) repeated or aggravated violation of any state or federal law protecting the environment; or

(2) substantial evidence, as determined by a secretary or the commissioner, of any of the following acts: (i) willfully supplying materially false information incident to obtaining or attempting to obtain or performing any public contract or subcontract; (ii) willful failure to comply with recordkeeping and accounting requirements prescribed by law or regulation; (iii) a record of failure to perform or of unsatisfactory performance in accordance with the terms of one or more public contracts, provided that such failure to perform or unsatisfactory performance has occurred within a reasonable period of time preceding the determination to debar and provided further that such failure to perform or unsatisfactory performance was not caused by factors beyond the contractor's control; (iv) a record of health and safety or environmental violations of a sufficient frequency and severity so as to evidence a pattern of noncompliance with existing state and federal laws, or any rules and regulations applicable thereto; (v) any other cause affecting the responsibility of a contractor which the secretary or the commissioner determines to be of such serious and compelling nature as to warrant debarment. Notwithstanding any other provision of this section, any contractor debarred or suspended by any agency of the United States shall by reason of such debarment or suspension be simultaneously debarred or suspended under this section, with respect to non-federally aided contracts; the secretary or the commissioner may determine in writing that special circumstances exist which justify contracting with the affected contractor. The secretary or the commissioner shall give written notice to the secretary of administration of any such determination.

(d) No contractor may be suspended unless a secretary or the commissioner has first informed the contractor by written notice of the proposed suspension mailed by registered or certified mail to the contractor's last known address, except when the secretary or the commissioner determines that immediate suspension is necessary to prevent serious harm to the commonwealth, in which case the suspension shall take effect immediately upon signing by the secretary or the commissioner of an order of suspension, and notice shall be mailed to the contractor at the earliest opportunity. The notice shall inform the contractor of the reasons for the proposed suspension and shall state that the contractor may within fourteen days respond in writing and may in such response request a hearing. The secretary or the commissioner may extend the period for response at the request of the contractor. The secretary or the commissioner shall determine whether to impose the suspension or, in the case of an emergency suspension imposed prior to notice to the contractor, whether to continue the suspension after reviewing the contractor's response, if any, and making such investigation as the secretary or the commissioner determines is necessary and appropriate. An indictment, or any information or other filing by a public agency charging a criminal offense, for any of the offenses listed in paragraph (1) of subsection (c) shall constitute adequate evidence to support a suspension.

If the contractor requests a hearing, and the suspension is not based on an indictment, the secretary or the commissioner shall conduct a hearing according to the rules for the conduct of adjudicatory hearings established by the secretary of administration pursuant to chapter thirty A. Such hearing shall be initiated within thirty days of the imposition of the suspension, unless the contractor requests that the hearing be delayed. Officers and employees of the office of the inspector general and records of said office shall not be subject to subpoena for such hearing, if in the opinion of the inspector general production of records or testimony would prejudice any pending investigation by said office.

A suspension shall not exceed twelve months unless a pending administrative or judicial proceeding in which the contractor is a party may result in a conviction or final adjudication of an offense listed in paragraph (1) of subsection (c).

(e) No contractor may be debarred under this section unless a secretary or the commissioner proposing the debarment has first informed the contractor by written notice of the proposed debarment mailed by registered or certified mail to the contractor's last known address. The notice shall inform the contractor of the reasons for the debarment and shall state that the contractor will be accorded an opportunity for a hearing if the contractor so requests within fourteen days of receipt of the notice. A hearing requested under this paragraph shall be conducted by the secretary or the commissioner within sixty days of receipt of the request, unless the secretary or the commissioner grants additional time therefor at the request of the contractor. The hearing shall be conducted according to the rules for the conduct of adjudicatory hearings established by the commissioner of administration pursuant to chapter thirty A. A debarment shall not be imposed until (i) fourteen days after receipt by the contractor of notice of the proposed debarment if no hearing is requested, or (ii) the issuance of a written decision by the secretary or the commissioner which makes specific findings that there is sufficient evidence to support the debarment and that debarment for the period specified in the decision is required to protect the integrity of the public contracting process. A contractor shall be notified forthwith of the decision by registered or certified mail, and of the contractor's right to judicial review in the event that the decision is adverse to the contractor. If a suspension precedes a debarment, the suspension period shall be considered in determining the debarment period.

(f) A debarment or suspension may include all known affiliates of a contractor. The decision to include a known affiliate within the scope of a debarment or suspension shall be made on a case by-case basis, after giving due regard to all relevant facts and circumstances. The offense or act of an individual justifying suspension, or the evidence justifying a suspension, may be imputed to the entity with which the individual is connected when such offense or act occurred in connection with the individual's performance of duties for or on behalf of the entity or with the knowledge, approval, or acquiescence of the entity or one or more of its principals. The entity's acceptance of the benefits derived from the conduct shall be evidence of such knowledge, approval, or acquiescence. The offense or act of an entity justifying debarment, or the evidence justifying a suspension, may be imputed to any officer, director, shareholder, partner, employee or other individual associated with the entity who participated in, knew of, or had reason to know of the entity's act. An entity or individual may not be suspended or debarred except in accordance with the procedures set forth in this section, provided that a public agency may reject a bid or proposal from any contractor when the public agency reasonably determines that such contractor is not responsible or eligible.

(g) In determining whether to debar a contractor, or the period of a debarment, all mitigating facts and circumstances shall be taken into consideration. Except as precluded by statute, a debarment may be removed or the period thereof may be reduced by the secretary or the commissioner who imposed the debarment or suspension upon the submission of an application supported by documentary evidence setting forth appropriate grounds for the granting of relief, such as newly discovered material evidence, reversal of a judgment or conviction, bona fide change of ownership or management, or the elimination of the cause for which the debarment was imposed.

(h) During the period for which a person has been debarred or suspended, that person shall not submit or cause to be submitted offers, bids, or proposals to any public agency, nor shall any public agency solicit or consider offers, bids, or proposals from, nor execute, renew, or extend any contract with, a debarred or suspended contractor, and a contractor shall not contract for supplies or services from a debarred or suspended subcontractor on any public contract.

(i) The secretary of administration shall by regulation drawn up in consultation with each secretary and the commissioner provide for, upon the request of any secretary or the commissioner the timely commencement by, the removal to, or consolidation at the executive office of administration and finance of debarment or suspension proceedings. Such regulations also shall provide that the contractor against whom debarment or suspension proceedings have been initiated may apply to the secretary of administration for consolidation of such proceedings at the executive office of administration. Such proceedings shall be conducted by the secretary of administration or his designee in accordance with the provision of this section.

4.7 False, Fictitious, or Fraudulent Claims Made to Commonwealth or Municipality (Statutory reference M.G.L. c. 266, § 67B) Whoever makes or presents to any employee, department, agency or public instrumentality of the commonwealth, or of any political subdivision thereof, any claim upon or against any department, agency, or public instrumentality of the commonwealth, or any political subdivision thereof, knowing such claim to be false, fictitious, or fraudulent, shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than five years, or in the house of correction for not more than two and one-half years, or both.

4.8 Public Construction -- Health and Safety (Statutory reference M.G.L. c. 30, § 39S)

(a) As used in this section the word "person" shall mean any natural person, joint venture, partnership corporation or other business or legal entity. Any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, alteration, remodeling or repair of any public work by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, and estimated by the awarding authority to cost more than $10,000, and any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, estimated to cost more than $10,000, shall certify on the bid, or contract, under penalties of perjury, as follows:

(1) that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;

(2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and

(3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the

United States Occupational Safety and Health Administration that is at least 10 hours in duration.

(b) Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration shall be subject to immediate removal.

(c) The attorney general, or his designee, shall have the power to enforce this section including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts in all cases where, after investigation of the facts, he has made a finding that the award or performance has resulted in violation, directly or indirectly, of subsection (b), and he shall not be required to pay to the clerk of the court an entry fee in connection with the institution of the proceeding.

4.9 Security for Payment of Labor, Materials, Charges, etc., on Certain Public Works; Filing of Claim; Petition, Hearing and so forth (Statutory reference: M.G.L. c. 149, § 29) Officers or agents contracting in behalf of the commonwealth or in behalf of any county, city, town, district or other political subdivision of the commonwealth or other public instrumentality for the construction, reconstruction, alteration, remodeling, repair or demolition of public buildings or other public works when the amount of the contract in the case of the commonwealth is more than five thousand dollars, and in any other case is more than two thousand dollars, shall obtain security by bond in an amount not less than one half of the total contract price, for payment by the contractor and subcontractors for labor performed or furnished and materials used or employed therein, including lumber so employed which is not incorporated therein and is not wholly or necessarily consumed or made so worthless as to lose its identity, but only to the extent of its purchase price less its fair salvage value, and including also any material specially fabricated at the order of the contractor or subcontractor for use as a component part of said public building or other public work so as to be unsuitable for use elsewhere, even though such material has not been delivered and incorporated into the public building or public work, but only to the extent of its purchase price less its fair salvage value and only to the extent that such specially fabricated material is in conformity with the contract, plans and specifications or any changes therein duly made; for payment of transportation charges for materials used or employed therein which are consigned to the contractor or to a subcontractor who has a direct contractual relationship with the contractor; for payment by such contractor and subcontractors of any sums due for the rental or hire of vehicles, steam shovels, rollers propelled by steam or other power, concrete mixers, tools and other appliances and equipment employed in such construction, reconstruction, alteration, remodeling, repair or demolition; for payment of transportation charges directly related to such rental or hire; and for payment by such contractor and subcontractors of any sums due trustees or other persons authorized to collect such payments from the contractor or subcontractors, based upon the labor performed or furnished as aforesaid, for health and welfare plans, supplementary unemployment benefit plans and other fringe benefits which are payable in cash and provided for in collective bargaining agreements between organized labor and the contractor or subcontractors; provided, that any such trustees or other persons authorized to collect such payments for health and welfare plans, supplementary unemployment benefit plans and other fringe benefits shall, subject to the following provisions, be entitled to the benefit of the security only in an amount based upon labor performed or furnished as aforesaid for a maximum of two hundred and forty consecutive calendar days.

In order to obtain the benefit of such bond for any amount claimed due and unpaid at any time, any claimant having a contractual relationship with the contractor principal furnishing the bond, who has not been paid in full for any amount claimed due for the labor, materials, equipment, appliances or transportation included in the paragraph (1) coverage within sixty-five days after the due date for same, shall have the right to enforce any such claim (a) by filing a petition in equity within one year after the day on which such claimant last performed the labor or furnished the labor, materials, equipment, appliances or transportation included in the claim and (b) by prosecuting the claim thereafter by trial in the superior court to final adjudication and execution for the sums justly due the claimant as provided in this section.

Any claimant having a contractual relationship with a subcontractor performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor but no contractual relationship with the contractor principal furnishing the bond shall have the right to enforce any such claim as provided in subparagraphs (a) and (b) of paragraph (2) only if such claimant gives written notice to the contractor principal within sixty-five days after the day on which the claimant last performed the labor or furnished the labor, materials, equipment, appliances or transportation included in the paragraphs (1) coverage, stating with substantial accuracy the amount claimed, the name of the party for whom such labor was performed or such labor, materials, equipment, appliances or transportation were furnished; provided, that any such claimant shall have the right to enforce any part of a claim covering specially fabricated material included in the paragraph (1) coverage only if such claimant has given the contractor principal written notice of the placement of the order and the amount thereof not later than twenty days after receiving the final approval in writing for the use of the material. The notices provided for in this paragraph (3) shall be served by mailing the same by registered or certified mail postage prepaid in an envelope addressed to the contractor principal at any place at which the contractor principal maintains an office or conducts his business, or at the contractor principal's residence, or in any manner in which civil process may be served.

Upon motion of any party, the court shall advance for speedy trial a petition to enforce a claim pursuant to this section. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to petitions to enforce claims pursuant to this section. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to said sections fifty-nine or fifty-nine B and shall, upon motion of any party, advance for speedy trial the petition to enforce the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any claimant under this section with the petition of one or more other claimants on the same bond, unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated, and that such consolidation will prevent unnecessary duplication of evidence.

The court shall not dismiss any petition on the ground that it was filed before the sixty-fifth day after the day the claimant last performed the labor or furnished the labor, materials, equipment, appliances or transportation included in the claim, nor shall the court dismiss any petition on the ground that a claim involves more than one contract with the same party and that the one year period has elapsed as to any one contract; provided, that the court shall not enter a decree upon any claim or part thereof prior to the seventieth day

after the day the claimant last performed the labor or furnished the labor, materials, equipment, appliances or transportation included in the claim.

A decree in favor of any claimant under this section shall include reasonable legal fees based upon the time spent and the results accomplished as approved by the court and such legal fees shall not in any event be less than published rate of any recommended fee schedule of a statewide bar association or of a bar association in which the office of counsel for claimant is located, whichever is higher.

Any person employing persons on any public works hereinbefore referred to shall post conspicuously, at such place or places as will provide reasonable opportunity for all employees to read the same, a correct copy of this section. The attorney general shall enforce this paragraph.

END OF SECTION

SECTION 00 83 00

SITE UTILIZATION

PART 1 - GENERAL

1.1 REFERENCES: General provisions of Contract, including General and Supplementary Conditions and Division l, General Requirements, apply to work specified in this Section.

1.2 SITE LOGISTICS – GENERAL OVERVIEW

A. The project site is located at 25 Madison Street, Worcester, MA.

B. The site is located within a vacant parking lot at the corner of Madison Street and Southbridge Street. The site is currently used as overflow and temporary parking for the neighborhood. The site is located in a densely populated urban environment near Polar Park and Interstate 290.

C. Parking:
1. Parking will be allowed in designated on-site areas for Contractor construction and personal vehicles. Sufficient parking for worker vehicles should be available for the project duration. If parking demand exceeds available space, the construction manager may, at its discretion, limit on-site parking for each contractor to one vehicle for every two workers. Parking is at the sole risk of the employer and their employees.
2. If necessary, Trade Contractors and Subcontractors are responsible for making and paying for their own off-site parking arrangements for their construction workforce if and when required. At the complete and final discretion of the CM, parking on-site may be permitted or not permitted for contractors depending on construction activities or phases of the project.

D. Onsite storage and office trailers:
1. Onsite storage of materials and equipment will be allowed unless noted otherwise by the Construction Manager. For planning purposes, the specific needs of each contractor must be coordinated in advance with the Construction Manager.
2. Lack of on-site storage will not be an acceptable excuse for missing any project deadline or material delivery requirements.
3. Contractors are required to release materials and equipment upon approval and be responsible for their off-site storage.

E. Deliveries and construction traffic:
1. Notify the CM at least 72 hours in advance of any material or equipment deliveries. Deliveries not planned in advance will be turned away.
2. All trade contractors and subcontractors will assume responsibility for meeting and directing delivery trucks and personnel associated with their work.

3. All trade contractors and subcontractors will provide manpower and equipment (i.e. lull and licensed operator) to offload delivered material and equipment to meet scheduled offloading durations.
4. No deliveries will be allowed before 7:00 AM or after 2:30 PM. In addition, no trucks will be allowed to park or idle near the site prior to 7:00 AM. This requirement will be strictly enforced.

F. Refer to Proposed Truck Route and Site Utilization Plan included in this section.

1.3 NEIGHBORHOOD CONSIDERATIONS:

A. It is important to the City that a safe environment is maintained at all times and that disturbance and disruption to the surrounding community is mitigated to the greatest extent practical.

1.4 DUST CONTROL:

A. Each Trade Contractor or Non-Trade Contractor, in addition to requirements stated in other sections, shall be responsible for wetting down and/or chemically treating all demolition, excavation, and general construction operations that generate dust. Such wetting or treating is to be performed in a concurrent and continuous method during dust generating activities. Trash chutes, if utilized, must be enclosed. Dirt piles shall be covered if wetting or chemical treatment does not keep dust from becoming airborne. Dust generated from brushing, grinding, or similar operations shall be treated in such a way as to prohibit it from becoming airborne and migrating from the site. Particular attention shall be paid to any adjacent windows, parked cars and the neighborhood parks.

1.5 NOISE and VIBRATION CONTROL:

A. There shall be particular attention paid to noisy or significant vibratory operations and equipment as this site is adjacent to residential buildings and businesses. Minimal disruption to the day-to-day operations of the Town and its residents is the main goal. All machines shall be muffled and maintained in good operating condition. All jack hammering and high-impact operations, such as boulder breaking and close-to-building concrete demolition, shall be scheduled with the Construction Manager.

1.6 SITE UTILIZATION PLAN:

A. The attached Site Utilization Plan for the general construction is provided for reference only and is representative of the forward-looking site logistical approach. The plan is to be reviewed by the major contractors performing work activities and can be revised as necessary per mutual agreement of these parties and the Construction Manager. The final Site Utilization Plan for any phase of the work will be subject to the approval of the Town/City Name.

1.7 TRAFFIC, PARKING and TRANSPORTATION REGULATIONS:

A. All Traffic, Parking and Transportation required by all Trade Contractors or Non-Trade Contractors will have to accept and follow, in strict accordance, to the City of Worcester Traffic, Parking and Transportation Regulations.

B. Management of construction truck activity and routing in the Town/City through the coordinated efforts of the Traffic Department and the Public Works Department; Authority to restrict trucks lie in Massachusetts General Laws Chapter 85 and the 2006 Massachusetts Amendment to the 2003 Manual on Uniform Traffic Control Devices (MUTCD) Section 11A-9. Key criteria for a truck exclusion from a municipal way include, a suitable alternative route is available and one or more of the following: A.) There is at least 5% heavy commercial vehicles, B.) Heavy wheel loads will result in severe deterioration of the roadway, and C.) Land use is primarily residential and the municipality has requested exclusion only during hours of darkness.

C. Delivery Trucks and any other heavy equipment:
   1. Please refer to the provided trucking route for more specific information on how to access the site.

D. WORK ZONES: Any work performed outside the limits of work areas designated on the construction documents shall carry the following responsibilities.
   1. Provide traffic plans as necessary to comply with the City of Worcester when any work encroaches into the streets or sidewalks.
   2. Any fencing, barricades or signage required to perform the scope of work required outside the limits of work areas, including any restoring of previous fencing / barricading locations. Unless otherwise noted, restore area of work to original condition or acceptable to City of Worcester standards and coordinate such work with Construction Manager.

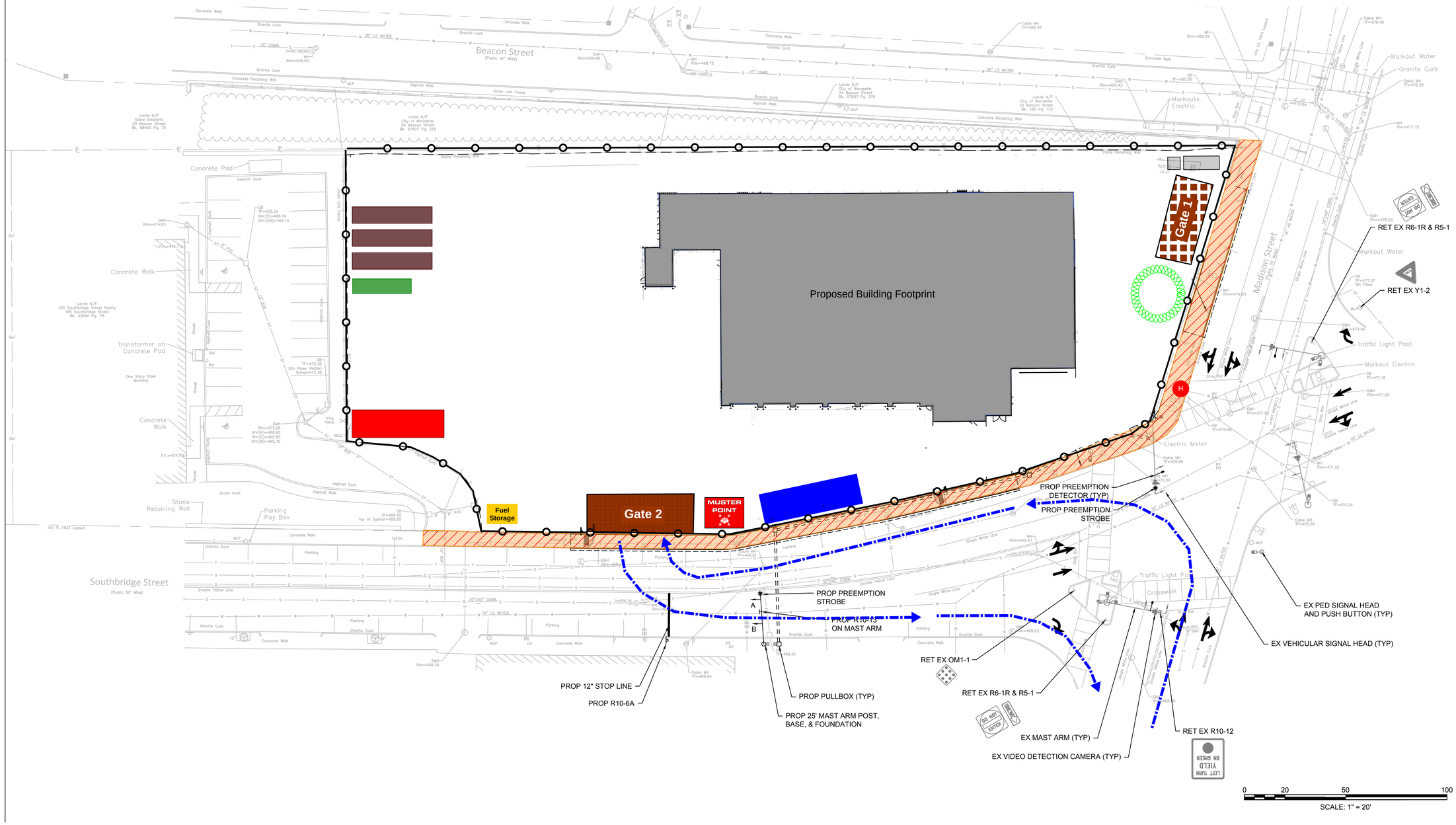
1.8 PROPOSED TRUCK ROUTE AND PLANS:

A. Attachment A: Proposed Trucking Route Site Logistics Plan

END OF SECTION

Legend

- Construction Fence
- Tree protection
- WTR Trailer
- OPM Trailer
- Construction Entrances
- Storage Containers
- Dumpster
- Fire Hydrant
- Fuel Storage Area
- Active Pedestrian Sidewalk
- Typical Trucking Route



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CONSULTANTS

FIREMATIC
WENDEL | MITCHELL ASSOCIATES
29 THACHER PARK RD, VOORHEESVILLE, NY 12186

CIVIL/LANDSCAPE
WESTON & SAMPSON
85 DEVONSHIRE ST, 3RD FL, BOSTON, MA 02109

STRUCTURAL
RSE ASSOCIATES
63 PLEASANT ST, WATERTOWN, MA 02471

MEP/FP/LIGHTING
ARUP
60 STATE ST, BOSTON, MA 02109

CODE
JENSEN HUGHES
33 ARCH ST, BOSTON, MA 02110

ENERGY MODEL
ANDELMANLELEK
1408 PROVIDENCE HWY, NORWOOD, MA 02062

NOT FOR CONSTRUCTION

PROJECT

WORCESTER SOUTH DIVISION FIRE STATION PROJECT
25 MADISON ST
WORCESTER, MA 01608

CITY OF WORCESTER

455 MAIN STREET
WORCESTER, MA 01605

KEY PLAN

ISSUE CHART

MARK	ISSUE	DATE

Job Number 157132.000

TITLE

TRAFFIC PLAN

SHEET NUMBER

C7.01

90% DD ESTIMATE 6/27/25

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6/27/2025 2:53:17 PM P:\MA\Worcester MA\240113 - Perkins & Will South Division Firehouse\05-BIM-CAD\03-Transportation\TRAFFIC PLAN.dwg

SECTION 00 84 20

FORM OF NON-TRADE SUBCONTRACT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 00 and 01.

B. All Subcontractors (i.e., non-Trade Contractors) shall be required to execute a contract with the Construction Manager. A copy of a sample contract is provided as an attachment to this section. The agreement is based on the AIA Document A401 – 2007: Standard Form of Agreement between Contractor and Subcontractor, with minor modifications as indicated by the red boxes.

C. Subcontractors are expected to execute this contract as provided without qualification or amendment. If qualifications are required, they shall be provided to the Construction Manager at the time of bidding prior to a Notice of Award being issued.

D. Attachment: Sample AIA Document A401 (revised)

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

[NOT USED]

END OF SECTION

W.T. RICH COMPANY

SUBCONTRACT

THIS AGREEMENT made this 21st day of August ,2025 by and between:

<SUBCONTRACTOR NAME> ("Subcontractor")
<SUB ADDRESS>
<CITY, STATE, ZIP>

and

W.T. Rich Company, Inc. ("Contractor")
1075 Worcester Street, Suite 310
Natick, MA 01760

WHEREAS, Contractor has undertaken the construction of

Worcester South Division Fire Station located at 25 Madison Street in Worcester, MA.

in accordance with the provisions of a contract between Contractor and

The City of Worcester ("Owner")
799 Main Street
Worcester, MA 01610

(the "Prime Contract").

NOW, THEREFORE, in consideration of the agreements herein contained, the parties hereto mutually agree as follows:

ARTICLE 1 – SCOPE OF WORK

A. Subcontractor shall furnish all labor, materials, skill, equipment, tools, construction equipment, construction machinery, transportation, and other facilities, services, instrumentalities, and things necessary or incidentally required for the proper execution and completion of the following work required by the Prime Contract, hereafter the "Work":

> All work, requirements and responsibilities defined in the XXX Scope of Work Sheet, provided as Exhibit 1 and in accordance with the attached Exhibit 2 List of Contract Documents.

B. Except as expressly modified in this Subcontract, all of the Work is to be furnished and performed in accordance with, and Subcontractor is bound to Contractor by, all terms and provisions of the "Contract Documents" which include, but are not limited to, the Prime Contract, general conditions, special conditions and supplementary conditions, and all riders, exhibits and addenda thereto, and the plans, drawings, and specifications (technical and non-technical provisions) prepared by Perkins and Will ("the Architect"), dated December 19, 2025 and all addenda and modifications thereto, all of these documents being made a part of this Subcontract as fully as if reproduced herein. Subcontractor shall assume to Contractor, with respect to that portion of the Work described above, all obligations and responsibilities, which Contractor has assumed to the Owner pursuant to the

Contract Documents. The specific reference to or physical incorporation herein of any provision included within the Contract Documents is for emphasis or clarification only and is not intended to be in limitation of the foregoing. Unless expressly modified in the Subcontract, Subcontractor is bound to Contractor by all the terms and provisions of the Contract Documents whether substantive, procedural, administrative, technical or non-technical in nature, as Contractor is bound to the Owner. The Contract Documents are available at Contractor's office for review and copying.

C. Subcontractor acknowledges that prior to execution of this Subcontract, Subcontractor was afforded adequate opportunity to visit the Project to review the Scope of the Work to be performed by Subcontractor and to review the Subcontract, including the Contract Documents. Subcontractor shall be responsible for any loss, cost, damage and/or expense occasioned by Subcontractor's failure to inspect diligently and adequately the project site, the Subcontract and Contract Documents.

D. Subcontractor will furnish material that meets the quality requirements called for in the Contract Documents.

E. Subcontractor shall: (1) perform all Work to the full satisfaction of Contractor and Owner, and in proper cooperation with Contractor and other subcontractors so as not to delay or otherwise interfere with or obstruct their Work; (2) provide sufficient, safe and proper facilities at all times for the inspection of the Work; and, (3) within twenty-four (24) hours or such reasonable time as Contractor allows, after receiving written notice from Contractor, at its own expense, proceed to remove from the Project all materials rejected by Owner or Contractor, whether or not installed, and to take down and/or rebuild all portions of the Work which Owner or Contractor shall, by written notice, reject as unsound or improper, or as in any way failing to conform to the Subcontract.

F. Contractor may reject Subcontractor's Work if: (1) Subcontractor's Work is not in conformance with the Contract Documents, as determined by the Contractor, Owner or Architect; (2) Subcontractor's Work violates any applicable laws, by-laws, ordinances, regulations, codes, rules, orders and covenants; or (3) Contractor has determined, in Contractor's opinion, that Subcontractor's Work has not been performed in a good and workmanlike manner in full compliance with the Subcontract.

G. Subcontractor will use diligent effort to discover promptly actual or potential conflicts between the Work of Subcontractor and the Work of Contractor, other subcontractors or Owner's own forces. Subcontractor will advise Contractor promptly, in writing, of any such actual or potential conflicts, and Subcontractor shall cooperate with Contractor, other subcontractors and the Owner to resolve such conflicts. Upon request of Contractor, Subcontractor shall participate in the preparation of coordination drawings regarding areas of congestion. Subcontractor acknowledges and understands that conflicts resulting from areas of congestion may occur and that Subcontractor shall be required to resolve such conflicts promptly, without additional compensation.

H. The documents comprising the Subcontract are intended to be read as a whole, and any Work required by one part and not mentioned in another (e.g., item shown in drawing and not mentioned in the specifications, or mentioned in the specifications and not shown in drawings), shall be executed to the same extent as though required by all. In the event of a conflict between one or more provisions of the Subcontract, the provision imposing the more demanding term, condition, duty or standard of performance, or the greater limitation on the nature and type of relief or damages allowed to Subcontractor, shall control. A conflict exists in the Subcontract when the same subject matter is addressed by two or more provisions of the Subcontract in a manner that cannot be reconciled to give effect to all provisions.

I. This Subcontract is subject to any provision contained in the Contract Documents requiring consent of Owner or its representative for the subletting of any Work of the Prime Contract.

J. Subcontractor shall provide all sheds, scaffolding, lifts and hoisting for its own use, and shall clean up and dispose of all dirt and debris caused by Subcontractor's Work on a daily basis or shorter interval if required for safety or if directed by Contractor; disposal shall mean placing in Contractor-provided dumpster located on the premises, unless the Contract Documents explicitly indicate legal disposal off-site by the Subcontractor.

K. Subcontractor shall submit to Contractor a schedule of values allocated to the various parts of the Work of this Subcontract aggregating the Subcontract Price. Such schedule of values shall include such detail and be supported by such evidence as Contractor may require. Subcontractor warrants that the schedule of values submitted will represent a true and fair allocation of values to the various parts of the Work of this Subcontract. In submitting a Requisition (as defined in Article 2) for payment, Subcontractor shall submit Requisitions based upon the most recent schedule of values. No Requisition shall be deemed submitted and no payment shall be due to Subcontractor until such time as the schedule of values has been furnished to Contractor in form and substance acceptable to Contractor.

L. Within fifteen (15) days from the date of this Subcontract, Subcontractor shall submit a complete, detailed listing (or drawings) of all locations for sleeves, cut-outs, or embedded items related to the concrete structure or other structure for coordination with other trades and structural and architectural requirements. Any failure by Subcontractor to submit such data for prior approval will render Subcontractor solely responsible for any expense incurred to cut, core, patch or relocate.

M. Subcontractor shall furnish in a timely manner all shop drawings, submittals, samples, certificates and the like as required to meet the project schedule, which will meet the approval of the Architect, Contractor, and Owner and shall give Contractor notice of, and opportunity to be present at, all inspections and testing with reference to the Work.

N. Subcontractor shall, at its own cost and expense, apply for and obtain all permits necessary for the proper execution and completion of the Work. Subcontractor shall notify Contractor of the delivery of all permits, licenses or certificates required by it to be obtained and shall, upon demand, deliver copies of the same to Contractor. All Work performed by Subcontractor and Subcontractor's performance of the Work under this Subcontract shall comply strictly with the laws, by-laws, ordinances, regulations, codes, rules, orders and covenants of the local, state, and/or federal government and of any and all of their departments and bureaus (the "Laws"). Subcontractor shall be responsible for any violation of any Laws and, to the fullest extent permitted by law, shall defend and indemnify Contractor for any loss or damage resulting from any such violation. This defense and indemnity obligation is in addition to and not in lieu of any other obligations contained in the Subcontract.

O. If Subcontractor observes that the drawings and specifications are at variance with any applicable Laws, Subcontractor shall immediately notify Contractor in writing. If Subcontractor performs any Work knowing it to be contrary to the Laws, Subcontractor shall bear all direct and indirect costs and expenses arising therefrom.

P. Subcontractor shall dismiss any worker from the Work whose employment thereon shall be objected to by Contractor. Grounds for dismissal include unauthorized smoking, serious or repeat safety violations, incompetence, fighting, unruly or violent behavior, sexual harassment, refusal to follow direction from authorized Contractor personnel, evidence of drug or alcohol use while working or

other offenses articulated in the Contract Documents. Subcontractor shall not receive any schedule or performance relief as a result of such dismissal(s).

Q. *Subcontractor hereby confirms that it has complied with the obligations under the Immigration Reform and Control Act (IRCA) and that the workers provided by it and any lower tier subcontractors in connection with the Work (the "Workers") are authorized for employment in the United States. Subcontractor further confirms that it has properly completed I-9's for all of its employees working on the Project and that it will require all lower tier subcontractors and suppliers in connection with the Work to confirm in writing that they have properly completed I-9's for all of their employees working on the Project. Subcontractor shall defend and indemnify Contractor in the event that any of the Workers on the Project are found not to be authorized to work under IRCA or any other applicable law or in the event that there is a determination that the obligations set forth under IRCA, including the obligation to prepare correctly and maintain I-9's for such Workers, have not been complied with, including but not limited to all direct and indirect damages, fines and penalties, punitive damages, attorneys' fees and costs.*

ARTICLE 2 – PAYMENT

A. Contractor shall pay Subcontractor as full payment for all Work and all other matters to be done, performed, furnished or provided by Subcontractor, the total price and sum of **WORDS - CENTS ($XX.XX)** (the "Subcontract Price"), payable in periodic progress payments as provided in this Subcontract and as follows: the Requisition amount (as defined in Article 2.B.) approved less that percentage of retainage withheld by Owner from Contractor, if any, or, at Contractor's election, five percent (5%) of Subcontractor's Requisition.

B. Subcontractor's applications for periodic progress payments, including final payment, hereinafter called "Requisitions," are to be submitted to Contractor or its designee in the manner, form and substance acceptable to Contractor. Each Requisition shall include the value, in accordance with the most recent schedule of values, of all Work performed or reasonably expected to be performed within the calendar month for which the Requisition is submitted. Each Requisition shall be supported by such data substantiating Subcontractor's right to payment as Contractor may require including, but not limited to, an affidavit certifying that all lower tier subcontractors and suppliers furnishing labor, materials, equipment or services to or through Subcontractor have been paid to the date covered by the most recent Requisition and lien waivers from lower tier subcontractors in form and substance acceptable to Contractor. A Requisition also must contain a certification from Subcontractor that it was made in good faith. All Requisitions shall be submitted to the Contractor's designated project manager (or his or her designee) on or before the 25th day of the month in which the Work is performed (the "Submission Date") or as otherwise dictated by the Subcontract. A Requisition shall be deemed submitted only upon actual receipt by Contractor and Subcontractor's compliance with all other requirements of this Subcontract. A Requisition may be rejected by Contractor if: (1) it is delivered after the Submission Date specified in this Article 2.B., in which case Subcontractor may submit it on the next month's Submission Date; (2) it is incomplete, inaccurate or Subcontractor fails to provide the required supporting data and documents; (3) it is not submitted to the person identified above; (4) it is not certified as made in good faith; or, (5) Subcontractor has not submitted a schedule of values in accordance with Article 1.K; (6) Subcontractor is greater than four (4) weeks overdue on certified payroll submission requirements. If the Submission Date falls on a Saturday, Sunday or legal holiday in the location of the Project, the Submission Date shall be the last business day prior to the Submission Date.

C. Contractor will pay Subcontractor within a reasonable time or as otherwise required by law or the Contract after Contractor receives payment from the Owner for the Work that is the subject of Subcontractor's Requisition. Contractor may withhold all or part of a payment if Contractor identifies performance issues or deficiencies with Subcontractor's Work and the estimated costs to remedy the performance issues or deficiencies exceed the unadvanced Subcontract balance.

D. Payment by the Owner to Contractor is a condition precedent to Contractor's or its surety's (ies') obligation to pay Subcontractor. To the fullest extent permitted by law, any surety for which Contractor is principal, shall have the protection of any and all defenses available to the Contractor, including, but not limited, to the pay-if-paid defense that no money is due Subcontractor from Contractor because the Owner has not paid Contractor, for any claims arising out of an amount Subcontractor claims is owed for labor, materials, services or equipment supplied by, to or through it for the Project. Subcontractor acknowledges that it is relying on the credit and ability of the Owner, and not that of Contractor, to pay for Work performed and accepts the risk that it will not be paid by Contractor for Work performed in the event Contractor is not paid by Owner for such Work.

E. Contractor may, in its sole discretion, make payment for any portion of Subcontractor's Work by joint check or by direct check to any lower tier subcontractor, supplier or benefit fund to which Subcontractor has an outstanding obligation associated with the Project. Any payments made by Contractor by joint check or direct check as provided in this Article 2.E. shall be deemed to have been made directly to Subcontractor.

F. No partial or final payment made, nor approval of the Work or any portion thereof, given for purposes of making a payment, shall be proof of performance of this Subcontract, nor shall it constitute an acceptance of any Work that is not in accordance with the Subcontract.

G. Subcontractor warrants and guarantees that title to all Work, materials, and equipment covered by a Requisition will be in Contractor on or before the receipt of such payment by Subcontractor, free and clear of all liens, claims, security interests, or encumbrances, hereinafter referred to as "Liens"; and that no Work, materials, or equipment covered by a Requisition will have been acquired by Subcontractor or by any other person performing the Work at the Project site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or Lien thereon is retained by the seller or otherwise imposed by Subcontractor or such other person.

H. Subcontractor shall pay all sales and use taxes due with respect to its Work hereunder and, if the Project is located in Massachusetts, shall comply with M.G.L. Chapters 64.H. § 30A and 64.I. § 31A to post such bonds as may be required by the Commonwealth of Massachusetts to assure payment of same in the event that Subcontractor is not a resident of Massachusetts. This project is a Massachusetts Sales Tax exempt project. Owner's Exempt Purchase Certificate, was provided with the Notice of Award.

I. Subcontractor shall, prior to and as a condition of receiving final payment, execute and deliver to Contractor a final release, of all claims of Subcontractor against Contractor, Contractor's surety, Owner and the Project, except for such claims as are specifically listed in the release as exceptions thereto and which have been previously asserted pursuant to the terms of this Subcontract. If requested by the Contractor, the Subcontractor shall provide final releases from suppliers and sub-tier contractors. The Subcontractor Final release form was provided with the Notice of Award.

ARTICLE 3 – TIME FOR PERFORMANCE OF THE WORK

A. Subcontractor shall not commence the Work until receipt of a written Notice of Award issued by Contractor. Immediately upon receipt of the Notice of Award, Subcontractor shall proceed with the Work promptly and diligently under the direction of Contractor in compliance with the Project schedules of Contractor. Contractor shall have the right, without additional cost to Contractor, from time to time, to modify the Project schedules and consequently the time for performance of Subcontractor's Work. Subcontractor shall comply with all Project schedules established by Contractor. The standard hours of operation are from 7:00am to 3:30pm, Monday through Friday, unless modified by Contractor or stated otherwise in the Prime Contract documents.

B. At Contractor's election, Subcontractor shall accelerate the construction schedule. In such event, Contractor will issue a written Notice to Accelerate to Subcontractor. Subcontractor shall be reimbursed only for overtime costs incurred and verified by time slips approved by Contractor, but only for the overtime premium above the standard rates. No overhead or profit shall be charged in addition to these overtime costs. Subcontractor is not entitled to acceleration costs resulting from Subcontractor's failure to maintain the schedules of Contractor. In such instances, Subcontractor will be liable to Contractor for any direct or consequential costs Contractor incurs including, but not limited to, additional supervision costs.

C. Subcontractor agrees that time is of the essence for compliance with each of its obligations under the Subcontract. By executing the Subcontract, Subcontractor confirms that the Project schedule is a reasonable period for performing the Work.

ARTICLE 4 – DELAY

Subcontractor shall have no claim for monetary damages for delay no matter how caused; except that for any delay or increase in the time required for performance of this Subcontract not due to the fault of Subcontractor, Subcontractor shall be entitled only to such extension of time for the performance of its Work as shall be allowed to Contractor by Owner, or as shall be allowed by Contractor. All claims for such extension of time shall be made in the manner and within the time required by the Contract Documents for like claims by Contractor to Owner.

ARTICLE 5 – PROSECUTION OF WORK, DEFAULT AND TERMINATION

A. Events of Default:
    a. The Contractor may declare the Subcontractor in default if the Subcontractor:
        i. Fails to perform the Work in accordance with the Subcontract Documents or applicable schedule;
        ii. Fails to supply adequate labor, supervision, materials, or equipment to maintain progress;
        iii. Fails to pay lower-tier subcontractors, suppliers, or laborers in a timely manner;
        iv. Fails to comply with applicable laws, regulations, or site safety requirements;
        v. Fails to correct defective or nonconforming work within a reasonable time after notice; or
        vi. Breaches any other material term of this Subcontract.

B. Notice and Cure Period:
    a. Upon occurrence of any Event of Default, the Contractor shall provide the Subcontractor with written notice specifying the default. The Subcontractor shall have 3 business days to cure the default to the satisfaction of the Contractor, unless otherwise agreed. If the default is cured, the Subcontractor must maintain the cure going forward;

otherwise, the Contractor shall have the right to re-instate the default and seek remedies and/or termination without having to provide any additional cure period time.

C. Failure to Cure Remedies
   a. If the Subcontractor fails to cure the default within the cure period, the Contractor may, by written notice, seek and enforce the following remedies, the cost of which shall be borne by the Subcontractor:
      i. Supplement or replace Subcontractor's workforce to address the failure or direct consequences thereof
      ii. Correct or replace defective work
      iii. Compensate other contractors for additional work, manpower or overtime as required to recover from the direct impacts of the default
      iv. Pay costs resulting as a direct consequence of the default
   b. The Contractor shall have the right to withhold payment to the Subcontractor in an amount equal to the estimate cost to complete the work including the estimated cost of the any default remedies completed, underway or reasonably anticipated.

D. Termination for Cause:
   a. If the Subcontractor fails to cure the default within the cure period, the Contractor may, by written notice, terminate the Subcontract in whole or in part. Upon termination for cause:
      i. The Contractor may take possession of all materials, equipment, and tools on site owned by the Subcontractor and reasonably necessary to complete the Work;
      ii. The Contractor may complete the Work by itself or by engaging others, and may use the Subcontractor's materials, equipment, or subcontractors to do so;
      iii. The Subcontractor shall not be entitled to any further payment until the Work is completed; and
      iv. If the cost to complete the Work, including administrative and legal costs, exceeds the unpaid balance to the Subcontractor, the Subcontractor shall be liable for the difference.

E. Remedies Not Exclusive:
   a. The rights and remedies in this clause are in addition to any other rights and remedies available at law, in equity, or under the Subcontract.

ARTICLE 6 – INSURANCE

Subcontractor shall purchase and maintain and shall require all of its lower tier subcontractors to purchase and maintain, insurance of the types of coverage and limits of liability, including Completed Operations coverage for the number of years specified. Coverages shall be with companies satisfactory to Contractor and authorized to issue policies in the state in which the Project is located, shall name Contractor, Owner and any other party designated by Contractor as an additional insured on a primary and non-contributory basis, and shall be maintained without interruption from the date of the commencement of Subcontractor's Work until the date of final payment and termination of any coverage required to be maintained after final payment. Certificates of Insurance in a form satisfactory to Contractor evidencing Subcontractor's coverage and that of all of its lower tier subcontractors shall be provided to Contractor prior to commencement of Subcontractor's Work. Upon request of Contractor at any time, Subcontractor shall provide copies

of the policy or policies evidencing Subcontractor's coverages. These Certificates and the insurance policies required by this Article shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to Contractor. If any of the forgoing insurance coverages are required to remain in force after final payment, an additional Certificate evidencing continuation of such coverage shall be submitted with the final Requisition. If any information concerning reduction or change of coverage is not furnished by the insurer, it shall be furnished by Subcontractor with reasonable promptness according to Subcontractor's information and belief. Information regarding insurance requirements can be found in Specification Section 007227.

ARTICLE 7 – BONDS

With regard to the provision of performance and payment bonds for this project by this subcontractor:

☐ Performance and payment bonds for this project are **REQUIRED.** The subcontractor shall provide such bonds in the full amount of the contract value stated in Article 2.A. The cost of such bonds is to be borne by the subcontractor and is included within the stated contract value.
☐ Performance and payment bonds for this project are **NOT REQUIRED.**
☐ The subcontractor has confirmed its ability to obtain performance and payment bonds for this project, but the cost of such bonds is not included in the contract value stated in Article 2.A. The subcontractor is being considered for inclusion in the project's Subcontractor Default Insurance (SDI) program. If the subcontractor is approved for SDI, no bonds shall be required. If the subcontractor is not approved for SDI, the contractor shall request the subcontractor provide performance and payment bonds for the project, and the contractor shall issue a change order for the cost of such in the amount of **WORDS - CENTS ($XX).**

If required above, Subcontractor shall purchase, maintain, and deliver to Contractor prior to the commencement of Subcontractor's Work performance, payment and (if applicable) mechanic's lien prevention bonds in the amount of the Subcontract Price with corporate sureties holding a certificate of authority as an acceptable surety of Federal Bonds as listed on Treasury Circular 570, must be authorized to transact business in the Commonwealth of Massachusetts and must be satisfactory to Contractor, conditioned on the faithful performance of this Subcontract in all its particulars and in such form and substance as is satisfactory to Contractor. The cost of all such bonds, if noted as required above, are included in the Subcontract Price. In the event, at any time during the performance of the Subcontract, the surety named on such bonds loses its authorization to write surety bonds in the state in which the Project is located, or is determined to be insolvent or not credit worthy by Contractor, Subcontractor, upon written request of Contractor, shall furnish additional performance, payment and mechanic's lien prevention bonds, at Subcontractor's expense, each in the full amount of the Subcontract Price. Each additional bond shall be in form and substance acceptable to Contractor and shall be written by a surety company acceptable to Contractor.

ARTICLE 8 – INDEMNITY

A. In addition to any other defense, indemnity or hold harmless obligation imposed on Subcontractor by the Subcontract or law, Subcontractor shall, to the fullest extent permitted by law, indemnify, defend and hold harmless the Contractor, Owner and any other party designated by Contractor (individually, an "Indemnitee" and collectively, the "Indemnitees") from and against any and all claims, damages, losses and expenses, including attorneys' fees, involving the following:

1. Any actual or alleged infringements of any patent, trademark, copyright or other intellectual property or proprietary right by Subcontractor, its lower tier subcontractors or the Work furnished by Subcontractor;
2. Injury or death to any person, or damage to or destruction of any property (including loss of use thereof), or any other damage or loss by whomsoever suffered resulting from or arising out of or in connection with the Work, whether or not any such damage or loss is due to the negligence of any kind or character or other fault of any one or more of the Indemnitees or breach of any statutory duty, contractual obligation or other obligation by one or more of the Indemnitees;
3. Any failure of the Subcontractor or the Work to comply with the requirements of the Subcontract;
4. Any lien, claim, security interest or other encumbrance made or filed against: (a) the Work, Project site and the Project including any and all interests and estates therein and any and all improvements and materials placed on the Project site by Subcontractor or its Sub-subcontractors; or, (b) any payment, performance, lien prevention, or lien discharge bond posted by any of the Indemnified Parties; and,
5. Any hazardous material or waste, toxic substance, pollution or contamination brought to or generated on the Project site by Subcontractor or its lower tier subcontractors, or used, handled, transported, stored, removed, remediated, disturbed or disposed of by Subcontractor or its lower tier subcontractors.
6. Any claims, damages, losses, or expenses arising directly from or related to the actual work performed by Subcontractor, including but not limited to errors, omissions, defects, or delays in the Subcontractor's performance of the Work, whether or not such claims are attributable to Subcontractor's negligence or breach of contract.

With regard to Subcontractor's obligations under A.2 or A.6 above, Subcontractor shall not be required to defend, indemnify and hold harmless any Indemnitee for claims, damages, losses and expenses for bodily injury, death or property damage resulting or arising out of that Indemnitee's sole negligence or intentional misconduct.

B. In claims against any person or entity indemnified under this Article by an employee of Subcontractor, Subcontractor's lower tier subcontractors or suppliers, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Article shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for Subcontractor or Subcontractor's lower tier subcontractors or suppliers under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 9 – CHANGES IN SUBCONTRACT PRICE

A. Subcontractor shall not be entitled to submit a request for an increase in the Subcontract Price ("REFIN") unless Subcontractor provides timely written notice of its claim as provided herein. Subcontractor shall provide written notice of any such claim to Contractor no later than seven (7) days after the occurrence giving rise to the claim or the claim shall be waived by Subcontractor. If the Contract Documents provide a shorter notice period, that shorter notice period shall govern. Timely notice of a claim is a condition precedent to submitting a REFIN. Subcontractor understands that no officer, employee or other representative of Contractor has authority to waive compliance with this provision.

B. A REFIN must be in writing, specify the amount of the requested increase in dollars, and contain all supporting data required by the Contract Documents and Contractor including, but not limited to: (1) the quantity and unit cost of each item of material included in the REFIN, (2) the number of hours of work and hourly rate for each class of labor included in the REFIN, and (3) a description

and amounts of all other costs included in the REFIN including but not limited to labor overhead costs, costs of machinery and equipment, costs of bonds and insurance, and general conditions costs. A REFIN also must contain a certification from Subcontractor that the REFIN was made in good faith. In addition to the foregoing, a REFIN shall be submitted to the Contractor's designated project manager via email or mail, with a copy to the Contractor's designated Project Executive or, if no such designation is made, to the Contractor's Chief Executive Officer. If the REFIN is submitted before the work included in the REFIN is performed, all costs shall be based on Subcontractor's good faith cost estimates. If the REFIN is submitted after the work included in the REFIN is completed, all costs shall be based on actual costs and records supporting those costs shall be submitted with the REFIN. A REFIN may be rejected if it is: (i) incomplete, inaccurate, or Subcontractor fails to provide the required supporting data and documents with the REFIN; (ii) not submitted to the persons identified above; or, (iii) not certified as made in good faith.

C. Subcontractor shall not be entitled to an increase in the Subcontract Price unless Subcontractor properly submits a REFIN and that REFIN is approved in writing prior to Subcontractor's commencement of the work that is the subject of the REFIN. Notwithstanding the foregoing sentence, Subcontractor shall be entitled to submit a REFIN despite the fact that it commenced the work that is the subject of the REFIN prior to submission or approval of a REFIN only under the following two circumstances: (1) Contractor has directed in writing that Subcontractor proceed with the work that is the subject of the REFIN; or (2) the circumstances requiring the work that is the subject of the REFIN constitute an "emergency" under the Contract Documents. In either of the above cases, the Subcontractor shall perform the work on a time and materials basis and shall comply with all notification, tracking and documentation requirements prescribed in the Contract Documents.

D. No REFIN shall contain any charge for supervision, tools, overhead, or profit other than a defined percentage of the cost of the extra work for overhead and profit, such percentage to be determined based on the terms of the Prime Contract. The percentage specified in this Article 9.D. shall apply to all work encompassed in the REFIN regardless of the number of contractors of whatever tier performing the work to, under or through Subcontractor.

E. Subcontractor shall be entitled to assert a claim for additional compensation (other than for claims prohibited by Article 4) from Contractor as a result of any act, omission, or direction of Owner, Architect, or any agent of Owner, only if and to the extent that the Contractor has a valid, enforceable, like claim against the Owner pursuant to the provisions of the Contract Documents. The Subcontractor agrees to become a party to and to be bound by any proceeding involving the Contractor, the Architect, or the Owner to the extent that such proceedings involve any of the rights or obligations of the Subcontractor under the Subcontract.

F. If Contractor and Subcontractor do not agree as to the appropriate adjustment to the Subcontract Price in connection with a REFIN, Contractor may issue a "directive" that directs Subcontractor to proceed with the extra work that is the subject of the REFIN and leaves the adjustment to the Subcontractor Price open. Subcontractor shall proceed with the extra work and provide Contractor the information and documents required under Article 9.B. to support its additional costs. When the extra work has been completed, Contractor shall determine the appropriate adjustment, or for claims resulting from the Owner or Architect, shall refer the matter to the Architect or Owner's representative to determine the appropriate adjustment to the Subcontract Price. Their decision shall be binding on Subcontractor unless Subcontractor notifies the Contractor in writing that it disputes the decision within the shorter of: (i) twenty-four (24) hours before the expiration of the time

allowed, if any, under the Contract Documents to contest the decision; or (ii) five (5) business days after Subcontractor's receipt of the decision. If Subcontractor properly disputes the decision, the matter shall be subject to dispute resolution under Article 10.

ARTICLE 10 – DISPUTE RESOLUTION

A. In the event of any dispute, controversy or claim (collectively a "dispute") between Contractor and Subcontractor, Subcontractor shall proceed with the Work or extra work without delay and without regard to such dispute or the pendency of any proceeding in relation to the same.

B. Any dispute between the Contractor and Subcontractor concerning the Project shall first be submitted to mediation for resolution. A party may commence mediation by serving a Request for Mediation on the other party. The mediation shall be held in Boston, Massachusetts, unless the parties agree to a different location. The Contractor and Subcontractor shall share equally in the cost of the mediator's fee and any filing fees. Submission of the matter to mediation shall be a condition precedent to arbitration, litigation or any other dispute resolution procedure.

C. Except as limited below, if the Contractor and Subcontractor do not resolve the dispute through mediation, the dispute shall be submitted to arbitration. Any such arbitration shall be conducted in the same manner and under the same procedure as provided in the Contract Documents with respect to claims between the Owner and the Contractor, except that a decision by the Architect shall not be a condition precedent to arbitration. If the Contract Documents do not provide for arbitration or fail to specify the manner and procedure for arbitration and provided the Contractor in its sole discretion elects to proceed to arbitration, Contractor and Subcontractor will agree on a single arbitrator to arbitrate the dispute. The arbitration shall be conducted in Boston, Massachusetts, in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association (the "AAA") then in effect, but the AAA will not administer the arbitration. The decision of the Arbitrator(s) shall be final and binding and shall be enforceable in any court of competent jurisdiction. Subcontractor consents to being joined in any arbitration proceeding or lawsuit between Owner and Contractor in which Contractor deems the presence of the Subcontractor to be appropriate in order to afford full and complete relief in the proceeding or action, whether or not arbitration or other litigation is then pending between the Contractor and Subcontractor, in which event any proceeding relating to the same claim shall be stayed pending a determination in the proceeding in which the Subcontractor is joined. This provision regarding arbitration shall be specifically enforceable in any court of competent jurisdiction.

D. The Contractor may, in its sole discretion, elect to waive the requirement for mediation, arbitration or both, and have the dispute, whether raised by Contractor or Subcontractor, resolved through litigation.

E. Contractor and Subcontractor waive their rights to a trial by jury.

ARTICLE 11 – WAIVER OF CONSEQUENTIAL DAMAGES

Subcontractor waives all rights to any claims for consequential, punitive or indirect damages that it may have against Contractor arising out of or concerning this Subcontract or in any way related to the Project.

ARTICLE 12 – WARRANTY

Subcontractor does hereby warrant and guarantee that the Work shall be performed in accordance with the Subcontract and shall be free of defects and Subcontractor shall repair or replace, without cost to Owner or to Contractor, any and all defects due to imperfect workmanship or materials, and shall pay for any damage resulting therefrom, which appear or are discovered either before or after acceptance of the Work and for which Contractor is obligated to repair or replace pursuant to the Contract Documents. Upon notice in writing from Contractor of the existence and nature of such defects or damage, Subcontractor shall proceed forthwith but in no event later than five (5) calendar days after notice, to cure, repair, restore or otherwise correct the Work, eliminating such defects and the damage, if any, resulting therefrom. The foregoing warranty is not in lieu of the terms of any other warranty of Subcontractor, express or implied, but is in addition thereto.

ARTICLE 13 – LABOR

Subcontractor shall perform all Work on this project with labor that will work harmoniously with other elements of labor involved in the Work. In the event that any labor dispute or difficulty is created by or results from the operations of Subcontractor in connection with the Work, thereby causing or resulting in any delay, interference with, or stoppage of any portion of the Work of the Contract Documents, or any other subcontractor, and such delay or interruption continues for two (2) days, Contractor may, at its option, terminate this Subcontract pursuant to the terms herein and shall have all of the rights and remedies provided in this Subcontract. Subcontractor shall not participate in or accede to any cessation of Work that may occur as a result of any labor dispute.

ARTICLE 14 – CONTRACTOR'S DAMAGES

A. Any damage, loss, cost or expense, including, without limitation, liquidated damages or reasonable attorneys' fees and costs, incurred by Contractor in connection with Subcontractor's breach of this Subcontract shall be paid by Subcontractor.

B. Any sum owed by Subcontractor to Contractor under any provision of this Subcontract or any other contract between Contractor and Subcontractor, may at the election of Contractor be deducted from any payment or payments otherwise due or becoming due to Subcontractor hereunder, or under any other contract between Subcontractor and Contractor.

ARTICLE 15 – LIENS AND OTHER LOWER TIER CLAIMS

Subcontractor shall cause prompt discharge or dissolution of any claims against Contractor, Contractor's surety, Owner, or the project site by way of lien, attachment or otherwise, which claims are asserted in consequence of rights claimed through Subcontractor.

ARTICLE 16 – SUBCONTRACTOR'S INSOLVENCY

Contractor may, without prejudice to any right or remedy, supplement Subcontractor's Work, terminate this Subcontract, or take any other action provided in this Subcontract or as otherwise

permitted by law if:

A. the Subcontractor is generally not paying its debts as they become due;
B. the Subcontractor becomes insolvent;
C. the Subcontractor consents to the appointment of a receiver, trustee, liquidator, custodian or the like of the Subcontractor or of all or any substantial portion of its assets;
D. a receiver, trustee, liquidator, custodian or the like is appointed with respect to Subcontractor or takes possession of all or any substantial portion of Subcontractor's assets and such appointment or possession is not terminated within sixty (60) days; or,
E. the Subcontractor makes an assignment for the benefit of its creditors.

ARTICLE 17 – ASSIGNMENT

Subcontractor shall not assign or sublet this Subcontract or any payment due hereunder or any part or the whole of the Work to be done hereunder, without the written consent of Contractor, which consent Contractor shall be under no obligation to give. Any attempt to do so by Subcontractor shall constitute a repudiation and a refusal of performance of this Subcontract by Subcontractor and grounds for termination for cause pursuant to this Subcontract. Contractor may assign this Subcontract at any time.

ARTICLE 18 – SAFETY

A. Subcontractor acknowledges that the safety of persons and property on and off the Project in connection with performance of the Work is of the utmost importance to Contractor and Owner. Subcontractor is responsible for the safety of its employees and the employees of any lower tier subcontractor or supplier performing any portion of Subcontractor's Work. Subcontractor shall cooperate with Contractor and Owner in efforts to prevent injuries to persons and property and comply with all applicable safety rules and regulations, to create and maintain an injury free environment. Subcontractor shall follow and abide by all project-wide safety programs established by Contractor or Owner. A copy of Subcontractor's safety program must be submitted for approval to Contractor prior to commencement of the Work. Subcontractor shall comply with all Subcontract requirements relating to safety and all applicable local, state and federal law including without limitation, the Occupational Safety and Health Act of 1970 and the so-called "Right to Know" law, as amended from time to time.

B. Subcontractor shall immediately report in writing to Contractor any injury to any Subcontractor or lower tier employee, or any property damage at the Project site in connection with Subcontractor's or one of its lower tier subcontractor's or supplier's activities.

C. Contractor assumes no liability for Subcontractor's noncompliance with any provisions of this Article 18 and, to the fullest extent permitted by law, Subcontractor shall defend and indemnify Contractor from and against any and all claims, damages, losses and expenses arising out of Subcontractor's failure to comply with the terms of this Article 18 or any other Subcontract requirements relating to safety, including but not limited to OSHA penalties or other monetary fines, delay resulting from Contractor's written notification to remedy unsafe practices, removal of Subcontractor, its employees or lower tier subcontractors, or termination of this Subcontract.

D. Before bringing to the Project any material listed on the Massachusetts Substance List or similar list of another state if the Project is being performed outside of Massachusetts, Subcontractor shall furnish Contractor with a copy of the required Material Safety Data Sheet for that substance.

ARTICLE 19 – PROTECTION OF THE WORK

Subcontractor will take all necessary precautions to protect properly the Work of others, including but not limited to, the work of other subcontractors, Contractor, and Owner, from damage caused by the performance of this Subcontract. Throughout the course of construction, Subcontractor, at its expense, shall be responsible for the protection of Subcontractor's Work, and Subcontractor, at its expense, shall take all necessary precautions to protect Subcontractor's Work from damage during construction operations.

ARTICLE 20 – THIRD PARTIES

Nothing contained in this Subcontract shall create any contractual relation between Subcontractor and the Owner nor shall it create any obligation on the part of the Owner to pay or see to the payment of any sums to Subcontractor or any lower tier subcontractor or supplier. Further, only Contractor and Subcontractor identified on page one of this Subcontract and in the signature blocks below shall have any rights hereunder. There are no intended third-party beneficiaries of this Subcontract except as identified in Article 6 “Insurance,” Article 8 “Indemnity” and Article 15 “Liens and Other Lower Tier Claims.”

ARTICLE 21 – DELIVERIES

All deliveries of materials to the Project are to be scheduled with Contractor a minimum of forty-eight (48) hours in advance. Deliveries are subject to approval or rejection by the Contractor based on other planned site activities. Subcontractor shall be responsible for unloading and safely storing all of its materials and equipment and shall coordinate unloading operations and storage locations with Contractor’s superintendent.

ARTICLE 22 – ATTENDANCE AT JOB MEETINGS

Upon Contractor’s request, Subcontractor will attend regularly scheduled Project meetings. Subcontractor’s representative at such meetings shall have the authority to accept notices described in this Subcontract and to render decisions on behalf of Subcontractor and bind Subcontractor by such decisions.

ARTICLE 23 – SUPERVISION AND OTHER COSTS

Subcontractor will be responsible for any and all costs incurred by Contractor for supervision and related costs to facilitate the completion of corrective work and punch list work. Subcontractor may, at Contractor’s election and sole discretion, be responsible for Contractor’s supervision costs for work Subcontractor elects to perform on off-hours and weekends.

ARTICLE 24 – DATE OF AGREEMENT

Subcontractor confirms that the Work performed by Subcontractor on the Project, prior to the date on which this Subcontract is fully executed, if any, is subject to the terms and conditions of this Subcontract and that all representations made by Subcontractor herein are retroactive to the date on which Subcontractor commenced Work on the Project.

ARTICLE 25 – TERMINATION FOR CONVENIENCE

A. Contractor may, at any time, terminate this Subcontract for Contractor's convenience and without cause. Upon receipt of written notice from Contractor of such termination for Contractor's convenience, Subcontractor shall: (1) cease operations as directed by Contractor in the notice; (2) take all actions necessary, or that Contractor may direct, for the protection and preservation of the Work; and (3) except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate the existing lower tier subcontracts and purchase orders as directed by Contractor and enter into no further subcontracts and purchase orders. In case of such termination for Contractor's convenience, Subcontractor shall only be entitled to receive payment for Work executed up through the effective date of the termination. Subcontractor is not entitled to overhead or profit on the Work not executed.

B. In the event that Contractor terminates Subcontractor for cause and an arbitrator(s) or Court subsequently holds that Contractor did not have the right to terminate Subcontractor for cause, the termination will be deemed a termination for convenience pursuant to Article 25.A and Subcontractor's rights to recover any damages for the termination will be limited as provided therein.

ARTICLE 26 – SEVERABILITY

Should any provision of this Subcontract be invalid as a matter of law, such invalidity shall affect only such provision and shall not invalidate or affect the remaining provisions of this Subcontract.

ARTICLE 27 – INTEGRATION

This Subcontract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, either written or oral.

ARTICLE 28 – HEADINGS

The Article headings in this Subcontract have been inserted for convenience or reference only and shall not in any manner affect the construction, meaning or effect of anything contained herein nor govern the rights and liabilities of the parties.

ARTICLE 29 - EXHIBITS

The following Exhibits are attached to and incorporated into this contract:

EXHIBIT 1 – XXX Scope of Work Sheet
EXHIBIT 2 – List of Contract Documents

IN WITNESS WHEREOF, the parties hereto have executed this agreement on the date first above

written.

XXX **(SUBCONTRACTOR)**	**W.T. RICH COMPANY, INC.** **(CONTRACTOR)**
By_____	
By:_____	
Printed Name:	Printed Name: Evan Moore
Title:	Title: Project Executive
Duly authorized	Duly authorized

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project information.

B. Work covered by Contract Documents.

C. Phased construction.

D. Project Schedule.

E. Contractor duties.

F. Owner-furnished, Contractor-installed products.

G. Access to site.

H. Protection of persons, work, and property.

I. Work restrictions.

J. Specification and Drawing conventions.

K. Provisions for electronic media.

1.2 RELATED REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Worcester South Division Fire Station Project
   1. Project Location: 25 MADISON ST WORCESTER, MA 01608.

B. Owner: CITY OF WORCESTER 455 MAIN ST, WORCESTER, MA 01608.

C. Architect Identification: The Contract Documents were prepared for the Project by Perkins&Will, 225 Franklin St, Boston, MA 02110; telephone 617-478-0300.

D. Architect’s Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
   1. Refer to the Drawing Title Page.

E. Construction Manager: _____.
   1. Construction Manager for this Project is Project's constructor. In Divisions 01 through 49 Sections, the terms "Construction Manager" and "Contractor" are synonymous.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. A new fire house facility located in Worcester, Massachusetts. The project Involves the construction of a new two (2) story facility for the South Division of the Worcester Fire Department and other Work indicated in the Contract Documents.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in _____ phases, with each phase substantially complete as indicated:
   1. See Preliminary Project Schedule.

B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates for all phases of the Work.

C. Secure individual permits and inspections for each separate portion of each building, as necessary to allow for completion of separate portions of the work, Certificate of Occupancy for that portion of the work, and Owner's occupancy and use of that portion of the work prior to Substantial Completion of the entire contract's work.
   1. Coordinate the construction schedule and the incremental sequence of completion with the Owner prior to obtaining permits.
   2. Execute Certificate of Substantial Completion for each designated portion of the Work prior to Owner occupancy. Allow access for Owner personnel and operation of HVAC, Plumbing, Electrical, and Communication Systems.

1.6 PRELIMINARY PROJECT SCHEDULE

A. The schedule milestones are presented solely to provide information to Offerors and is not and shall not become an official or contractual project schedule, unless incorporated by the selected Offeror and the City of Worcester into the contract.

B. The actual phases of the Project, including but not limited to: Potential early site enabling package, site/foundation/structural steel early work packages, construction, abatement, demolition, site work, etc. shall be established by the CM at Risk as part of their obligations under the Contract.
   1. Award Construction Manager at Risk: August, 19, 2025
   2. Begin Preconstruction Services: August 19, 2025
   3. Begin Phase 1 Early Site Enabling work: November 1, 2025
   4. Substantial Completion of Phase 1 February 1, 2026
   5. Begin Phase 2 construction of new fire station: March 3, 2026
   6. Substantial Completion for Phase 2 new fire station: April 9, 2027
   7. Final Completion of Phase 2, ready for Occupancy: June 1, 2027

1.7 CONTRACTOR DUTIES

A. VOC Compliance: Ensure that all assemblies, components, and systems comply with all VOC (Volatile Organic Components) requirements and regulations of the Environmental Protection Agency (EPA), Occupational Safety Health Administration (OSHA), State, County, City, and Local Air Control District.
   1. See Divisions 02 through 28 for Project VOC Restrictions.

B. Except as specifically noted, provide and pay for:
   1. Labor, materials, and equipment.
   2. Tools, construction equipment and machinery.
   3. Water, heat, and utilities required for construction.
   4. Other facilities and services necessary for proper execution and completion of work.

C. Secure and pay for, as necessary for proper execution and completion of Work, and as applicable at time of receipt of bids:
   1. Building Permit.
   2. Licenses.

D. Give required notices.

E. Comply with all applicable local Building Codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of Work.

F. Promptly submit written notice to Architect of observed variance of Contract Documents from requirements of authorities having jurisdiction. Assume responsibility for Work known to be contrary to code or regulatory requirements performed without such notice.

1.8 OWNER-FURNISHED, CONTRACTOR-INSTALLED PRODUCTS

A. Owner will furnish products indicated in Documents. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products:
   1. Toilet, bath and laundry accessories, See Section 10 28 00 “Toilet, Bath and Laundry Accessories.”
   2. Fire-fighting equipment and other equiment indicated.
   3. Reference Information included in Volume 3
      a. Fire-Fighting Equipment and other Emergency Response Equipment.

C. Owner Responsibilities: For Owner-furnished, Contractor-installed products, the Owner will:
   1. Arrange for Shop Drawings, Product Data, and Samples and deliver to the Contractor
   2. Arrange and pay for delivery of Owner-furnished items according to Contractor's construction schedule
   3. Inspect delivered items for damage.
   4. Arrange for replacement of Owner-furnished items that are damaged, defective, or missing when delivered to Contractor.

5. Arrange for manufacturer's field services for delivery of manufacturer's warranties to the Contractor.
6. Furnish the Contractor the earliest possible delivery date for Owner-furnished products.

D. Contractor Responsibilities: For Owner-furnished, Contractor-installed products, the Contractor shall:
1. Provide support systems to receive Owner's equipment as well as provide plumbing, HVAC, and electrical connections.
2. Be present for delivery and assist the Owner's inspection.
3. Use Owner-furnished delivery dates in Contractor's construction schedule
4. Review Shop Drawings, Product Data, Samples, and other submittals, and return to the Architect, noting discrepancies or anticipated problems regarding incorporation of the product.
5. Be responsible for receiving, unloading, handling, and storing Owner-furnished items at Project site.
6. Protect Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
7. Repair or replace items damaged because of Contractor's operations with new items matching originally specified items.
8. Install and incorporate Owner-furnished items into the work, in accordance with manufacturer's installation instructions, and make building utility services connections.

1.9 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section and by Owner's right to perform work or retain other contractors on portions of the project.
1. During construction, allow for Owner occupancy and public use of, and access to, existing facilities.
2. Make each entity engaged in work on the Project aware that the existing facilities house operating functions that must remain in operation during the construction period, except as the Owner may otherwise direct. Plumbing, heating, ventilating, electrical, fire alarm, and telephone systems are to be functional throughout the construction period with a minimum of interruptions in service. Do not block any required fire exits.
3. Confine operations at Project site to areas permitted by law, ordinances, permits, and Contract Documents.
4. Do not unreasonably encumber site with materials or equipment that hinders access.
5. Protect and keep safe products stored on premises.
6. Products and materials are to be stored to not interfere with operations of Owner or other contractors.
7. Obtain and pay for use of additional storage or work areas needed for operations.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limit use of site for work and storage as follows:

a. Do not use completed paved areas for storage without Owner's approval.
b. Do not store materials within drip-line of new or existing trees.
c. Restrict Work and storage to areas indicated on Drawings or approved by Owner.
d. Limit site access to locations approved by Owner.
e. Restrict parking to areas approved by Owner.
f. Do not perform operations that would interrupt or delay Owner's daily operations.

2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment onsite.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.10 PROTECTION OF PERSONS, WORK, AND PROPERTY

A. Contractor shall maintain adequate protection of the Work from damage and shall protect the Owner's and adjacent property from injury or loss arising from the Work.
1. Repair damage to existing buildings, property, and site caused by employees, subcontractors, or consultants.

B. Contractor shall provide and always maintain OSHA-required danger signs, guards, and obstructions necessary to protect the public and construction personnel from any dangers inherent with or created by the construction of the Work.
1. Comply with federal, state, and city rules and requirements pertaining to safety, and all EPA standards, OSHA standards, and NESHAP regulations pertaining to asbestos and other hazardous materials.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated.
1. Hours for Core Drilling and other noisy activities: Coordinate with Owner. Perform during hours when building is least occupied.
2. Obtain approval from Owner for work outside of these hours.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Owner not less than 72 hours in advance of proposed utility interruptions.
   2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Architect not less than two days in advance of proposed disruptive operations.
   2. Obtain Architect's written permission before proceeding with disruptive operations.

E. Nonsmoking Property: Smoking is not permitted within the building or on Owner’s property.

F. Restricted Substances: Use alcohol, tobacco products, vaping devices, and other controlled substances within existing building and on Project site is not permitted.

G. Employee Identification: Owner will provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
   1. Maintain list of approved screened personnel with Owner's representative.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

A. Specifications Format: The Specifications are organized into Divisions and Sections using CSI/CSC's "MasterFormat 2020" 50-Division numbering system.
   1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence, without all numbers included in the sequence. Consult the Table of Contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
   2. The order of articles, paragraphs, subparagraphs, and sub-subparagraphs within the text of any Specification section is defined by a sequence of indentations.
      a. Article, paragraph and subparagraph titles, and other identifications of subject matter in the Specifications, are intended as an aid in locating and recognizing various requirements in the beginning words of a sentence.
      b. Specification text shall govern over titling and shall be understood to be interpreted as a whole. Where a title establishes the subject, the titles are subordinate to and do not define, limit, or otherwise restrict the Specification text.
   3. The captions and headings of various subdivisions of the Contract Documents are intended only as a matter of reference and convenience for describing the Work and in no way define, prescribe, or limit the scope or intent of the Contract Documents or any subdivision thereof.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
    b. Contract Documents may omit modifying words such as "all" or "any," and articles such as "the" or "an." The absence of a modifier or article from one statement that appears in another is not intended to affect the interpretation of either statement.
3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
4. The Specifications do not:
    a. Establish trade jurisdictions or divisions of responsibility.
    b. Define subcontract scopes of work.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Work specified in any one Section is related to, and dependent upon, Work specified in other Sections, whether or not specific reference is made to the Work of other Sections. Cross-references in the Specifications are general references intended as a matter of convenience for aiding in the location general information and are not all-inclusive.

E. Names, telephone numbers, and website addresses and other contact information listed in the Contract Documents are for convenience only, are subject to change, and are believed to be accurate and up to date as of the printing of the Contract Documents.

F. Use of the word "including," when following any general statement, shall not be construed to limit such statement to specific items or matters listed, whether or not non-limiting language (such as "without limitation," "but not limited to," or other words of similar import) is used with reference thereto; but rather, shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement.

G. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.13 PROVISIONS FOR ELECTRONIC MEDIA

A. Digital Data Files: Electronic drawing/model files of the Contract Drawings will not be furnished by Architect for Contractor's use in preparing submittals unless procedures stated within Section 01 33 00 - Submittal Procedures are agreed to and Contractor executes the Agreement Form, and the Contractor properly prepares and submits the Submittals Schedule as indicated in Section 01 32 00 - Construction Progress Documentation

B. For the duration of this Project, it is the intent to distribute information in electronic format where allowable. Drawings, Specifications, Contract Document Modifications, memoranda, letters or other documents issued in the normal course of execution of the Work will be issued and distributed in electronic format (.pdf).
   1. Costs associated with printing and distribution of the project information shall be included in the Contract Sum.
   2. Printed documents will be provided and expected only for documents that are required to be in paper format by this Contract, Authorities Having Jurisdiction, or other statutory requirements.
      a. Drawings that require revision will be reissued for replacement as full-size sheets.
      b. Specifications that require revision will be reissued as complete replacement Specification Sections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 12 00

CONSTRUCTION MANAGER PROJECT SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS WHICH ARE HEREBY MADE A PART OF THIS Section of the Specifications.

B. For the purposes of this section, the term Subcontractor shall refer to all Trade Contractors and Non-Trade Contractors on the project.

1.2 DESCRIPTION OF WORK

A. This Section includes the following:
1. General Schedule Requirements
2. Phasing and Contract Dates
3. Milestone Schedule
4. Crew and Manpower Requirements
5. Critical Path Items
6. Lean Construction Requirements
7. Submittal and Lead Time Management
8. MEP 3D Coordination Requirements

1.3 GENERAL SCHEDULE REQUIREMENTS

A. The project has critical completion requirements. All Subcontractors must mobilize all necessary management and field resources upon Notice of Award to enable and ensure the timely commencement and completion of contract work per the project schedule.

B. The Construction Manager will develop and distribute a detailed construction project schedule. The schedule is a tool to facilitate the planning, communication and execution of the work. Adjustments to this schedule that do not fundamentally and substantially alter the scope or quantity of the work shall be accommodated by the Subcontractors without additional cost to the project.

C. All Subcontractors shall provide within 10 working days of Notice of Award, a list of activities required to complete their scope of work, durations for those activities and crew sizes for each activity. The durations of the activities are subject to change based on where they fall within the overall sequence of work and the CPM schedule.

D. The schedule will be subject to refinement and revision based on Subcontractor input.

E. Subcontractors shall provide their input within 5 working days of receipt of the project schedule from the Construction Manager. Failure to provide such input will constitute acceptance of the schedule on behalf of the Subcontractor. Input shall be defined as providing activities with durations and resources per area of the project.

F. The schedule will be manpower loaded. All Subcontractors shall provide within 10 working days of schedule receipt their estimate of their trade's work hours for each activity defined within the schedule that is to be performed under their contract.

1.4 PHASING AND CONTRACT DATES

A. NOTICE OF AWARD DATES: Project completion dates and milestone dates defined within this section are based on Notice of Award dates on or before the following dates:
   1. 100% Construction Documents:
      a. All Trade Contractors: **January 28, 2026**
      b. Priority non-Trade Contractors: **January 30, 2026**
      c. Balance of Contracts (Executed GMP): **May 2026**
      d. Note - Priority non- trade bidders Site, Concrete, and Structural Steel

B. PHASING: The following provides an outline of the major project phases:
   1. PHASE 1 – Site clearing and enabling, support of excavation, install retaining wall, underground temporary and permanent utilities, stormwater detention system
      a. Start: March 2026
      b. Substantial completion: June 2026
   2. PHASE 2 – Full construction – Foundations, superstructure, backup walls, slabs, roof, and envelope
      a. Start: April 2026
      b. Substantial completion: February 2027
   3. PHASE 3 – Rough-in, Finishes, and Testing
      a. Start: September 2026
      b. Substantial completion: June 2027
   4. Note: Substantial completion includes attaining temporary and final certificate of occupancy.
   5. Overall Project Substantial completion including attainment of Final Certificate of Occupancy is required by June 2027

C. Failure to meet any of the above phased substantial completion requirements shall result in liquidated damages being assessed against the responsible Subcontractor(s) in the amount of $2,500 per day.

1.5 MILESTONE DATES

A. The Construction Manager and all Subcontractors shall be responsible for the proper progression of the work to ensure the overall project schedule requirements are met. Critical milestone completion requirements have been defined in the table that follows.

Activity / Milestone (All items are COMPLETION milestones unless noted otherwise)	Required Completion Dates
PHASE 1 – Site clearing and enabling, support of excavation, install retaining wall, underground temporary and permanent utilities, stormwater detention system	
Site Setup: erosion controls, fencing, entrances, dense grade	3/22/2026
Site Clearing, Soil Removal, Site Demo and Bulk Excavation at Building Foundations	4/20/2026
Support of Excavation	5/4/2026
Install Retaining Wall	5/4/2026
Water Service	5/11/2026
Storm Drainage	5/11/2026
Sanitary/Sewer	5/21/2026
Electrical UG Service Ductbanks	6/11/2026
Storm Detention/Inflitration Systems	6/12/2026
Electrical Pads - Ready for Utilty Equip. / Permanent Power	6/25/2026
PROJECT SUBSTANTIAL COMPLETION PHASE 1 and Temp C of O	6/25/2026
Phase 2 - Full Construction Superstructure, Exterior Backup Walls and Slabs	
Prep for Foundations	5/11/2026
Place Footings and foundation walls	6/8/2026
Elevator Pits/Foundation Waterproofing	6/15/2026
Cure and Backfill	6/15/2026
CMU Bearing Walls	7/20/2026
Construct Masonry Training Tower, Stair, Elevator Shaft	8/10/2026
Structural Steel and Detailing	8/30/2026
4x Wood Roof Decking	9/27/2026
Pour Slab on Deck	9/13/2026
Exterior Wall Framing and Sheathing (Bunks and Entry)	9/27/2026
U/G MEP's	10/4/2026
Pour SOG	10/18/2026
Roofing Substrate, Vapor Retarder and Rigid Insulation	10/25/2026
Roofing Membrane and detailing	11/22/2026
Envelope – Vapor Barrier	10/25/2026
Envelope Rigid Insulation/Brick Veneer	1/3/2027
Envelope – Curtain Wall and Store Fronts	2/28/2027
PHASE 3 – Rough-in, Finishes, and Testing	

Rough-in: Level 2	11/29/2026
Rough-in: Level 1 – Offices/Admin/Bunks	12/13/2026
Rough-in: Level 1 – Apparatus Bay	12/27/2026
Finishes: Level 2	3/14/2027
Finishes: Level 1 – Offices/Admin/Bunks	3/28/2027
Finishes: Level 1 – Apparatus Bay	4/11/2027
WTC, Cleaning, & Punchlist: Level 2	4/4/2027
WTC, Cleaning, & Punchlist: Level 1 – Offices/Admin/Bunks	4/18/2027
WTC, Cleaning, & Punchlist: Level 1 Apparatus Bay	5/2/2027
Testing, Inspections, and Sign Offs: TAB	5/2/2027
Testing, Inspections, and Sign Offs: Fire Alarm	5/9/2027
Testing, Inspections, and Sign Offs: AHJ Inspections & Sign-off	6/6/2027
Substantial Completion:	6/20/2027

B. The milestone dates listed in this section are intended to convey the overall work flow and timing of the project. All supporting and related work required to achieve the milestones and the overall schedule should be inferred and are to be completed at the soonest possible opportunity. It is the responsibility of each and every Subcontractor to review the milestone requirements listed below, and properly plan and perform their work such that all critical, supporting and ancillary activities are performed to achieve the milestone completion dates defined within this section. It shall be the Subcontractors responsibility to provide proper resourcing for these requirements to achieve the milestone completion requirements.

C. This project requires all systems to be Fully Functional Fully Tested (FFFT). This will require the rooms listed below to be 100% completed out of sequence with the rest of the construction schedule. All framing, drywall, joint compound, paint, doors, frames, hardware, ceilings, fire protection, mechanical, ATC, fire alarm, power, and data access must be 100% complete to allow for permanent power, building network, permanent mechanical, ATC systems, fire alarm, security, and audio visual to be completely functional and tested before being tested by the building commissioning agent.

1. Compressor Room 103
2. Main Electric 111
3. Emergency Electric 112
4. Water Service 114
5. Elevator Machine Room 119E

6. Electric Closer 121.2
7. Server 217
8. Electrical 222A

D. Fully Functional Fully Tested (FFFT) is defined as follows:

1. Fully functional is a system or piece of equipment being installed and 100% programmed and fully functional per the latest project specifications Contract Documents, sequences, and plans. All life safety, electrical, and fire protection systems certified and validated through simulated emergency scenarios. Testing and balancing are complete, with all reports issued approved. All owner-supplied equipment has been installed and integrated. Operational dependencies like network access, licensing, and third-party systems are fully resolved. The installing contractor has signed the System Readiness Affidavit certifying this equipment is ready for testing.
2. Fully tested is when a system or piece of equipment has been tested with WT Rich and the installing contractor present and proven to be fully functional per the latest project sequence of operations and specifications Contract Documents. The system is free of operational or installation issues. The installing contractor has signed the System Readiness Affidavit certifying this equipment has been tested and ready for final commissioning. All building systems have been fully installed, integrated, and tested. Mechanical, electrical, plumbing (MEP), and low-voltage systems are complete with no outstanding issues. Systems such as HVAC, BMS, fire alarm, lighting, and IT infrastructure operate as a cohesive, centralized unit.

E. If a milestone completion date requirement is not met due to the performance failure or shortcoming of one or more Subcontractors, then each such Subcontractor shall be liable for schedule recovery costs which may include costs associated with extended work hours, weekend work, off-shift work, supplemental work force or other costs or damages incurred by the Construction Manager or other subcontractors as a result of the missed deadline. In addition to these milestone delay costs, liquidated damages may also be assessed if such performance issues cause a delay to phase substantial completion or final completion deadlines.

F. Milestone dates are subject to adjustment at the discretion of the Construction Manager. Adjustments to the milestone schedule that do not fundamentally and substantially alter the scope or quantity of the work shall be accommodated by the Subcontractors without additional cost to the project.

G. The milestone schedule is not intended to restrict work that can and should proceed in areas outside of what is shown on the milestone schedule. It is anticipated that selective work of certain trades will proceed on floors at times outside of what is listed, provided that the work is properly coordinated and sequenced with the work of other trades and the overall construction schedule. Such work might include, for example, construction of plumbing cores for bathrooms, mechanical rooms, electrical rooms, elevator work, vertical chases, stair work, roof work, exterior work, etc.

H. Achievement of project milestones is essential. If the actual work progress enables work to proceed in advance of the requirements listed, Subcontractors shall mobilize and perform the work ahead of schedule, provided proper notification of the revised work requirement has been communicated by the Construction Manager to the Subcontractor. **One week advance notice shall be considered proper notification for the advancement of such work requirements**.

I. As part of their responsibilities to fulfill the milestone completion requirements, Subcontractors must properly plan and account for coordination time, submittal preparation, review and approval time, material and equipment lead time, and the sequence and duration of other trades' work.

J. Contractors shall provide sufficient manpower and/or extended work shifts, off-shift work (second shift and/or third shift), and weekend work (Saturdays and/or Sundays) as necessary to meet the requirements of the schedule. The cost of premium time to accommodate these requirements shall be borne by the subcontractor. The Construction Manager shall provide supervisory coverage for extended work days (7 am to 5:30 pm, Monday to Friday) and all Saturdays as necessary for the duration of the project throughout the project and without additional cost to the subcontractors. Construction Manager supervisory coverage for any additional coverage requirements will be borne by the contractors requiring additional shift or day coverage. CM supervisory time for Saturdays or extended hours or weekend specifically required due to insufficient contractor weekday manpower or contractor rework will be responsibility of the relevant contractor.

1.6 LEAN CONSTRUCTION REQUIREMENTS

A. The Construction Manager will be utilizing LEAN Construction practices including the Last Planner System (LPS). All Contractors, including sub-tier contractors will be required to participate.

B. All Contractors will be required to:
   1. Have project manager AND onsite supervisor/foreman attend the equivalent of a full day training.
   2. Have project manager AND onsite supervisor/foreman participate in multiple two- to four-hour Pull Planning sessions.
   3. Have project manager and/or onsite supervisor/foreman update and execute tasks within a Constraint Log.
   4. Have onsite supervisor/foreman prepare and contribute to Weekly Work Plan Form each week.
   5. Have onsite supervisor/foreman participate in Weekly Work Planning and Daily Huddle meetings.

C. Additional Lean Practices may include:
   1. Zero Punch List policy
   2. "Nothing Touches the Ground" policy

D. The Construction Manager will provide training, coaching and host the required meetings. Contractors are required to actively participate when any portion of their work is being discussed. Failure to participate may result in removal from the project.

E. Refer to the Contract Manager's "Lean Construction Plan" for additional information, which is attached to and forms a part of this specification section.

1.7 CREW AND MANPOWER REQUIREMENTS

A. The fast-track nature of the project will necessitate multiple crews working in different areas in parallel with one another.

B. At a minimum, all Subcontractors must provide a sufficient number of workers, organized and managed into effective work crews, so that work shall progress independently, simultaneously and expeditiously in each of the major work areas. This means that progress in one of these areas must not be deterred or delayed because a Subcontractor is waiting for workers to complete work in another area. Each work area must be provided with sufficient staff aligned to the available work level in that area. In addition, Subcontractors shall provide a sufficient number of foremen and supervisors to allow for proper management, control, direction and oversight of the work in each of these areas.

C. Subcontractors to include all required labor, crew sizes, possible premium time, etc. that is appropriate to meet durations and milestones as indicated in the project schedule. CM may elect to utilize premium time to **accelerate** schedule.

1.8 CRITICAL PATH ITEMS

A. All supply and sub-tier contracts for critical path items must be finalized within 7 working days of Notice of Award.

B. Below is a list of critical path and high priority work items. This is not intended to be a comprehensive list of critical items, but rather a preliminary list for reference purposes. Great urgency must be placed on the expedited procurement, submission, and approval of the listed items and any other items deemed critical to meet the milestone schedule.
   1. Foundation systems
   2. Ground improvement system
   3. Approved fill materials for site grading
   4. Underslab plumbing
   5. Utilities (Primary Power, Water Service, Transformers & Switchgear)
   6. Structural steel
   7. Masonry veneer
   8. Metal stairs and handrails
   9. Roofing
   10. Hollow metal frames
   11. Curtainwall and storefront
   12. Interior Finishes (Long Lead items - Millwork, Casework, wall/ceiling/floor finishes)
   13. Elevators
   14. Fire Suppression
      a. Hydraulic calculations and engineered shop drawings
      b. Materials and equipment

c. Coordination - MEP Rough-in Work (all relevant materials, equipment and coordination must be expedited to meet the milestone schedule defined in paragraph 1.9).

15. Plumbing
    a. Materials and equipment
    b. Coordination, including Under Slab and Chase Piping (Coordination - MEP Rough- in Work - all relevant materials, equipment and coordination must be expedited to meet the milestone schedule defined in paragraph 1.9).
16. HVAC
    a. Piping, Insulation and accessories
    b. Exhaust Fans and Roof Intake Hoods
    c. Ductwork With Insulation, Diffusers, Registers And Grilles
    d. Terminal Heating Units
    e. Pumps and Accessories
    f. High Efficiency Condensing Boilers
    g. Air Cooled Liquid Chiller
    h. Rooftop HVAC Units
    i. Ductless Cooling Unit Systems
    j. Direct Digital Automatic Temperature Controls
    k. Testing Adjusting and Balancing
    l. Coordination - MEP Rough-in Work (all relevant materials, equipment and coordination must be expedited to meet the milestone schedule defined in paragraph 1.9).
17. Electrical
    a. Switch Gear (and Gear Package in general)
    b. Fire Alarm
    c. Lighting
    d. Security and Access Control
    e. Sound, Public Address, Master Clock and Intercom
    f. Technology
    g. Teledata
    h. Audiovisual Systems
    i. Coordination - MEP Rough-in Work (all relevant materials, equipment and coordination must be expedited to meet the milestone schedule defined in paragraph 1.9).

1.9 SUBMITTAL AND LEAD TIME MANAGEMENT

A. It is each Subcontractor's responsibility to understand the lead time associated with their scope of work and to plan, manage and execute their procurement and submittal responsibilities to assure that material and equipment will be on site as needed to meet the milestone schedule.
    1. At a minimum, meet the submittal requirements defined in Section 007225 CM Supplemental Conditions.
    2. If submittals and shop drawings need to be expedited in advance of these requirements, the Subcontractor shall expedite their responsibilities accordingly.
    3. Critical submittals and pertinent delivery schedules will be reviewed in depth with the Construction Manager and each Subcontractor immediately following

the Notice of Award. Refer to section 1.7 for the minimum list of items that will require great urgency and expediting to ensure the schedule is achieved.

4. This subcontractor is to provide a list of contractually owned materials and equipment with lead times from the manufacturer within 10 days of contract award.

B. Provide compliant submittals and shop drawings. Subcontractors shall bear the responsibility for any delays encountered due to submittals that must be revised and re-submitted.

C. Notify the Construction Manager within 7 days of award of any substitutions for which the Subcontractor intends to seek approval. Subcontractors shall bear the full responsibility for any delays incurred as a result of substitutions submitted without the proper supporting documentation or that do not meet the "or equal" requirement.

D. If material lead time expedite fees are available and required to meet the milestone schedule, the Subcontractor shall bear the cost of such fees.

E. If any combination of manufacturer lead time or shop drawing preparation time threaten the on- time achievement of the project milestones, the Subcontractor shall notify the Construction Manager in writing within five working days of Notice of Award.

1.10 MEP 3D COORDINATION SCHEDULE REQUIREMENTS

A. Proper and timely coordination of MEP work will be essential to the successful achievement of the project milestone schedule.

B. The project will use BIM-based 3D coordination. Refer to Section 007225 - CONSTRUCTION MANAGER SUPPLEMENTAL CONDITIONS, Section 013111 - 3D COORDINATION REQUIREMENTS / BIM EXECUTION and individual MEP Trade Contract and Subcontractor Sections for the defined process and responsibilities associated with the 3D MEP Coordination process.

C. An overview of the BIM Coordination Schedule is as follows:

Coordination Activity	Completion Dead-line
Underslab	4/27/2026
1st Floor	6/8/2026
2nd Floor	7/6/2026

D. The following Subcontractors shall provide, AT A MINIMUM, a full-time, dedicated MEP coordination resource from the start of the coordination process through the time that all coordination models have been completed, finalized and signed-off:

1. Fire Protection
2. Plumbing
3. HVAC
4. Electrical

E. The coordination resource must be experienced in 3D modeling. Subcontractors shall provide additional MEP coordination resources, beyond the full-time dedicated person identified above, if required to meet the schedule.

F. The above dates are for final sign-off of the model for the area indicated. Failure to meet any of the above dates for final and completed coordination models will result in liquidated damages in the amount of **$250 per day** being assessed against each and every Subcontractor that failed to meet their obligations in developing these models.

PART 2 - PRODUCTS

[NOT USED]

PART 3 - EXECUTION

[NOT USED]

END OF SECTION

Lean Construction Plan

A - LEAN CONSTRUCTION PHILOSOPHY & EXPECTATIONS

Lean Construction is a philosophy of designing production systems in a construction environment with the aim of decreasing time, effort, and waste. It essentially changes the relation between the Construction Manager and the contractors, as well as the relationship between the various contractors. Its goal is to create a consistent, predictable workflow that maximizes value and minimizes costs by reducing variation in design, procurement, and operations to benefit the owner, the Construction Manager and all contractors.

This project will be implementing Lean Construction methodologies, including but not limited to the Last Planner System (LPS). LPS is a tool to assist teams create a coordinated and reliable plan that achieves workflow. It is expected that all contractors will use these methodologies in the planning and execution of their respective scope of work, including full participation in all phases of the Last Planner System.

B - PULL PLANNING

1. All contractors are required to make and keep commitments based on their confidence that prerequisite work, design information, materials, labor, and equipment will be ready so that they can start and complete installations to meet project milestones. The contractors' Superintendent/Foreman is required to participate with all other contractors in pull planning each major phase of work on the project in which they will be involved.

2. Each pull plan will work towards creating the detailed expansion of the milestone schedule included in the Bid Documents. The milestone schedule is a guide for the intended phasing and flow throughout the project. It is not intended to provide dates or durations for any activity. Dates, durations, and all sequencing will be created through pull planning sessions throughout the life of the project. Do not assume sequencing or handoffs prior to any pull planning session other than those specifically defined within the Bid Documents. Final sequencing and handoffs at all pull planning sessions will be agreed upon by the entire project team to support the best interest of the project.

3. The durations and sequencing agreed upon in the pull planning sessions will be contractual obligations. At each pull planning session, the Superintendent/Foreman from each contractor will structure the flow of work and outline the network of commitments by identifying the handoffs between related trades. Each Superintendent/Foreman has the responsibility to plan their work six weeks ahead in a lookahead schedule and to identify crew assignments for the current and subsequent week in a weekly workplan. They are required to commit to performing work that they know can be made ready for their crews and to refuse to assign work that they are not confident can be started due to not being ready.

C - 5S STANDARDS

W.T. Rich staff and Contractors shall adhere to the 5S standards:

1. **Sort:** Identify needed materials from clutter and waste. Remove all materials that do not belong on the project.

2. **Set-in-Order:** Arrange the needed materials in an effective manner to maximize productivity, provide minimal range or motion, and ensure ease of use.

3. **Shine:** Clean work area, tools, and equipment daily, thereby making potential hazards more identifiable.

4. **Standardize:** Formalize standards and procedures for work performed in A through C above.

5. **Sustain:** Ensure that the project continues to improve its 5S processes by conducting safety and quality inspections.

D – SCHEDULING PROCEDURES

1. Each Superintendent/Foreman for each contractor shall have the most current information about the status of contract issues, submittals, shop drawings, material and equipment deliveries, design changes, change orders, safety, and labor availability.

2. Each Superintendent/Foreman has the ability to plan work for their respective company and the authority from their companies to make commitments to the project in order to execute this plan.

3. Each Superintendent/Foreman will participate in the pull planning sessions for each phase in which their company is involved.

4. Each Superintendent/Foreman will bring their lookahead schedule and weekly work plan to the weekly planning meeting and actively participate in coordinating work with other contractors under the direction of the project team.

5. Each Superintendent/Foreman will identify constraints to work within their lookahead schedule, take actions to remove identified constraints, and make requests of others to remove identified constraints.

6. Each Superintendent/Foreman will report task completions as they occur to the project team as well as subsequent contractors.

7. Each Superintendent/Foreman will track tasks completed as planned and report the results along with explanations of shortfalls and limiting factors in the weekly planning meeting. The total completed tasks will be measured weekly by a Percent Plan Complete (PPC) matrix.
8. Each Superintendent/Foreman will participate in contractor coordination sessions to coordinate work for the upcoming weeks.

9. Each Superintendent/Foreman will participate in a daily huddle to discuss the progress of the that day's commitments and methods for mitigating shortfalls and limiting factors.

10. Roles and Responsibilities:

    A. W.T. Rich will facilitate and administer all scheduling sessions, providing directions and coordination of the activities of the contractors, approving work plans, and updating/maintaining/distributing all requisite forms to all contractors.

    B. Contractors shall include in their bid the necessary resources to implement these procedures and participate and all facets therein for the duration of the project.

    C. By submitting a proposal for this project, contractors are committing to this process and shall allot the necessary time/effort to plan the work and make themselves available for all planning sessions.

11. Contractors shall document the process and provide weekly copies of work plans to W.T. Rich.

12. W.T. Rich will document the process and publish the following reports:

    A. Weekly reports on Percent Plan Complete (PPC) for the overall project.

    B. Monthly reports on Percent Plan Complete (PPC) for the overall project. This report will also track the performance of tasks assigned to W.T. Rich, the Design Team, and the Owner.

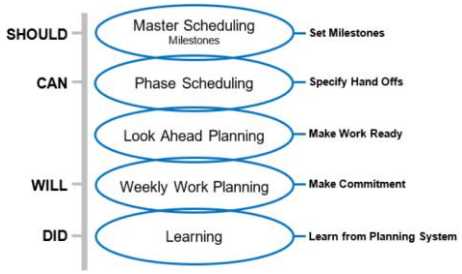
    C. Quarterly variance reports that illustrate unacceptable variances and recommend steps to reduce future variances.

E – SCHEDULING APPROACH

A five-step lean collaborative scheduling approach will be implemented on this project. All contractors shall participate in the process.

1. **Phase Planning:** All contractors shall attend multiple pull planning sessions for a collaborative approach to specify handoffs, project sequence, activity durations, pacing, manpower commitments, coordination, and work flow.

2. **Make Ready Planning:** At the weekly contractor meetings, contractors shall identify constraints, update procurement status, and confirm previous and future commitments. The "Make Ready Schedule" is a six-week forecast of upcoming activities to properly plan and coordinate labor, material, and equipment. Contractors will submit their six-week lookahead schedules in order to coordinate their work plan at the contractor meeting.



3. **Weekly Planning:** At the weekly contractor meetings, the handoffs and sequence agreed upon in the pull planning sessions will be detailed into daily commitments for the upcoming week.

4. **Measurement:** At the weekly contractor meetings, the Percent Plan Complete (PPC) will be measured for the previous weekly work plan, and any variations therein will be discussed to

mitigate future variations.

5. **Daily Planning and Commitment:** Daily huddles are required for all Superintendents/Foremen on the jobsite. These huddles will confirm that the daily tasks were completed or develop an alternate plan for the next day.

F – ADDITIONAL PROCEDURES

1. **BIM Coordination:** All major contractors will be required to participate in BIM coordination sessions to be facilitated by W.T. Rich. Refer to the Bid Documents for specific BIM coordination requirements.

2. **Prefabrication:** Contractors are encouraged to prefabricate assemblies and systems when it benefits the overall project. Benefits and impacts of prefabrication should be discussed at the various planning sessions.

3. **Just-in-Time Deliveries:** Whenever possible, contractors should limit materials to batch sizes to complete a specific task or commitment on a weekly basis. Opportunities for just-in-time deliveries should be discussed at the various planning sessions.

4. **Zero Punchlist Goal:** This concept minimizes rework and flow disruption by ensuring that quality control inspections are performed as the work progresses. Construction defects are addressed when discovered and work is 100% complete before moving to the next area, resulting in fewer activities on the final punch list.

SECTION 01 13 00

DELEGATED DESIGN REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for assemblies and construction systems provided by the Contractor as delegated design.

1.2 DEFINITIONS

A. Delegated: Delegated by the Owner and Architect to the Contractor.

B. Design: Planning, coordination, and graphic and written communication of a portion of the Work, including determination and engineering of system or assembly or system organization and structure, in response to functional requirements, arrangement and performance criteria indicated in the Contract Documents.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Portions of the Contract Documents delegate the design of certain components, assemblies or systems to the Contractor, or may otherwise specify "delegated design requirements" in individual specification Sections.

B. Contractor is to be responsible for delegated design Work, including design, engineering and performance.

C. Drawings of delegated design portions of Work are diagrammatic and are intended only to show:
   1. Design intent of finished materials, profiles, shapes and forms.
   2. Relationships between elements.
   3. Location, identification, dimension and size of components, assemblies and accessories.
   4. Schematic attachment details and diagrams of fasteners and connections.

D. Specifications for delegated design portions of the Work establish performance criteria for materials, products, systems, and methods of execution, along with minimum performance requirements for indicated portions of the Work.

E. Architect will review informational submittals specified herein to determine whether or not the delegated component, assembly or system design complies with the following:
   1. Contractor's engineering shows substantiation of the specified performance criteria.
   2. Conforms to specified performance requirements, including those subsequent modifications.

3. Complies with the overall project design.
4. Can be appropriately integrated into the overall design of the project.
5. Review by the Architect does not relieve the Contractor from compliance with the requirements of the delegated component.

F. In the event of conflicts regarding the Contractor's proposed delegated design solutions and the design intent of the Contract Documents, the decision of the Architect will be final.

1.4 PROCEDURAL REQUIREMENTS

A. Design Requirements: Proposed delegated design solutions are to demonstrate compliance with the original design intent of the Contract Documents, as determined by the Architect.
1. Unless otherwise defined by the Contract Documents, appearance of exposed elements, including member sizes, profiles and alignment of components, are to be within dimensional limits of section profiles indicated on the Drawings, and are to be consistent throughout the Project. Do not deviate from profiles, layouts or arrangements indicated without prior written approval from the Architect.
2. Proposed delegated design solutions that exactly follow details indicated on the Drawings do not relieve Contractor of responsibility for design and performance of delegated design portions of Work.

B. Engineering Requirements: Engineer delegated design portions of the Work to meet or exceed specified performance requirements, to satisfy the requirements of the authorities having jurisdiction, and to provide structurally sound, water and weathertight assemblies capable of withstanding the specified in-service loads without failure.

C. Additional Requirements:
1. Fabricate, assemble and install delegated design portions of the Work to accommodate the full range of manufacturing, operating and field installation tolerances of adjacent work specified in other Sections.
2. If required by the authorities having jurisdiction, submit shop drawings, specifications, calculations and other supporting data necessary for obtaining jurisdiction approval after they have been reviewed by the Architect and prior to beginning installation. Pay fees incurred.

1.5 INFORMATIONAL SUBMITTALS

A. General: Coordinate and process submittals for delegated design portion of Work in same manner as for other portions of Work.

B. Design Data:
1. Submit engineering calculations demonstrating compliance with the requirements of Contract Documents and of the authorities having jurisdiction.
a. Provide calculations legible and that incorporate sufficient cross-references to shop drawings to make calculations readily understandable and reviewable.
b. Test reports are not acceptable as a substitute for calculations.

2. Structural Calculations: Include the following:
   a. Analysis of framing members.
   b. Section property computations for framing members.
   c. Analysis of anchors, including anchors embedded in concrete
   d. Signature and seal of the qualified Engineer responsible for their preparation.

C. Furnish appropriate certification from licensed fabricator shop or complete detailed inspection reports signed by each inspector performing unlicensed shop inspection to the Architect before the Work affected by these inspections is delivered to the site.

1.6 QUALITY ASSURANCE

A. Engineer Qualifications: Unless stated otherwise in other sections, provide the following:
   1. Professional Engineer legally licensed and qualified to practice in the State of Massachusetts and experienced in and having a minimum of 10 consecutive years providing the type of engineering services indicated in the Contract Documents.
   2. Engineering services are defined as those performed for the design, fabrication and installation of components and assemblies similar in material, design, complexity and extent to those indicated in the Contract Documents for this Project.

B. Fabricator/Installer Qualifications: Firm with a minimum of 10 consecutive years' experience in the design, testing, fabrication, assembly, installation and coordination of specified components, assemblies, and systems on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance. Submit evidence demonstrating the following:
   1. Ability to coordinate and work with a qualified testing agency for testing exterior building envelope assemblies utilizing the recognized test standards of the industry on projects similar in material, design, complexity and extent of this Project.
   2. Experience in managing, scheduling, coordinating, and maintaining on-time performance in conjunction with the successful projects and for the proposed project.
   3. An in-place, comprehensive quality assurance and quality control program and procedures that demonstrates how it is being applied on the project. Describe and demonstrate how the proposed comprehensive quality assurance and quality control program has been successful on other projects.
   4. Current resources, including currently employed personnel, to produce the Work to the specified requirements.
   5. Ability to produce proposal drawings, accommodate plant visits, and mockups, organization plans, project management plans and proposed schedules in conjunction with the bidding for this Project.
   6. Ability to warranty curtain wall systems for 5 years and the curtain wall finishes for 20 years.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide products, materials, components and accessories required for a complete installation and operation in the proposed design, whether or not such items are indicated in the Contract Documents.

B. Provide anchors, attachments, hardware, inserts, fasteners, clips, bracing, framework, and similar items as required to meet specified design and performance requirements, and to anchor delegated design Work to adjacent supports, or to related adjoining work, whether or not such items are indicated in the Contract Documents.

PART 3 EXECUTION

3.1 DESIGN

A. Unless otherwise indicated or specified, maintain design intent and specified performance requirements of the Contract Documents.
   1. If certain fabrication or erection methods, minor dimensional changes and detailing adjustments to the original design in the Contract Documents are required, indicate such on submitted Shop Drawings.
   2. Prior to shop drawing submittal, obtain written approval from the Architect for proposed changes and adjustments.

B. Engage a qualified Engineer to design connection details and determine fastener types and sizes.
   1. Fasteners or connections are not to conflict with or require revision to the design profiles indicated on the Drawings or to the supporting work.
   2. Connections are not to impose eccentric loading, nor induce twisting or warping to supporting structure.
   3. Design connections to accommodate potential and actual misalignment of adjacent work within tolerances specified in other Sections.

END OF SECTION

SECTION 01 14 19.16

DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

This section of the specification covers the control of dust via calcium chloride and water, complete.

PART 2 - PRODUCTS

2.1 CALCIUM CHLORIDE

A. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

B. Calcium chloride failing to meet the requirements of the specifications or that which has become caked or sticky in shipment, may be rejected by the Engineer.

2.2 WATER

Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.1 APPLICATION

A. Calcium chloride shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application. See Section 31 25 00, EROSION AND SEDIMENTATION CONTROL.

B. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as required by the Engineer. Application shall be by means of a mechanical spreader, or other approved methods. The Engineer shall determine the number and frequency of applications.

C. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

D. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

SECTION 01 22 00

UNIT PRICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

A. Unit price as is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include materials, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL

A. Refer to individual Sections of Specifications for the descriptions of units of work where the establishment of unit prices is required; the methods of measurement and pricing are specified therein.

3.2 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Self-leveling – 1/4” to 1/2" average thickness
   1. Description: Furnish and install self-leveling underlayment per requirements of 03 54 16 Hydraulic Cement Underlayment. - Average thickness 1/4" to 1/2", in accordance with Specification Section 09 65 19 “Resilient Tile Flooring”

2. Unit of Measurement: 2,500 SF

B. Unit Price No. 2: Self-leveling – 1/2” to 3/4" average thickness
   1. Description: Furnish and install self-leveling underlayment per requirements of 03 54 16 Hydraulic Cement Underlayment. - Average thickness 1/2” to 3/4", in accordance with Specification Section 09 65 19 “Resilient Tile Flooring”
   2. Unit of Measurement: 4,000 SF

C. Unit Price No. 3: Self-leveling – 3/4" to 1” average thickness
   1. Description: Furnish and install self-leveling underlayment per requirements of 03 54 16 Hydraulic Cement Underlayment. - Average thickness 3/4" to 1”, in accordance with Specification Section 09 65 19 “Resilient Tile Flooring”
   2. Unit of Measurement: 1,500 SF

D. Unit Price No. 4: Illuminated Exit Sign
   1. Description: Provide illuminated exit sign, including 75 feet of conductor and raceway, according to Section 26 51 00 “Interior Lighting”.
   2. Unit of Measurements: Each.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: Amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. Cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Acceptance of Alternates: Alternates will be reviewed and accepted or rejected at Owner's option. Execute accepted alternates under the same conditions as other work of the Contract.
   1. Owner Review Time: Provide 30 days for Owner review and decision of acceptance or rejection of Alternates.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No.1 – Photovoltaic System
   1. Base Bid: Provide infrastructure from main switchgear to roof for Photovoltaic System as shown in drawings.
   2. Alternate: Furnish and install Photovoltaic System.
   3. References:
      a. Drawing Sheets: PV04.03 and 09-Electrical series.
      b. Specification: Section 26 31 20

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for submitting and processing requests for product substitutions after the award of the construction contract.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Electronically submit a PDF copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form provided by Architect.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product, fabrication, or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from model code organization acceptable to the authorities having jurisdiction.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

B. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
1. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
2. Acceptance, if granted, will be based on reliance upon data submitted and the opinion, knowledge, information, and belief of the Architect at the time decision is rendered. Approval therefore is interim in nature and subject to reevaluation and reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed.
3. In proposing items for consideration, Contractor assumes all risk, costs, and responsibility for item's final acceptance, compliance with Contract Documents, integration into the Work, and performance.
4. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

B. Substitution Request for products, assemblies, and equipment constitutes a representation that the Contractor:
   1. Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Has confirmed that the proposed substitution does not affect dimensions or functional clearances.
   3. Agrees to provide the same warranty for the substitution as for the specified product.
   4. Agrees to coordinate installation and make changes to other work that may be required for no additional cost to the Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.
      f. Requested substitution has been coordinated with other portions of the Work.
      g. Requested substitution provides specified warranty.
      h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

1.7 ATTACHMENTS

A. Post-Award Substitution Request Form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SUBSTITUTION REQUEST FORM

(For use after Procurement phase)

TO: Perkins&Will
225 Franklin St., Suite 700
Boston, MA 02110
(617) 478-0300

From: _____

_____

_____

Substitution Request No: _____ DATE:_____

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section "Substitution Procedures:"

PROJECT SPECIFICATION

Specification Name/Number: _____
Article, Paragraph, Page Number: _____
Item/System to be Substituted: _____

REASON FOR SUBSTITUTION REQUEST

SPECIFIED PRODUCT . . .

- ☐ Is no longer available.
- ☐ Is unable to meet project schedule.
- ☐ Is unsuitable for the designated application.
- ☐ Cannot interface with adjacent materials.
- ☐ Is not compatible with adjacent materials.
- ☐ Cannot provide the specified warranty.
- ☐ Cannot be constructed as indicated.
- ☐ Other: _____
- ☐ Cannot be obtained due to one or more of the following:
  - ☐ Strike
  - ☐ Lockout
  - ☐ Bankruptcy of manufacturer or supplier
  - ☐ Similar occurrence

PROPOSED PRODUCT . . .

- ☐ Will reduce the Contract Time by _____ days.
- ☐ Will reduce the Contract Sum by $ _____.
- ☐ Is an Owner-initiated substitution

Explanation of each item marked above (attach documentation):

_____

_____

_____

EFFECT OF SUBSTITUTION

Proposed substitution affects other work or trades: ☐ No ☐ Yes (if yes, explain)

_____

_____

Proposed substitution requires dimensional revisions or redesign of architectural, structural, mechanical, electrical, plumbing, life safety, or other work:

☐ No ☐ Yes (if yes, attach data explaining revisions)

PRODUCT COMPARISON

Provide side-by-side comparison between proposed substitution and specified product to facilitate review of Substitution Request:

	SPECIFIED PRODUCT:	**PROPOSED PRODUCT:**
Manufacturer:	_____	_____
Name / Brand:	_____	_____
Catalog No.:	_____	_____
Supplier:	_____	_____
Features:	_____	Variations: _____
	_____	_____
	_____	_____
	(Attach additional sheets if necessary)	(Attach additional sheets if necessary)

Local Distributor or Supplier: _____

Manufacturer's Representative: _____

Maintenance Service Available: ☐ Yes ☐ No

Spare Parts Source and Location: _____

Warranty Available is equivalent to the specified warranty: ☐ Yes ☐ No ____ Years

Describe any variation from specified warranty: _____

Product Manufacturing History ☐ New ☐ 2-5 yrs ☐ 6-10 yrs ☐ More than 10 yrs old

SUPPORTING DATA ATTACHED (REQUIRED WHERE APPLICABLE)

☐ Point-by-point comparison of performance criteria, materials, and components of specified product with proposed substitution.

☐ Drawings ☐ Specifications ☐ Product Data ☐ Samples

☐ Tests ☐ Reports ☐ LEED Compliance ☐ Warranty

REFERENCED INSTALLATIONS

Identify at least **three** similar local projects on which proposed substitution was used:

PROJECT #1:

Project: _____ Date Installed: _____

Address: _____

_____

Owner: _____

Contact: _____ Telephone: _____

Architect: _____

Contact: _____ Telephone: _____

Contractor: _____

Contact: _____ Telephone: _____

PROJECT #2:

Project: _____ Date Installed: _____

Address: _____

_____

Owner: _____

Contact: _____ Telephone: _____

Architect: _____

Contact: _____ Telephone: _____

Contractor: _____

Contact: _____ Telephone: _____

PROJECT #3:

Project: _____ Date Installed: _____

Address: _____

_____

Owner: _____

Contact: _____ Telephone: _____

Architect: _____

Contact: _____ Telephone: _____

Contractor: _____

Contact: _____ Telephone: _____

ACKNOWLEDGEMENTS: The undersigned certify that:

Performance: Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product, including appearance, quality, performance, code compliance, and sustainability compliance.

Warranty: Same warranty will be furnished for proposed substitution as for specified product.

LEED Compliance (LEED projects only): Same contribution to LEED program.

Operations and Maintenance: Same maintenance service and source of replacement parts, as applicable, are available locally for the proposed substitution.

No Adverse Effect: Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.

No Adverse Time or Cost: Cost data and time as stated above are complete. Contractor bears all costs for labor and materials associated with fully integrating proposed substitution into the Project. Claims for additional costs or time related to accepted substitution which may subsequently become apparent are waived.

Payment will be made to the Owner for changes to the project design, including Architect's and Engineer's redesign fees and engineering, detailing, special inspection, and construction costs incurred by the Owner caused by acceptance of the substitution.

Coordination necessary to fully integrate the proposed substitution, and any associated modifications to related or adjacent Work, have been or will be performed.

Dimensions and Clearances: Proposed substitution does not affect dimensions or functional clearances.

Conditions of Acceptance: The Architect's recommendation for approval, if granted, relies on data submitted and the opinion and knowledge of the Architect at the time decision is rendered. The approval is conditional in nature and subject to reevaluation and reconsideration if additional data or materials are submitted, or coordination with other work is observed to invalidate claims that substitution is equal to item originally specified.

Contractor: _____
(Name of Contractor)

Date: _____ By: _____

Subcontractor: _____
(Name of Subcontractor)

Date: _____ By: _____

Note: *Substitution requests are not part of the standard submittal process and shall not be submitted as part of Shop Drawings, Product Data, or Samples submittals. Substitution requests must be filled out completely. Unresponsive or incomplete requests will be rejected and returned without review.*

ARCHITECT'S REVIEW AND ACTION

☐ Substitution acceptance is recommended.

☐ Substitution acceptance is recommended, with the following comments: _____
_____

☐ Architect's additional services proposal attached.

☐ Resubmit Substitution Request:

- ☐ Provide the following: _____
- ☐ Provide proposal indicating amount of savings / credit to Owner

☐ Substitution acceptance is not recommended:

- ☐ Substitution Request received too late.
- ☐ Substitution Request received directly from subcontractor or supplier.
- ☐ Substitution Request not submitted in accordance with requirements.
- ☐ Substitution Request Form is not properly executed.
- ☐ Substitution Request does not indicate what item is being proposed.
- ☐ Insufficient information submitted to facilitate proper evaluation.
- ☐ Proposed product does not appear to comply with specified requirements.
- ☐ Design Team has no experience with product / manufacturer and is therefore unable to comment on the track record of quality, performance, or reliability.
- ☐ Proposed product will require substantial revisions to Contract Documents.

PERKINS&WILL

Perkins&Will acknowledges its reliance upon information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to not comply with requirements of the Contract Documents, the Contractor shall be solely responsible for performance of the work in accordance with requirements of the Contract Documents.

By: _____ Date: _____

OWNER'S REVIEW AND ACTION

☐ Substitution is accepted; Architect to prepare Change Order.

☐ Substitution is not accepted.

By accepting this substitution, Owner agrees to compensate Perkins&Will for additional services, if any, necessary to implement the substitution.

Additional Services: $_____

By: _____ Date: _____

(Owner's Representative)

END OF FORM

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions," or substantially similar form generated by the Architect.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Contractor's Action: Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      b. Include separate costs of labor, materials, equipment and supervision directly attributable to the change.
      c. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      d. Quotation Form: Use form acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include separate costs of labor, materials, equipment and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 - Substitution Procedures if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Construction Manager may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

A. Schedule of Values: Statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's Construction Schedule.
   1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section.
      b. Description of the Work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.

e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
1) Labor.
2) Materials.
3) Equipment.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance that covers items stored at a bonded warehouse, and during transport to the project site.
4. Provide separate line items in the Schedule of Values for each part of the Work where Applications for Payment may include cost of submittals.
a. Cost for submittals shall represent true cost of submittals preparation, as evidenced by subcontractor invoices, but not to exceed 5 percent of the total value of that item of work line item.
5. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
6. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is the 20th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days before the date for each progress payment.
1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
1. Other Application for Payment forms proposed by the Contractor shall be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit PDF of Application for Payment to Architect within 24 hours. Include waivers of lien and similar attachments if required.
   1. Provide transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Preparation and Submittal of Draft of Initial Application for Payment (Pencil Copy):

1. Prepare draft copy of Application for Payment and meet with Owner and Architect to review the draft copy prior to submittal of the Application for Payment.
2. Provide four (4) draft (pencil) copies within two (2) business days before the day of the review meeting with Owner and Architect. Submit substantiating data with each application copy: subcontractor applications for payment, copies of invoices, storage receipts, and data required by Owner
3. After review of draft (pencil) copy by Owner, Architect, and Contractor, prepare Application for Payment, using agreed-upon data on Owner/Architect-reviewed schedule of values and Owner/Architect-reviewed pencil draft.
4. Include specified information required for application preparation.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. Copy of executed Agreement between Owner and Contractor.
2. List of subcontractors.
3. Schedule of values.
4. Contractor's construction schedule (preliminary if not final).
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

J. Payment Applications During Construction: Submit changes in submittals schedule, construction schedule, and other schedules with each application for payment.

K. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

L. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. Evidence that claims have been settled.

5. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
6. Final liquidated damages settlement statement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Requests for Information (RFIs).
   3. Digital project information management.
   4. Project meetings.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request from Owner, Construction Manager, or Architect seeking information required for clarifications of the Contract Documents.

C. PIMS: Web-based Project Information Management System managed by the Contractor and for use by Owner, Owner's Consultants, Architect and Architect's Consultants.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.
   4. Post list on PIMS and always keep current.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, on PIMS and in prominent location in built facility. Always keep list current.

C. Administrative and Personnel: In addition to Project superintendent, identify other administrative and supervisory personnel as required for proper performance of the Work. Identify individuals and their duties and responsibilities; list their addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Include personnel required for coordination of operations with other contractors.

D. Coordination Drawings: Refer to Section 01 31 06 - Coordination Drawings.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of components to ensure maximum performance and accessibility for required maintenance, service, and repair of components, including mechanical and electrical.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work.

C. Conservation: Coordinate construction activities to ensure operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner’s property.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarifications or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Contractor shall submit RFIs to Architect using PIMS.
   2. Architect shall provide Contractor with a list of design team contacts by discipline for RFI distribution.
   3. Concurrent with submission to the Architect, Contractor shall also distribute RFIs to appropriate design team professionals, using PIMS, based on the disciplines affected by the RFI.
   4. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.

5. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
6. Include only one subject or item per RFI. RFIs that include more than one subject or item will be returned without review to the Contractor.

B. Contractor's failure to report discrepancies or omissions in the Contract Documents, or Contractor- or Subcontractor-generated assumptions, in lieu of Architect-issued clarifications regarding the intent of the Contract Documents, shall not be used as a basis for future claims once the apparent discrepancies or omissions have been reconciled by appropriate interpretation issued by the Architect.

C. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject or item.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

D. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.

E. RFI Submission Procedure:
1. Post electronic submittals as PDF electronic files directly to the Contractor's PIMS as described below.

F. Architect's Action: Architect will review each RFI, determine action required, and respond as indicated in the project General Conditions. Allow seven working days for Architect's response for each RFI.
1. RFIs received by Architect after 1:00 p.m. in Architect's time zone will be considered as received the following working day.
2. Where the due date for an action or response occurs on a Saturday, Sunday, or legal holiday, such action or response shall be considered due on the next day that is not a Saturday, Sunday, or legal holiday.
3. The following RFIs will be returned without action:
    a. RFIs addressing more than one subject or item.
    b. Requests for approval of submittals.

c. Requests for approval of substitutions.
d. Requests for approval of Contractor's means and methods.
e. Requests for approval of nonconforming Work.
f. Requests for coordination information already indicated in the Contract Documents.
g. Requests for adjustments in the Contract Time or the Contract Sum.
h. Requests for interpretation of Architect's actions on submittals.
i. Incomplete RFIs or inaccurately prepared RFIs.

4. Architect's action may include a request for additional information, in which case Architect's time for response will begin at the time of receipt by Architect of additional information.
5. RFIs involving requests for recommendations or design assistance on how to address remediation or correction of nonconforming work are not eligible for an increase in Contract Sum or an extension of Contract Time, regardless of when the RFIs are returned, or the corrective action proposed therein.
6. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 - Contract Modification Procedures.
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
      1) If Contractor’s notification is submitted more than 21 days after receipt of the RFI response, any work resulting from the RFI response is not eligible for an increase in Contract Sum or an extension of Contract Time.
7. In the event Contractor requests an accelerated RFI review and response by Architect, Architect will endeavor to accommodate Contractor’s request. However, any such desired accelerated review times shall not supersede the requirements of the Contract, and no extension of Contract Time will be authorized because of Architect’s failure or inability to adhere to Contractor’s desired accelerated review times.
8. Architect will return a response to the RFI via the PIMS.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were returned without action or withdrawn.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date the RFI response is due.
   8. List of parties the RFI was distributed to.
   9. Date Architect's response was received.
   10. Date the RFI was closed by the Contractor.
   11. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

H. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.6 DIGITAL PROJECT INFORMATION MANAGEMENT

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model will be provided by Architect for Contractor's use during construction.
   1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
   2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
   3. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.

B. Web-Based Project Information System (PIMS): Provide, administer, and use web-based Project software for purposes of hosting and managing Project communication and documentation until Final Completion.
   1. PIMS shall be similar to Procore, Ebuilder, Autodesk Construction Cloud or Plangrid but shall include, at a minimum, the following features:
      a. Project Directory, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
      b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
      c. Document workflow planning, allowing customization of workflow between project entities.
      d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
      e. Track status of each Project communication in real time, and log time and date when responses are provided.
      f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
      g. Processing and tracking of payment applications.
      h. Processing and tracking of contract modifications.
      i. Creating and distributing meeting minutes.
      j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
      k. Management of construction progress photographs.
      l. Mobile device compatibility, including smartphones and tablets.
      m. Creating and exporting editable logs for all PIMS functions including, but not limited to: RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders. Owner, Architect and Architect’s Consultants shall have rights and ability to download logs at any time.

2. Provide up to 20 user licenses for use of Owner, Owner's Commissioning Authority, Architect, and Architect's Consultants. Provide eight hours of software training at Architect's office for web-based Project software users.
3. At completion of Project, change of PIMS or end of Owner-Contractor Contract, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and time a minimum of 3 days prior to the meeting date.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees using PIMS.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes using PIMS to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, Architect's consultants, Contractor, Contractor's superintendent, major subcontractors, suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including but not limited to the following:
      a. Tentative construction schedule.
      b. Critical work sequencing and long-lead items.
      c. Designation of key personnel and their duties.
      d. Lines of communications.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for testing and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. Digital Execution Plan and associated procedures.
      l. Preparation of record documents.
      m. Use of the premises.
      n. Work restrictions.
      o. Working hours.

p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Parking availability.
u. Office, work, and storage areas.
v. Equipment deliveries and priorities.
w. First aid.
x. Security.
y. Progress cleaning.
z. Special procedural, inspection and submittal requirements of the Authorities Having Jurisdiction.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes using PIMS.

C. Digital Execution Conference: Schedule and conduct a digital execution conference before starting construction, at a time convenient to Owner Architect, and Contractor.
1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, Architect's consultants, Contractor, Contractor's superintendent, major subcontractors, suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect the exchange of digital information, including but not limited to the following:
a. Electronic file transfer requirements and protocols.
b. Right of reliance on Architect’s and Architect’s Consultants digital files.
c. Schedule of digital file transfers and periodic updates.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes using PIMS.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity as indicated in individual Sections.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner's Commissioning Authority of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.

k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information using PIMS.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, Architect's consultants, Contractor, Contractor's superintendent, major subcontractors, suppliers, and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including but not limited to the following:
a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Owner's partial occupancy requirements.
k. Installation of Owner's furniture, fixtures, and equipment.

l. Responsibility for removing temporary facilities and controls.
m. Close of PIMS and export of data to Owner and Architect.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes using PIMS.

F. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, and Architect each Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of proposal requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information using PIMS.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 06

COORDINATION DRAWINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative provisions for preparation and submittal of Coordination Drawings and Layout Drawings.

1.2 COORDINATION

A. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

B. Coordinate scheduling and timing of preparation of Coordination Drawings and Layout Drawings with other construction activities to avoid conflicts and to ensure orderly progress of the Work.

C. In event of conflicts involving location and layout of work; use following priority to resolve conflicts:
1. Structure and partitions have highest priority.
2. Equipment location and access.
3. Ceiling system and recessed light fixtures.
4. Gravity drainage lines.
5. High pressure ductwork and devices.
6. Large pipe mains, valves, and devices.
7. Low pressure ductwork, diffusers, registers, grilles, HVAC equipment.
8. Fire protection piping, devices, and heads.
9. Small piping, tubing, electrical conduit, and devices.
10. Sleeves through fire-resistance-rated partitions.
11. Access panels.

1.3 PROVISION AND USE OF DIGITAL DATA FILES

A. Digital Data Files: Electronic drawing/model (digital data) files of the Contract Drawings will not be furnished by Architect for Contractor's use in preparing Coordination Drawings and Layout Drawings unless procedures stated within Section 01 33 00 - Submittal Procedures are agreed to, the Contractor executes the Electronic File Transfer Agreement (EFTA) form, and the Contractor properly prepares and submits the Submittals Schedule as indicated in Section 01 32 00 - Construction Progress Documentation.

B. Release of digital data files are conditional upon the following:

1. The digital data represented in the files are not Contract Documents.
2. Only one set of digital data files will be furnished; Contractor assumes responsibility for distributing pertinent files to the various subcontractors.
3. The digital data files have been developed without the assistance or specific expertise of the individual subcontractors and installers, and therefore do not account for or incorporate means, methods, shop standards, and routing economies required by individual subcontractors for the scope of work required by the finished Work.
4. Modifications to the information and routings of the selected components shown on the digital data files may be required and are the responsibility of the Contractor. All modifications are part of the scope of Work of this Project and shall be provided at no additional cost to Owner.
5. Contractor and subcontractors agree that digital data files are not fit for any particular purpose, including, but not limited to quantity take-offs, pricing, development of a building information model (BIM), dimensional control, clash detection, construction sequencing, or the manufacture of any building component or system.
6. Architect makes no assurances that the digital data files will be usable by the Contractor's and subcontractors' systems, infrastructure, or software; and that the files may be subject to anomalies, errors, viruses, malware, or other unintended defects.

C. Limitations of Electronic Drawing File Transfer Agreement (EFTA):
1. Agreement Form applies to procurement of Architectural digital data files only. If Contractor desires digital data files for Drawings prepared by one of Architect's consultants, Contractor may contact consultant directly to obtain such files.
2. Contractor shall recognize that various consultants retained by the Architect for this Project, or retained separately by the Owner, may have agreements that differ from that included in the EFTA, and may have differing costs and procedures involved with obtaining digital data files.
3. Architect makes no assertion that the Architect's or Owner's consultants will furnish digital data files of their Drawings. Additionally, not all Drawings or documents may be available electronically.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Electronic files, prepared in either two-dimensional or three-dimensional format at the Contractor's option, and as applicable to the Work being coordinated.

B. Layout Drawings: Electronic files, prepared in either two-dimensional or three-dimensional format at the Contractor's option, and as applicable to the Work being located.

1.5 QUALITY ASSURANCE

A. Prior to Start of Work: Require written approval of Coordination Drawings from each subcontractor whose work is contained within the scope of, or is affected by, the Work for which the Coordination Drawings have been prepared.

B. Coordination Meetings: Schedule with affected trades and subcontractors. Refer to Section 01 31 00 - Project Management and Coordination.

PART 2 PRODUCTS

2.1 DESCRIPTION

A. Coordination Drawings: Reproducible overlay, or three-dimensional drawings showing work with horizontal and vertical dimensions demonstrating layout of the Work to avoid interference with structural framing, ceilings, partitions, equipment, conveying systems, fire suppression systems, plumbing systems, mechanical systems, electrical systems, lighting, fire alarm systems, telecommunications and A/V systems, electronic safety and security systems, and other services scheduled to be installed in congested or concealed spaces.

B. Coordination Drawings: Provide for the following items of work:
   1. Where required by individual specification Sections.
   2. Where installation is not completely shown on Shop Drawings.
   3. Where coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
   4. Where limited space availability necessitates coordination, including the following areas and spaces:
      a. Under slabs-on-grade.
      b. In and above ceilings.
      c. In soffits and furr-downs.
      d. In insulation space above structural wood decking.
      e. Within walls.
      f. Within chases.
      g. In mechanical spaces.
      h. In electrical spaces.

C. Sleeve, Core Drill, and Block-out Layout Drawings: Reproducible overlay or three-dimensional drawings showing proposed locations and sizes of sleeves, core drills, block-outs, and embedded items in concrete walls, columns, floors, and beams.
   1. Refer to fire protection, plumbing, HVAC, electrical, and other facility systems Drawings for items penetrating floor, roof, and structural systems.
      a. Unless otherwise indicated, sleeves shall be provided for all utility and service (Divisions 21 through 28) items scheduled to traverse vertically through the building structure or penetrate structural members, whether or not sleeves have been specifically shown.
   2. Core-drilling through structural members, as a substitute for proper layout, coordination, and installation of sleeves, will not be permitted.

PART 3 EXECUTION

3.1 COORDINATION DRAWINGS

A. General: Prepare Coordination Drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base Coordination Drawings on standard printed data. Include the following information, as applicable:
    a. Use applicable and most current version of the Contract Drawings as a basis for preparation of Coordination Drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade-specific information to the Coordination Drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    f. Indicate required installation sequences.
    g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Organize Coordination Drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide Coordination Drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-resistance-rated enclosures around ductwork.
7. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
   b. Reflected Ceiling Plans: Light fixtures, exit lights, emergency battery packs, smoke detectors, fire alarm, and A/V system speakers.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
   d. For conduit 1-1/4 inches (32 mm) in diameter and larger, show location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire Protection System: Show the following:
   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
   b. Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire alarm, A/V, and electrical Work. Show locations of visible ceiling-mounted devices relative to sprinkler heads in acoustical ceiling system grid.

3.2 LAYOUT DRAWINGS

A. Sleeve, Core Drill, and Block-out Layout Drawings: Reproducible overlay drawings showing proposed locations and sizes of sleeves, core drills, block-outs, and embedded items in concrete walls, columns, floors, and beams.
   1. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
   2. Structural Penetrations: Indicate penetrations and openings required for all disciplines. Refer to fire protection, plumbing, HVAC, electrical, and other systems drawings for items penetrating floor, roof, and structural systems.
   3. Core-drilling through structural members, as a substitute for proper layout and installation of sleeves, will not be permitted.

B. Indicate sleeves for utilities and services scheduled to traverse building structure or penetrate structural members. Indicate size of penetrating item, and size of corresponding sleeve.
   1. Call specific attention to Divisions 21 through 28 utilities and services that have been relocated from position originally indicated in Contract Documents, and the reason for such relocation.

2. Call specific attention to areas where concrete reinforcing or other structural members may require modification in order to accommodate sleeve or block-out.

C. Indicate areas where access panels are required to gain access to serviceable and maintenance items.

3.3 COORDINATION AND LAYOUT DRAWING FORMAT

A. General: Prepare Coordination Drawing and Layout Drawings according to requirements in Section 01 33 00 - Submittal Procedures.
   1. Electronic Digital Data Files: Prepare coordination digital data files according to the following requirements:
      a. File Submittal Format: Submit or post coordination drawing files using PDF format.
      b. Perform three-dimensional component conflict analysis as part of preparation of Coordination Drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
   2. Show architectural and structural elements with which the various facility services and systems must be coordinated, including the following:
      a. Partitions.
      b. Ceiling heights.
      c. Structural framing locations and elevations.
      d. Column lines.
      e. Other impediments and interferences with installation of the Work.
   3. Show locations of the various facility services and systems, horizontally dimensioned from column center lines, and vertically dimensioned from top of floor slab elevations.

B. Produce combined Coordination and Layout Drawing plans and sections that fully integrate the various fire suppression systems, plumbing systems, HVAC systems, electrical systems, communications systems, electronic safety and security systems, equipment, and other work.
   1. Systems shall be uniquely color-coded for ease of identification.

C. Prepare Drawings for coordination of installation of products and materials fabricated by separate entities.
   1. Indicate relationship of components shown on separate Shop Drawings.
   2. Indicate required installation sequences.
   3. Refer to Divisions 21 through 28 for specific Coordination Drawing requirements for facility services installations.

3.4 CONTRACTOR'S ACTION

A. Produce initial Coordination Drawings within 45 days after initial coordination meeting.

B. Resolve major interferences at initial coordination meeting prior to production of drawings.

C. After written approval of Coordination Drawings and Layout Drawings by each affected subcontractor, determine method used to resolve interferences not previously identified.

D. Give written approval of acceptable changes to Coordination Drawings and Layout Drawings prior to start of work in affected area.

E. Review Coordination Drawings and Layout Drawings and check for compliance with the Contract Documents. Note corrections, adjustments, and field dimensions. Mark with approval stamp before submitting to Architect.

F. Distribution: Furnish copies of final Coordination Drawings and Layout Drawings to manufacturers, subcontractors, suppliers, fabricators, installers, and others as necessary for performance of construction activities.

G. Use for Construction: Retain complete copies of Coordination Drawings and Layout Drawings on Project site and maintain copy in field office at Project Site.

3.5 ARCHITECT'S ACTION

A. Review: Architect will review Coordination Drawings and Layout Drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which remain the Contractor's responsibility. If Architect determines that Coordination Drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

3.6 ADJUSTING

A. At no additional cost to the Owner, make the necessary modifications or adjustments required to the Work as a result of the following:
   1. Failure to provide complete or correct Coordination Drawings or Layout Drawings for those items of Work.
   2. Failure to avoid or resolve conflicts or interferences prior to installation of the Work.
   3. Failure to call attention to changes that may be required to adjacent or subsequent Work made necessary as a result of modifications.

B. Core-drilling and other remedial work resulting from missing or mislocated sleeves shall be provided at no additional cost to Owner.
   1. In the event core-drilling severs reinforcing or otherwise weakens the structure, provide additional reinforcing and support as required, as determined by the Structural Engineer, to restore the structure's originally designed load-carrying capability.

END OF SECTION

SECTION 01 31 11

BIM IMPLEMENTATION PLAN

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. A team approach is required for the BIM process. The Construction Manager will provide all parties with appropriate access to the model via collaboration software such as Navisworks. The model will be used simultaneously with different parties for different tasks. For example, virtual coordination scope of work. The Construction Manager, the trades, and Design Team will work collaboratively to resolve all detected clashes and develop a model that represents a fully workable, constructible project.

B. All model deliverables shall be saved and delivered in their native format (i.e., rvt for Revit, pin for ArchiCAD, etc.) and in IFC format, (.dwg and. dwf format, nwd, .nwf, .nwc) as required and placed on the required FTP site for the entire project team to review.

C. If early packages are required, it is understood that the model may not be fully developed for those work elements (i.e., substructure, superstructure and under-slab utilities); however, the model that will be used for final coordination and construction must be complete and up to date.

D. The project team will have access to the current model on the project site throughout the construction phases.

E. Other general requirements include:

1. Physical conflicts exceeding the specified tolerance of 0.5 inch will be documented and provided to the coordination team for review.
2. All adjustments to resolve conflicts, as determined by the team, will be incorporated in the 3D model before a new clash detection iteration is performed.
3. Attendance at specific coordination meetings with the Construction Manager is required. If needed, the Design Team will be brought in to assist in resolving any conflicts that require alterations to building elements or redesign of MEP systems.
4. If such changes are required, updated drawings and models (if available) will be provided to the coordination team for their use in modeling.
5. Once all the conflicts are resolved, each trade is to provide a complete annotated file for a “sign off” drawing. This shall include all elevation off finish floor, inverts, pipe sizes, and system identification. The annotated drawing files and the sign-off process are to be expedited to meet the needs of the overall schedule. Contractors failing to do so shall bear responsibility for any delays caused.

1.2 MODELING GOALS

A. Throughout the construction phases, BIM will be utilized to develop a coordinated discipline model, reviewed, annotated signed off on by each trade and submitted to

the design team for the project. The CM and trades (Coordination Team) will utilize the model during coordination meetings to review and resolve conflicts amongst the trades and building elements. The model shall be used in the field to support project reviews, site logistics, and ongoing construction.

B. On select renovation projects and at the discretion of the Construction Manager, the CM may elect to perform a 3D scan of the existing building for use within the BIM model.

1.3 SOFTWARE

A. The project shall be designed and coordinated using Building Information Modeling (BIM) software. This includes all designated trades' models necessary for analysis, fabrication and construction. The Construction Manager will provide a base 3D model in Revit and Navisworks.

B. The following lists the BIM software that will be utilized on the project:

Clash Detection Software	**BIM Use**
Navisworks (most current version)	Clash Detection Scheduling (if applicable) Construction Layout[1]
Trade Fabrication Software	**Discipline**
Revit Architecture	Architecture Interiors
Revit Structure	Structure
Autocad MEP Fabrication (most current version)	Mechanical Electrical Plumbing Fire Protection
Civil 3D	Civil

1.4 COMMUNICATION AND MANAGEMENT

A. The Construction Manager shall appoint a "MEP Manager/Coordinator" for each project. This individual will be responsible for receiving modeling information from the Coordination Team and to ensure the model information is correct, being communicated, updated and incorporated into the coordination model. Each party is responsible for maintaining their respective models and providing their modeling information, at appropriate intervals. An FTP or project website will be provided by the Construction Manager throughout the construction phases. The project site will be used by the project team.

B. The FTP site will be password protected and is required to be accessible for only one project.

C. All members of the Coordination Team are required to attend BIM Coordination meetings unless excused by the MEP Manager/Coordinator.

D. Refer to SECTION 011300, CM PROJECT SCHEDULE for the BIM coordination schedule.

1.5 BIM MODEL ELEMENTS

A. Architectural Elements:
   1. The architectural model is to include, without limitation, partition walls, ceilings, chases, door and window openings, exterior envelope, roof, stairs and railings and:
   2. Interior partitions at correct thickness and height
   3. Tag material types (masonry, drywall, shaft wall, glass block, etc.)
   4. MEP chases (vertical)
   5. Elevator shafts
   6. Stairwells
   7. Finish floor at correct elevation and thickness
   8. Ceilings at correct elevation and thickness. Tag material types (drywall, acoustical, etc.)
   9. Exterior envelope at correct thickness with proposed exterior material facing to the outside
   10. Interior and exterior door sizes and locations
   11. Reflected ceiling plans of all levels with recessed light locations modeled with approximate dimensions and elevations of lighting fixtures, speakers, etc.
   12. Furniture layouts corresponding to the Furnishings and Equipment (F&E) requirements of the client agencies. Furniture and equipment simulations to be similar in dimensions to actual proposed (use manufacturers' blocks if available)
   13. All interior storage units, cabinetry, racks, shelving, etc.

B. Structural Elements
   1. Structural modeling will be developed first to correspond with the structural design documents and shop drawings. It will include, but not be limited to:
      a. All substructure elements (i.e., spread footings, piles, foundations, grade beams, etc.)
      b. All superstructure elements (i.e., beams, columns, girders, framing and bracing sans connection details, shear elements, etc.)
      c. Structural floor and roof decks, elevator shafts and stairwells
      d. All openings; roof, floor, beam, etc. Special consideration shall be given to any beams/structures that may require installation and possible removal for areas such as mechanical spaces with future roof top equipment.
   2. The steel fabricator's 3D model will be procured and infused into the design model via Navisworks in order to have a more accurate model for coordination. If a fabricator's structural model is unavailable prior to coordination, the design model should be updated to the Designer's (Structural Engineer) final structural design.

C. Mechanical, Electrical, Plumbing, and Fire Protection (MEPFP) Elements:
   1. MEP/FP modeling will include, but not be limited to, all horizontal and vertical solid and flexible duct runs, modeled at correct sizes, slopes and shapes. All

mechanical equipment elements should be modeled based on manufacturers equipment product data (i.e., RTU's, VAV boxes, boilers, generators, chillers, etc.), in order to assure adequate physical space. All manufacturer and code clearances must be incorporated in the models.

a. Mechanical/Sheet Metal
    1) Ducts, dampers, VAV's, insulation
    2) Air handling equipment
    3) Boilers
    4) Chillers
    5) Pumps
    6) All mechanical piping (piping to be modeled to its outside diameter, fittings, valves, insulation)
    7) Supply, return, exhaust louvers, grilles and diffusers
    8) Equipment pads
b. Plumbing
    1) Piping (piping to be modeled to its outside diameter) fittings, valves, insulation
    2) Risers
    3) Pitched drains (i.e., roof drain mains, etc.)
    4) Pumps and equipment
    5) Fixtures will be located with penetration stub into walls, floors and ceilings
    6) Sleeved objects will be located in all foundations, interior and exterior walls to the correct outside diameter
    7) Equipment pads
c. Electrical
    1) All major equipment and conduit
    2) Switchgear
    3) Transformers
    4) Panel boards
    5) Generators
    6) Conduit
    7) Locate and model all lighting fixtures with the overall required access clearance
    8) Equipment pads
d. Fire Protection
    1) Equipment (i.e., fire pumps, hose racks, standpipes, etc.)
    2) Risers
    3) All piping
    4) Head Locations
    5) Equipment pads

D. For field installation, the signed off final models are treated as a contract for space. By modeling components and their complete scope of work, including access space and manufacturer clearances, trade partners reserve space. If a conflict arises during the field installation, the trade partner who did not reserve space for components must move his/her components to allow for the trade partner who did reserve space at his/her own cost. Work which does not appear in the composite

construction model may not proceed until the modeled and coordinated systems are completely installed. At that point, "uncoordinated" or "field coordinated" work may proceed.

E. Digital mock-ups are detailed models of specific areas and assemblies can improve understanding of and coordination between design details. Digital mock-ups facilitate discussion with consultants and trade partners resulting in optimized and constructible details.

1.6 CONSTRUCTION TURNOVER

A. As work is being completed, trade partners are expected to maintain accurate and current as-built records to facilitate the exchange of project closeout information. These steps can include:
   1. Subcontractor models will include all equipment serial numbers, shop drawing and submittal information
   2. Objects in the model are to include performance data, warranty, maintenance information and product specifications at a minimum
   3. Subcontractors will maintain as-builts per industry standards, contract requirements
   4. Subcontractor shall keep their working BIM files on Share file for the duration of the project
   5. As-Built BIMs shall be updated with required object-enablers as well as the 2D as-builts shall be uploaded to Share file
   6. All objects must be 3D solids, parametric components, or AEC (Architecture, Engineering, and Construction) objects. Wireframe and line-based models will not be accepted
   7. All MEP systems are to be modeled up to their connection points 10'-0" outside the building and shall include all underground systems
   8. Assist the CM and the owner with any integration into the owners building maintenance software.

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's construction schedule.
   2. Construction schedule updating reports.
   3. Reports:
      a. Daily construction reports.
      b. Material location reports.
      c. Site condition reports.
      d. Special reports.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Major Area: A story of construction, a separate building, a separate wing, a major department, or a similar significant construction element.

G. Milestone: A key or critical point in time for reference or measurement.

H. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals Format: Reference Section 01 33 00 - Submittal Procedures for requirements.

B. Submittal Schedule: Arrange the following information in a tabular format:
1. Specification Section number and title.
2. Submittal category (action or informational).
3. Name of subcontractor.
4. Description of the Work covered.
5. Scheduled date for first submittal.
6. Date of submission.
7. Scheduled date for Architect and Owner’s final release or approval.
8. Fabrication and delivery time frame.
9. Required on job date.
10. Approval date.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
1. Submit a working electronic copy of schedule. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit as required with monthly payment application.

H. Site Condition Reports: Submit immediately at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 - Project Management and Coordination. Review methods and procedures related to Contractor's construction schedule, including, but not limited to, the following:
   1. Review format for reports.
   2. Verify availability of qualified personnel needed to develop and update schedule.
   3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
   4. Review delivery dates for Owner-furnished products.
   5. Review schedule for work of Owner's separate contracts.
   6. Review submittal requirements and procedures.
   7. Review time required for review of submittals and resubmittals.
   8. Review requirements for tests and inspections by independent testing and inspecting agencies.
   9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
   10. Review and finalize list of construction activities to be included in schedule.
   11. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the submittal schedule, progress reports, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS

2.1 SUBMITTAL SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for initial review, at least one resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

B. Restrictions and Limitations:

1. Submittal review and processing times listed in Section 01 33 00 - Submittal Procedures shall be considered baselines and shall take precedence over any lesser times promulgated by Contractor in the Submittal Schedule or Construction Schedule.
2. No delay claim will be entertained, and no extension of the Contract Time will be authorized due to Contractor's failure to transmit submittals enough in advance of the Work to permit proper and reasonable processing.
3. If the Contractor fails to submit a Submittal Schedule or fails to provide submittals in accordance with the approved Submittal Schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion and final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an earlier or later completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
   2. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect and Owner.
   3. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   5. Startup and Testing Time: Include time as required by Owner for startup and testing. Startup and Testing must be completed by Substantial Completion.
   6. Commissioning: Include time as required by Owner for commissioning, startup, and testing. Commissioning must be completed by Substantial Completion.
   7. Substantial Completion: Indicate date established for Substantial Completion. Allow time for Architect and Owner's administrative procedures necessary for certification of Substantial Completion.
   8. Punch List and Final Completion: Include time as required by Owner for completion of punch list items and final completion.
   9. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 - Summary. Delivery dates indicated stipulate the earliest possible delivery date.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 - Summary. Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.
5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
1. Permanent enclosure as defined in Section 01 50 00 - Temporary Facilities and Controls.
2. Commencement of space conditioning.
3. Structural completion.
4. Temporary enclosure and space conditioning.
5. Permanent space enclosure.
6. Completion of mechanical installation.
7. Completion of electrical installation.

E. Upcoming Work Summary/Look-Ahead Schedule: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.

2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using the Critical Path Method.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect and Owner’s approval of the schedule.
2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

D. CPM Schedule Preparation: Prepare a list of activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and commissioning.

j. Punch list and final completion.
k. Activities occurring following final completion.

2. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

E. Contract Modifications: For each proposed contract modification, if applicable and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.

11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.
20. Construction photographs with descriptions.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information in accordance with RFI provisions of Section 01 31 00 - Project Management and Coordination. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report immediately. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule with application for payment.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect and Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for the following:
   1. Construction photographs.
   2. Construction video recordings.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Construction photographs may not be used for Contractor’s marketing materials or social media unless approved by Owner.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.
   1. Submit photos electronically. Include copy of key plan indicating each photograph's location and direction.
   2. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name of Contractor.
      c. Date photograph was taken.
      d. Description of location, vantage point, and direction.
      e. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within seven days of recording.
   1. Submit video recordings electronically. Include copy of key plan indicating each video's location and direction.
   2. Identification: With each submittal, provide the following information in file metadata tag:
      a. Name of Project.
      b. Name of Contractor.
      c. Date video recording was recorded.
      d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format. Photographs should be clear, free from obstruction with appropriate lighting, and easily viewable.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1.5 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs with maximum depth of field and in focus.
   1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Flag construction limits before taking construction photographs.
   2. Take photographs to show existing conditions adjacent to property before starting the Work.
   3. Take photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
   4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

C. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
   1. Underground utilities.
   2. Underslab services.
   3. Piping.
   4. Electrical conduit.
   5. Radient heating.

D. Periodic Construction Photographs: Take photographs at weekly intervals coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

F. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
   1. Three days' notice will be given, where feasible.
   2. In emergency situations, take additional photographs within 24 hours of request.

1.6 CONSTRUCTION VIDEO RECORDINGS

A. Preconstruction Video Recording: Before starting demolition and construction, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.
   1. Flag construction limits before recording construction video recordings.
   2. Show existing conditions adjacent to Project site before starting the Work.
   3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of demolition and construction.
   4. Show protection efforts by Contractor.

B. Periodic Construction Video Recordings: Record video recording monthly and coinciding with the cutoff date associated with each Application for payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 minutes(s).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Submittals: Written and graphic information and physical samples sent to the Architect for confirmation of the Project design.

B. Project Information Management System (PIMS): Web-based Project Information Management System managed by the Contractor and for use by Owner, Owner's Consultants, Architect and Architect's Consultants.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow 10 business days for review of each resubmittal.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with a unique identifier:
   a. Specification number with no spaces followed by a period.
   b. Three-digit sequential number followed by a period.
   c. Two-digit revision number followed by a dash. An initial submittal will use 00 for the revision number.
   d. Two-character Type Identifier followed by a dash.
      1) CT for certificate.
      2) IN for informational submittal.
      3) PD for product data.
      4) QL for qualification information.
      5) SA for samples.
      6) SD for shop drawing.
      7) TR for test report.
   e. Short description of the content, using material designation indicated in the Contract Documents where present.
   f. Example: 084413.001.00-SD-Curtain Wall CW-1.pdf
3. Use submittal schedule to permanently record Contractor's review and approval markings and action taken by Architect and Owner.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner.

D. Options: Identify options requiring selection by the Architect and Owner.

E. Deviations: Identify deviations from the Contract Documents on submittals.
1. Clearly identify deviations from the Contract Documents by clouding or other suitable means acceptable to Architect and Owner.
   a. Provide accompanying detailed written explanation for each deviation.
   b. Provide the corresponding specification Section labeled with compliance and non-compliance.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

H. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Submit electronic submittals to Architect and Owner using PIMS.
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
   3. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 40 00 - Quality Requirements.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Equipment dimensional drawings.
      b. Wiring diagrams showing factory-installed wiring.
      c. Printed performance curves.
      d. Operational range diagrams.

e. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
3. Number and title of applicable Specification Section.
4. Number of Samples: Submit samples as required in individual Specification Sections.
5. Disposition: When possible, maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the responsibility of Contractor.

E. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 - Project Management and Coordination.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 - Construction Progress Documentation.

G. Application for Payment: Comply with requirements specified in Section 01 29 00 - Payment Procedures.

H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

O. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

P. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

Q. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

R. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

S. Maintenance Data: Comply with requirements specified in Section 01 78 23 - Operation and Maintenance Data.

T. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic filesigned and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. Provide delegated-design drawings to Owner in electronic format.

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00 - Closeout Procedures.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Final Unrestricted Release: When the Architect marks a submittal:
      a. A - NO EXCEPTIONS
      b. The Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
   2. Final-But-Restricted Release: When the Architect marks a submittal:
      a. B - EXCEPTIONS AS NOTED

b. The Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance. Resubmittal is not required for this action.

3. Returned for Resubmittal: When the Architect marks a submittal:
   a. C – REVISE AND RESUBMIT
   b. Do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
   c. Do not use, or allow others to use, submittals marked "C- REVISE AND RESUBMIT" at the Project Site or elsewhere where Work is in progress.
4. Returned as Rejected: When the Architect marks a submittal:
   a. D – REJECTED
   b. Do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. The submittal does not conform to the design concept or meet requirements of the Contract Documents.
   c. Do not use, or allow others to use, submittals marked "D – REJECTED" at the Project Site or elsewhere where Work is in progress.
5. Returned as received for Information Only: When the Architect marks a submittal:
   a. E – FOR INFORMATION ONLY
   b. Proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. The submittal is acceptable, but the Architect's affirmative action is not required.
6. Returned as Not Reviewed: When the Architect marks a submittal:
   a. F - NOT REVIEWED
   b. Submittal is not required by the Contract Documents.

B. Submittals are reviewed for conformance with the design concept expressed in the Contract Documents. Review is not for the purpose of confirming or approving:
   1. Deviation from the Contract Documents, including but not limited to deviation with reference to material, quantity, location, quality, dimension, or orientation (except as expressly annotated in writing by the Architect herein).
   2. Means, methods, sequences, or techniques of construction (unless expressly called for in the Contract Documents and herein expressly highlighted for review and approval by the Architect).
   3. Safety of the Contractor(s) work, work plan, procedures, workers or of the site.
   4. Any clarification of a patent or latent ambiguity or defect in the Contract Documents.
   5. Procurement or request for any labor, materials or other expense of the contractor(s) which is in addition to that previously approved by the Owner.

C. Contractor shall be and shall remain responsible for:
   1. Compliance with the Contract Documents.
   2. Coordination of the Work (including amongst various trades).
   3. Performing the Work in a safe and satisfactory manner.
   4. Confirming and correlating quantity and dimensions.
   5. Construction schedule.

D. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

E. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

F. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.

G. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.3 ATTACHMENTS

A. Appendix A – Electronic Drawing File Transfer Agreement Form (BIM).

END OF SECTION

Electronic File Transfer Agreement (Contractor – BIM Files)

Name		**Date:**	[Publish Date]
Address		**Project Name:**	Worcester South Division Fire Station Project
Description of Data:	Architectural BIM File	**Project No:**	157132.000

The undersigned is a contractor (the "Contractor") performing services and/or directly or indirectly providing goods and material related to the subject project (the "Project"). The undersigned hereby requests that Perkins&Will and its consultants provide electronic files prepared by Perkins&Will and its consultants for the Project in the form of an electronic model (the "Model Files"). The undersigned acknowledges and agrees that Perkins&Will has no contractual obligation, or any other obligation, to provide the Model Files to the contractor. Perkins&Will agrees to provide the Model Files in consideration for the undertakings of the undersigned. The undersigned agrees that the Contract Documents that Perkins&Will is contractually obligated to prepare and/or deliver are hardcopy drawings and specifications only. The undersigned additionally agrees that the Model Files are not Contract Documents (as that term is defined in or understood to mean in the Owner-Contractor Agreement), do not represent Contract Document modifications, and are not intended to be a substitute for or a supplement to the hardcopy drawings and specifications, or to necessarily represent actual physical conditions on the Project site.

Model Files to be furnished include work prepared by Perkins&Will and its consultant(s) only. The Model Files were prepared by Perkins&Will using the Autodesk® Revit® software platform. Model Files will be furnished in that software platform's standard format without modifications for the Contractor's convenience. One set of electronic Model Files will be furnished to the Contractor. The Contractor assumes responsibility for distributing pertinent files to the subcontractors.

The undersigned agrees that the request to provide the Model Files is purely for the convenience of the undersigned and does not constitute the rendering of professional services. Perkins&Will has prepared the Model Files to facilitate the production of the Contract Documents, which are reasonably accurate and complete to the extent of the standard of professional care. The undersigned acknowledges that Perkins&Will does not represent the furnished Model Files as being accurate or complete, as being suitable for the Contractor's purpose, or as identifying or containing any issue, anomaly, omission, or concern with reference to the Project.

The undersigned agrees and understands that the Model Files, except as expressly set forth above, are not fit for any particular purpose, including but not limited to quantity take-offs; pricing; clash detection; ascertainment of construction or installation tolerances and clearances; preparation of shop drawings, coordination drawings, or fabrication drawings; construction sequencing; or the manufacture of any building component or system. As such, the Model Files, and the information contained in them, and the information that may have been omitted from them, shall not be used as a basis for an increase in the Contract Sum or Contract Time.

The undersigned acknowledges that the Model Files have not necessarily been developed with the assistance or specific expertise of the individual subcontractors and installers, and therefore do not account for or incorporate means and methods required by individual subcontractors for their scope of the finished Work. Modifications to the information about the components included in the Model Files may be required and are the responsibility of the Contractor to ascertain, coordinate, and implement. All such modifications are part of the scope of Work of this Project and shall be provided at no additional cost to Owner.

The undersigned further acknowledges that Perkins&Will has made no representations to the undersigned that the Model Files are suitable for any purpose other than as expressly set forth above, or will be usable by the undersigned's systems, infrastructure, or software. The undersigned also understands and agrees that the Model Files may be subject to anomalies, errors, viruses, malware, or other unintended defects, and that Perkins&Will has not reviewed or determined whether such defects may be present in any electronic files. Use of these electronic files is solely at the risk of the undersigned.

The undersigned agrees to release any and all claims that they may have at any time against Perkins&Will or its consultants arising out of the use of the Model Files by the undersigned or by any other individual or entity. The undersigned agrees to hold harmless and indemnify Perkins&Will and its consultants from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees arising from or in any way connected with the provision of the Model Files by Perkins&Will or the use, modification, misinterpretation, misuse, or reuse by others of the Model Files provided by Perkins&Will. The undersigned shall not use, modify, or reproduce any of the Model Files without first removing identifying information for Perkins&Will and its consultants that may be incorporated in the furnished Model Files.

The undersigned confirms that it will use the Model Files only with reference to the Project and shall not copy or distribute the Model Files, or permit the Model Files to be copied or distributed by others, except for use on this Project. The undersigned shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms and conditions of this Agreement, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by this Agreement, assumes toward the Owner and Perkins&Will. The undersigned Contractor assumes responsibility for the breach of this Agreement by any Subcontractor to whom the Contractor distributes the Model Files.

Upon return receipt of this signed Agreement, the Model Files will be transmitted to the undersigned through electronic mail, or be posted on the Perkins&Will file transfer protocol site or the Project web site.

This Agreement may be executed in counterpart, and the parties agree that the individual counterparts, taken together, shall constitute a binding agreement.

The undersigned agrees that they are authorized to bind the company indicated below to the obligations of this Agreement, and understands that Perkins&Will is relying upon this representation in agreeing to enter into this Agreement. In addition to any rights that Perkins&Will may have against the company, the undersigned agrees that Perkins&Will shall have rights personally against the undersigned if this apparent authority is questioned or disputed by the company in any way.

The undersigned agrees that any violation of this Agreement by the undersigned or the company, or any of the agents, representatives, officers, or employees of either, will result in irreparable harm to Perkins&Will that cannot be entirely compensated by money damages. Therefore, the undersigned and the company agree that Perkins&Will may seek any and all equitable remedies that may be available to Perkins&Will, including but not limited to a temporary or permanent injunction in the event of any breach or threatened breach of the terms of this Agreement.

The undersigned shall reimburse Perkins&Will for any cost or expense, including attorney's fees and all labor and expenses (including those of in-house counsel), related to the enforcement of the terms of this Agreement.

Perkins&Will	***Acknowledged and Accepted***
Signature	*Signature of Recipient*
Name	*Name*
Title	*Company*
Date	*Title*

END OF AGREEMENT

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect and Owner or authorities having jurisdiction are not limited by provisions of this Section.
   4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

H. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

E. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, of each inspection, test, or similar service through the Contractor.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
   a. Date of issue.
   b. Project title and number.
   c. Name, address, and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretation of test results.
   j. Ambient conditions at the time of sample taking and testing.
   k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on retesting

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

C. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

D. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, telephone number, and email address of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement of whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

B. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, telephone number, and email address of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement of whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance. Where required by individual Specification Sections, Installer employing workers trained and approved by manufacturer, Installer being acceptable to manufacturer, and/or Installer being an authorized representative of manufacturer for both installation and maintenance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
   1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
   1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Massachusetts.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
      d. When testing is complete, remove assemblies; do not reuse materials on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Refer to Section 01 43 39 - Mockup Requirements and individual sections of the Specifications for mockup requirements.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
   2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
   3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
   1. The Contractor shall employ and pay a qualified independent testing agency to perform specified Quality-Control Services.
   2. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   3. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   4. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.

5. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
6. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
8. Re-testing: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

C. Testing Agencies Responsibilities: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 - Submittal Procedures.

E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

F. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
   1. Distribution: Distribute schedule to Owner, Architect, and testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 WORK CONDITIONS / SEQUENCE

A. If sub-contractors find that conditions are not appropriate for them to begin the work of their trade or if they are directed to perform their work out of sequence by the General Contractor or if the General Contractor directs sub-contractors to start and continue regardless of job conditions, the sub-contractor shall so notify the Owner and Architect in writing by certified mail immediately.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Authorities Having Jurisdiction reference during normal working hours.
   1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 - Execution.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 00

REFERENCES

PART 1 GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract, without any implied meaning extending the Architect's responsibility into the Contractor's area of Contractor coordination, supervision, or means and methods of construction as outlined in the Conditions of the Contract.
   1. In no situation will an approval by Architect release Contractor from responsibility to fulfill requirements of the Contract Documents.

C. “Authorities Having Jurisdiction” (AHJ): Means the agencies, either individually or collectively, charged by statute with administration and enforcement of the requirements of building codes and other regulations at the Project location.

D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

E. “General Requirements”:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions (if any) and other Division 01 General Requirement Sections, apply to all sections of the work.
   2. The provisions or requirements of Division 01 Sections apply to entire Work of the Contract and where so indicated, to other elements which are included in the Project.

F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

J. "Provide": Furnish and install, complete and ready for the intended use.

K. "Installer": Means the Contractor or other entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor to perform a particular construction operation at the Project site, including preparation, erection, installation, application, construction, re-installation, and similar operations required for execution of the Work.
   1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
   2. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

L. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits.
2. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 43 39

MOCKUP REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for constructing mockups.
   1. Integrated Exterior Mockups.

1.2 DEFINITIONS

A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

1.3 ACTION SUBMITTALS

A. Shop Drawings: For laboratory, integrated exterior, and whole room mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.4 QUALITY ASSURANCE

A. Coordinate with trades affected in completion of required mockups at location designated by Owner.

B. Complete each item or system of the mockup by the tradesmen who will provide the actual work.

C. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

D. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction of the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

E. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.5 PROJECT CONDITIONS

A. Coordinate with trades affected in completion of required mockups at location designated by Owner.

B. Complete each item or system of the mockup by the respective trades and subcontractors who will be performing the actual Work.

C. Before installing portions of the work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by the Owner and Architect.
2. Notify Owner and Architect five days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Owner’s and Architect's approval of mockups before starting fabrication, or construction of remaining work represented by the mockup.
a. Allow five days for initial review and each re-review of each mockup

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

D. Use the same installation methods and materials as required for the Work. Schedule construction so that it may be reviewed, and any necessary adjustments made, prior to commencing fabrication of the Work. When accepted, mock-up shall serve as the standard for materials, workmanship, and appearance throughout the Project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 INTEGRATED EXTERIOR MOCKUPS

A. General: Mockup components shall be full size, using the same materials as those to be used in the actual Work, including details and methods of construction.

B. Exterior Wall System Mockup:
1. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
2. Fabricate exterior wall mockup in accordance with approved Shop Drawings.
3. Construct mockup of portion of typical exterior wall, approximately 14 feet high by 8 feet wide.
4. Prepare each mockup from completely detailed drawings incorporating architectural and structural features in accordance with the Contract Documents. Mockup shall include components of both vertical and corner wall sections including insulation, glazing, metal panels and coping. The mockup shall include all types of glass units specified.
5. Provide full size mockup of portion of exterior wall system as indicated on Drawings, to include the following:
   a. Structural metal framing backup wall, including sheathing and air/weather barrier.
   b. Masonry veneer, including veneer ties and reinforcing.
   c. Exterior window assembly, with specified glazing, and including all related flashings and sealant.
6. Fabricate and erect each mockup under manufacturer's / installer's direct supervision and employ workmen as they would be employed during the actual erection at the job site. Employ same supervisory personnel who will perform site erection.
7. Tolerance: Exterior wall systems shall be fabricated and installed with sufficient tolerances to provide for such expansion and/or contraction as will be caused by an exterior ambient temperature ranging from 0 degrees fahrenheit to an exterior metal surface temperature of 160 degrees fahrenheit without causing harmful buckling, opening of joints, undue stress of fastenings or other detrimental effects.
8. Demolish and remove mockups when directed, unless otherwise indicated.

C. Exterior Building Sign Assembly:
   1. Provide a full-size sample of each type of illuminated and cast letter temporarily mounted on the building at the height designated for the final position of the sign for Architect's approval of size, shape and readability.
   2. Hang letter from roof or window so that it is at exact height required for the permanent attachment. Ensure temporary attachment is secure and safe. Retain in position until approved by Architect.

END OF SECTION

SECTION 01 45 33

CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for special inspections required by the International Building Code.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to substantiate that the construction is in compliance with the code prescribed special inspections, procedures and requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to substantiate that actual products incorporated into the Work and completed construction comply with the code requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

D. Field Special Inspections: Tests and inspections that are performed on-site to demonstrate required documentation for code compliance of Chapter 17 of the IBC International Building Code, with amendments. Edition/ release that is consistent with the requirements of the project.

E. Testing Agency: An entity engaged to perform special inspections, tests, inspections. Testing laboratory shall mean the same as testing agency.

F. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more inspections is specified and the inspections establish different or conflicting requirements demonstrate compliance with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Special Inspector Qualifications: Prior to the start of construction, the approved agencies shall provide written documentation to the building official demonstrating the competence and relevant experience or training of the special inspectors who will perform the special inspection and tests during construction. Experience or training shall be considered relevant where the documented experience or training is related in complexity to the same type of special inspection or testing activities for projects of similar complexity and material quantities. These qualifications are in addition to qualifications specified in other sections of the code.

B. The approved agency and their personnel shall act as the required special inspectors for the work required by ICC (IBC) Chapter 17.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 REPORTS AND DOCUMENTS

A. Inspection and Test Reports: Prepare and submit certified written reports as required by the code to achieve compliance the required special inspection requirements.
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Complete test or inspection data.
   8. Test and inspection results and an interpretation of test results.
   9. Comments or professional opinion attesting that the tested or inspected Work complies with the Code requirements.
   10. Name and signature of laboratory inspector.
   11. Recommendations on retesting and re-inspecting.

B. At completion of construction, the Testing Agency shall provide a final report sealed by its Professional Engineer in responsible charge, along with standard AHJ form(s) as required by the building official.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located, serving as the special inspections engineer of record in responsible charge of the project. The engineer shall be experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for inspections of the installations of systems, assemblies, or product that are similar in material, design, and extent to those indicated for this Project.

D. Specialists: Specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

E. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to the code requirements; and with additional qualifications specified in any related individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

1.7 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional special inspections and code required quality-control activities required to verify that the Work complies with the Code requirements, whether specified or not.
   1. Engage a qualified testing agency to perform these quality-control services.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

D. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.

E. Coordination: Coordinate sequence of activities to accommodate required special inspection services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner or Design Professional, as indicated in Statement of Special Inspections attached to this Section, and as follows:

B. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in Statement of Special Inspections attached to this Section, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

2. Notifying Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to authorities having jurisdiction, with a copy to the Contractor, Owner and Architect.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

IBC Sections	Type of Special Inspections and Extent	Applicable	Non-Applicable	Continuous	Periodic
1705.1.1	Special cases		X		
1705.2	Steel Construction	X			X
1705.3	Concrete construction	X			X
1705.4	Masonry construction	X			X
1705.5	Wood construction		X		
1705.6	Soils	X			X
1705.7	Driven deep foundation	X			X
1705.8	Cast-in-place deep foundations		X		
1705.9	Helical pile foundations		X		
1705.10	Fabricated items		X		
1705.11	Special inspections for wind resistance		X		
1705.14	Sprayed fire-resistant materials	X			X
1705.15	Mastic and intumescent fire-resistant coatings		X		
1705.16	Exterior insulation and		X		

	finish systems (EIFS)				
1705.17	Fire-resistant penetrations and joints		X		
1705.18	Testing for smoke control		X		
	Other :				

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution"

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SPECIAL STRUCTURAL TESTING AND INSPECTION

PROGRAM SUMMARY SCHEDULE

PROJECT NAME: _____

PROJECT NO.: _____

LOCATION: _____ PERMIT: _____(1)

TECHNICAL (2)		DESCRIPTION (3)	TYPE OF INSPECTOR (4)	REPORT FREQUENCY (5)	ASSIGNED FIRM (6)
SECTION	ARTICLE				
03 30 00 – 3.14		CAST-IN-PLACE CONCRETE CONCRETE PLACEMENT	SI-T I	DAILY	
04 20 00 – 1.7		UNIT MASONRY	TA	PERIODIC	
04 20 00 – 3.11		UNIT MASONRY SITE-PREPARED MORTAR PROPORTIONS	TA	PERIODIC	
04 20 00 – 3.11		UNIT MASONRY GROUT SPACES AND REINFORCEMENT	SI-T II	PERIODIC	
04 20 00 – 3.11		UNIT MASONRY SITE-PREPARED GROUT PROPORTIONS	SI-S I	PERIODIC	
04 20 00 – 3.6 B 4		COLD-FORMED METAL FRAMING MATERIAL SAMPLING & TESTING	SI-T I	DAILY	
04 20 00 – 3.6 B 4		COLD-FORMED METAL FRAMING WELDING	SI-T I	PERIODIC	

	PROCEDURES AND PREPARATION			
05 12 00	**STRUCTURAL STEEL FRAMING** **REINFORCEMENT OF EXISTING BEAMS, INCLUDING WELDS**	**SI-T I**	**EACH**	
05 12 00	**STRUCTURAL STEEL FRAMING** **DECK LAYOUT, REINFORCEMENT, AND CONCRETE**	**SI-T I**	**EACH**	
05 31 00	**STEEL DECKING**			
07 24 19 – 3.9	**WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)** **PROTECTION AND CURING**	**SI-T I**	**PERIODIC**	
07 81 00 – 3.6	**APPLIED FIREPROOFING** **CONDITION OF SUBSTRATES**	**SI-T I**	**PERIODIC**	
07 81 00 – 3.6	**APPLIED FIREPROOFING** **THICKNESS OF APPLICATION**	**SI-T I**	**PERIODIC**	
07 81 00 – 3.6	**APPLIED FIREPROOFING** **DENSITY IN POUNDS PER CUBIC FOOT (KG/M3)**	**TA**	**PERIODIC**	
07 81 00 – 3.6	**APPLIED FIREPROOFING** **BOND STRENGTH ADHESION/COHESION**	**SI-T I**	**PERIODIC**	

07 81 00 – 3.6	**APPLIED FIREPROOFING** **CONDITION OF FINISHED APPLICATION**	**SI-T I**	**PERIODIC**	
07 84 13 – 3.5	**PENETRATION FIRESTOPPING**	**SI-T I**	**PERIODIC**	

NOTE: THIS SCHEDULE SHALL BE FILLED OUT AND INCLUDED IN THE SPECIAL STRUCTURAL TESTING AND INSPECTION PROGRAM.

PERMIT NUMBER TO BE PROVIDED BY THE BUILDING OFFICIAL.

REFERENCE TO THE SPECIFIC TECHNICAL SCOPE SECTION IN THE PROGRAM.

USE DESCRIPTIONS PER IBC CHAPTER 17, AS ADOPTED BY [INSERT APPLICABLE STATE HERE]STATE BUILDING CODE.

SPECIAL INSPECTOR – TECHNICAL, SPECIAL INSPECTOR – STRUCTURAL.

WEEKLY, MONTHLY, PER TEST/INSPECTION, PER FLOOR, ETC.

FIRM CONTRACTED TO PERFORM SERVICES.

ACKNOWLEDGEMENTS

EACH APPROPRIATE REPRESENTATIVE SHALL SIGN BELOW:

OWNER:	**FIRM:**	**DATE:**
CONTRACTOR:	**FIRM:**	**DATE:**
ARCHITECT:	**FIRM:.**	**DATE:**
SER:	**FIRM:**	**DATE:**

SI-S:	**FIRM:**	**DATE:**
SI-T:	**FIRM:**	**DATE:**
TA:	**FIRM:**	**DATE:**
F:	**FIRM:**	**DATE:**

IF REQUESTED BY ENGINEER/ARCHITECT OF RECORD OR BUILDING OFFICIAL, THE INDIVIDUAL NAMES OF ALL PROSPECTIVE SPECIAL INSPECTORS AND THE WORK THEY INTEND TO OBSERVE SHALL BE IDENTIFIED.

LEGEND: SER = STRUCTURAL ENGINEER OF RECORD SI-T= SPECIAL INSPECTOR – TECHNICAL

TA = TESTING AGENCY SI-S = SPECIAL INSPECTOR – STRUCTURAL F = FABRICATOR

ACCEPTED FOR THE PERMITS AND INSPECTIONS DEPARTMENT BY: _____ DATE: _____

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for temporary utilities, support facilities, and security and protection of facilities.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, includes as a minimum, the following:
   1. Permanent or temporary roofing is complete, insulated, and weathertight, including parapets and roof edge terminations.
      a. Roof insulation is fully protected from getting wet.
      b. Roof drains are fully functional.
   2. Exterior walls are insulated, weathertight, and UV-resistant.
   3. All openings are closed with permanent construction or substantial weathertight temporary closures.
   4. Permanent enclosure envelope shall be capable of retaining controlled interior temperature and humidity levels.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 SUBMITTALS

A. Informational Submittals:

1. Site Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
2. Implementation and Termination Schedule: Within 15 days of date established from commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
3. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
4. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
5. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
6. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
    a. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
    b. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
    c. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
7. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
    a. Methods used to meet the goals and requirements of the Owner.
    b. Concrete cutting method(s) to be used.
    c. Location of construction devices on the site.
    d. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
    e. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
    f. Indicate Locations of sensitive research, patient, and equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner’s requirements.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, State Accessibility Code, Local Accessibility Code, and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42 mm) OD top rails.

B. Lumber and Plywood: Comply with requirements in Section 06 10 53 - Miscellaneous Carpentry.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rockwool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

F. Paint: Comply with requirements in Sections 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting.

G. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
   1. Office shall be of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

B. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

C. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 Closeout Procedures.

D. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

E. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

F. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner’s property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 01 10 00 - Summary.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

E. Temporary Heating and Cooling: Provide temporary temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
   1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
   1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service overhead unless otherwise indicated.
   2. Connect temporary service to Owner's existing power source, as directed by Owner.

H. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
   1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
   2. Provide warning signs at power outlets other than 110 to 120 V.
   3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
   4. Provide metal conduit enclosures or boxes for wiring devices.
   5. Provide 4-gang outlets, spaced so 100-foot (30-m) extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

J. Electronic Communication Service: Provide temporary electronic communication service in common-use facilities.
   1. Provide broadband in primary field office.
   2. Provide for connection of communication devices by Owner, Architect, and Contractor by Wi-Fi, or wired connections.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
   2. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.
   3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 31 20 00 "Earth Moving."
   3. Recondition base after temporary use, including removing contaminated material, regrading, proof-rolling, compacting, and testing.
   4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 32 12 16 "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Identification Signs: Provide Project identification signs as indicated on Drawings.
   2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   3. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 - Execution.

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Temporary Elevator Use:
   1. Use of elevators is not permitted.

K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
   1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 01 10 00 - Summary.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion and sedimentation control Drawings.
   1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
   2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
   3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
   4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Comply with requirements specified in Section 01 56 39 - Temporary Tree and Plant Protection.

F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

G. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

H. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

I. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Coordinate and provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

J. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

K. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

L. TEMPORARY WEATHER PROTECTION: Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Provide enclosures as required on the exterior or interior side of the building, whether the roof has been installed or not, and whether windows or doors have been installed or not, in order to protect the Work and allow Work to continue in accordance with the requirements of the Specifications. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
      a. Erect and maintain temporary enclosures and provide temporary heat during the months of November through March.
   2. Install tarpaulins securely, with fire-retardant-treated wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
   3. Close openings through floor or roof decks and horizontal surfaces with loadbearing wood- framed construction.
   4. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL- labeled fireretardant treated material for framing and main sheathing.
   5. Do not use new permanent doors and frames for temporary enclosures until finishing work is begun, and then only if carefully protected from damage. Prior to installation of permanent doors and frames, provide temporary wood or plywood doors with wood frames and proper hardware to make the doors self-closing.
      a. Close and lock all openings accessible from ground level at end of each day’s work to prevent entry of unauthorized persons.

6. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required. All doors shall have thresholds and door sweeps. Provide locksets keyed from both sides. Keys to all temporary locksets should be provided to the Fire and Police Departments.
7. Provide walk-off mats at each entrance through temporary partition.

M. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

N. Temporary Fire-Rated Partitions: Erect and maintain dustproof fire-rated partitions and temporary enclosures to limit dust and dirt migration and to separate occupied areas from construction, fumes, and noise. Fire-rated partitions shall be provided to separate existing occupied areas from construction areas in accordance with NFPA 241
1. Construct fire-rated dustproof partitions of not less than nominal 4-inch (100-mm) studs, 1/2-inch (13-mm) or 5/8-inch (16 mm) Type X gypsum wallboard on both sides, with joints taped.
2. Extend partitions up to underside of existing structure to the greatest extent possible.
3. Insulate partitions to provide noise protection to occupied areas.
4. Seal joints and perimeter with fire-resistant joint sealant.
5. Equip partitions with dustproof doors and security locks.
    a. Protect openings in 1-hour fire-rated partitions with 45-minute hollow metal or solid core wood doors.
6. Protect air-handling equipment.
7. Weatherstrip openings.

O. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
5. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
6. Prohibit smoking in construction areas.
7. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
8. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
9. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

P. Protection: Protect the Work at all times from damages. Provide all pumps, equipment and enclosures to ensure this protection.
   1. Remove all snow and ice as may be required for proper protection and prosecution of the work.
   2. Provide all shoring, bracing and sheeting as required for safety and for proper execution of work.
   3. Protect all work from damage during cold weather. If low temperatures make it impossible to continue operations safely in spite of cold weather precautions, cease work and so notify Architect. Repair and/or replacement of all work damaged from frost, freezing or any elements of the weather are the responsibility of the Contractor.
   4. Should high wind warnings be issued by the U.S. Weather Advisory Bureau, take every precaution to minimize danger to persons, to the Work, and to adjacent properties, including, but not limited to, removing all loose materials, tools and/or equipment from exposed locations, and removing or securing scaffolding or other temporary work.

5. Protect the building and the site from damage, loss or liability due to theft or vandalism when the work is not in progress at night, weekends, or holidays.Exercise precaution for the protection of persons and property at all times. Observe the provisions of applicable laws and construction codes. Take additional safety and health measures, or cause such measures to be taken as reasonably necessary. Maintain guards on machinery, equipment and other hazards as set forth in the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable laws.
6. Protect and preserve in operating conditions all utilities traversing the work area. Repair all damages to any utility due to work performed under this Contract, the satisfaction of the Architect at no additional cost to the Owner.

Q. Roof Protection: The Contractor shall protect newly installed roof surfaces to prevent damage. Keep traffic on roofs to an absolute minimum, and permit traffic only as required to complete the Work under this Contract. Manage access for each phase of the work to minimize operations on previously installed roofing. Do not store roofing material on previously installed new roofing.
   1. Repair or replace all roofing and substrates that are damaged by operations under this Contract by any means necessary, in accordance with the Specifications and the requirement and the roofing system Manufacturer’s recommendations to their original condition, to the satisfaction of the Architect, at no additional expense to the Owner.

R. Protect all new finished surfaces against possible damage from operations under this Contract.
   1. Restore or replace all surfaces that are damaged by operations under this Contract to their original condition, to the satisfaction of the Architect, at no additional expense to the Owner.
   2. Do not load, or allow any part of the structure to be loaded, with a weight that will endanger its safety or the safety of personnel operating in or around the premises.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
   a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
   b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
   c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 - Closeout Procedures.

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. This section includes the protection and trimming of trees that are to remain but interfere with, or are affected by, execution of the Work, whether temporary or new construction.

1.2 RELATED WORK

A. SECTION 31 00 00, EARTHWORK

B. SECTION 31 25 00, EROSION AND SEDIMENTATION CONTROL

C. SECTION 32 91 19, LOAMING AND SEEDING

1.3 QUALITY ASSURANCE

A. Tree Pruning Standards: Comply with the National Arborist Association's "Pruning Standards for Shade Trees" except where more stringent requirements are indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D448, size 24, with 90 to 100 percent passing a 2-½-inch (63-mm) sieve and not more than 10 percent passing a ¾-inch (19-mm) sieve.

B. Topsoil: As per Specification Section 32 91 13: Soil Preparation and Soil Mixes.

C. Filter Fabric: Manufacturer’s standard, non-woven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Temporary Protection: Provide temporary tree protection fencing as indicated on the contract drawings or approved alternative guard systems located outside the drip line (outer perimeter of branches) to protect remaining trees and other plants from damage.

B. Protect tree root systems from damage due to noxious materials caused by run-off or spillage while mixing, placing, or storing construction materials. Protect root

systems from flooding, eroding, or excessive wetting caused by dewatering operations.

C. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line and prevent soil compaction over root systems.

D. Do not allow fires.

3.2 EXCAVATION

A. Do not excavate within tree drip line, unless otherwise indicated.

B. Where excavation for new construction is required within tree drip lines, hand excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

1. Relocate roots in backfill areas wherever possible. If encountering large, main lateral roots, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3-inches (75 mm) back from new construction.

2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition and temporarily support and protect roots from damage until they are permanently relocated and covered with earth.

C. Where utilities trenches are required within tree drip lines, tunnel under or around the roots by drilling, auger boring, pipe jacking, or digging by hand.

1. Root Pruning: Do not cut main lateral roots to tap roots; cut only smaller roots that interfere with installation of new work. Cut roots with sharp pruning instruments; do not break or chop.

3.3 REGRADING

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree drip line. Maintain existing grades within tree drip lines.

1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots to tap roots; cut only smaller roots. Cut roots cleanly with sharp pruning instruments; do not break or chop.

B. Minor Fill: Where existing grade is 6-inches (150 mm) or less below elevation of finish grade shown, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

C. Moderate Fill: Where existing grade is more than 6-inches (150 mm) but less than 12-inches (300 mm) below finish grade elevation, place a layer of drainage fill, filter fabric, and a final layer of topsoil on existing grade.

1. Carefully place drainage fill against tree trunk approximately 2-inches (50 mm) above finish grade elevation and extend not less than 18-inches (450 mm) from tree trunk on all sides. For balance of area within drip line perimeter, place drainage fill to an elevation 6-inches (150 mm) below grade.

2. Place filter fabric with overlapping edges of 6-inches (150 mm) minimum.

3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.4 TREE PRUNING

A. If required, prune remaining trees to compensate for root loss caused by damaging or cutting root system as required by the Landscape Architect in accordance with accepted horticultural practices.

B. Cut branches with sharp pruning instruments; do not break or chop.

3.5 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations to prevent progressive deterioration.

1. Provide new trees of size and species selected by the Landscape Architect when trees over 6-inches (150 mm) in caliper, measured 12-inches (300 mm) above grade, are required to be replaced, due to abuse/damage/neglect of contractor.

3.6 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property.

END OF SECTION

SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction. Temporary measures include the following:
   1. Silt fences and straw bales.
   2. Sediment barriers and check dams.
   3. Stabilized construction entrance.
   4. Construction of temporary swales and sedimentation basins as required.
   5. Seeding, sodding, and hydromulching.

B. Comply with all local, state, and federal regulations regarding erosion control including the applicable provisions of the EPA (NPDES) regulations from the Federal Clean Water Act.

1.2 NOTICE OF INTENT

A. Contractor and Owner shall jointly submit an EPA Notice of Intent (NOI) prior to construction.

B. Contractor shall prepare the report, coordinate with Owner, and file in accordance with regulations.

1.3 REFERENCE STANDARDS

A. ASTM A702 - Standard Specification for Steel Fence Posts, Hot Wrought.

B. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit.

PART 2 PRODUCTS

2.1 SILT FENCE

A. Filter Fabric: Nonwoven polypropylene, polyethylene or polyamide thermoplastic fibers with non-raveling edges. The fabric shall be non-biodegradable, inert to most soil chemicals, ultraviolet resistant, unaffected by moisture or other weather conditions, and permeable to water while retaining sediment. The filter fabric shall be supplied in rolls a minimum of 36 inches (0.9 meter) wide.

B. Inlet Protection Support: Welded wire fabric 2 x 4 - W1.0 x W1.0 (50 x 100 - MW7 x MW7).

C. Fence Posts: Painted or galvanized steel Tee or Y-posts with anchor plates, not less than 5 feet (1.5 meters) in length with a minimum weight of 1.3 pounds per foot (1.9 k/m). Hangers shall be adequate to secure fence and fabric to posts. Posts and anchor plates shall conform to ASTM A702.

2.2 STRAW BALES

A. Standard bound rectangular hay bales.

2.3 STABILIZED CONSTRUCTION ENTRANCE

A. Aggregate: Graded mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448 and TEX 401-A coarse-aggregate; with 0 percent being retained by a 5-inch (127-mm) sieve and 100 percent being retained by a 3-inch (76-mm) sieve.

2.4 GRASS AND FERTILIZER

A. Materials, seeding, and sodding shall conform to applicable Division 32 section.

2.5 WATER

A. Use clean potable water for maintaining the grass.

PART 3 EXECUTION

3.1 GENERAL

A. Keep disturbed areas to a minimum required to adequately perform the work. At all times maintain the site in such a manner that minimizes erosion of the site. The execution of work under this section shall be in conformance with the NPDES rulings and the site Storm Water Pollution Prevention Plan.

B. Maintenance: Inspect all SWPPP controls not less than every seven days and after every storm event. Provide report to Owner after each inspection.

3.2 SILT FENCES

A. Silt fence shall be a minimum of 24 inches (0.6 meter) high. Posts shall be embedded a minimum of 12 inches (300 mm) in the ground, placed a maximum of 8 feet (2.4 meters) apart and set on a slight angle toward the anticipated runoff source.
   1. When directed by the Engineer or designated representative, posts shall be set at specified intervals to support concentrated loads.

B. Securely attach filter fabric to posts, with the bottom 12 inches (300 mm) of filter fabric buried in a trench a minimum of 6 inches (150 mm) deep and 6 inches (150 mm) wide to prevent sediment from passing under the fence.
   1. When silt fence is constructed on impervious material, a 12-inch (300-mm) flap of fabric shall be extended upstream from the bottom of the silt fence and weighted to limit particulate loss.
   2. No horizontal joints will be allowed in the filter fabric.
   3. Vertical joints shall be overlapped a minimum of 12 inches (300 mm) with the ends sewn or otherwise securely tied.

C. Silt fence shall be maintained for the duration of the project, and repaired, replaced, and/or relocated when necessary or as directed by the Engineer or designated representative. Accumulated silt shall be removed when it reaches a depth of 6 inches (150 mm).

3.3 EROSION CONTROL BARRIERS

A. Provide erosion control barriers at intervals along swales and ditches as shown on the Drawings or as necessary to meet the requirements of the Storm Water Pollution Prevention Plan.

B. Barriers: Silt fence or hay bales placed as indicated on the Drawings.

C. Maintain barriers in good working condition and replace when damaged.

3.4 STABILIZED CONSTRUCTION ENTRANCE

A. Remove trees, brush, stumps, obstructions, and other objectionable material and disposed of in a manner that will not interfere with the excavation, grading, and construction of the entrance as indicated on the Drawings.
   1. Stabilized construction entrance shall not drain onto the public right-of-way and shall not allow surface water runoff to exit the construction site.
   2. When necessary, vehicle wheels shall be cleaned to remove sediment prior to entrance onto public right of way.
      a. When vehicle washing is required, it shall be done on an area stabilized with crushed stone, which drains into an approved sediment trap or sediment basin.
   3. Sediment shall be prevented from entering any storm drain, ditch or watercourse through use of sandbags, gravel, boards, silt fence or other methods approved by the Engineer or designated representative.

B. The entrance shall be maintained in a condition that will prevent tracking or disposition of sediment onto public right of way. Provide periodic top dressing with additional stone as conditions demand, as well as the repair and/or cleanout of any measures used to trap sediment. Sediment that is spilled, dropped, washed, or tracked onto public right-of-way shall be removed immediately.

3.5 TEMPORARY SWALES

A. Description:
   1. Provide temporary drainage swales as required to carry drainage away from the work area to an approved outfall point.
   2. Unless otherwise shown on the drawings, swales shall be earthen "V" shaped channels graded to a sufficient depth and slope to carry the anticipated runoff, but at least 2 feet deep with a slope of 0.1 percent.
   3. Swales not designated to remain in place at the completion of the contract shall be cleaned of any muck, debris and other unsuitable material and filled with approved fill before final grading operations begin.
   4. Swales shall have erosion control barriers as required.

B. Maintenance:
   1. During the course of construction maintain temporary swales constructed for this contract so as to allow proper drainage from the construction area.
   2. Work with other contractors at the site in maintaining existing swales and ditches.
   3. Where necessary for access to the work areas, install adequately sized culverts and maintain to provide the access without disturbing the site drainage.
   4. Take care not to rut and damage sodded swales. Immediately repair damaged swales.
   5. Maintain sodded swales.

3.6 TEMPORARY DRAINAGE DITCHES

A. Immediately hydromulch or provide alternative stabilization method approved by Owner and Engineer, to drainage ditches upon final grading.

B. Repair erosion of the banks of the drainage ditches immediately and re-stabilize.

C. Place sediment barriers at intervals along the ditch as shown on the plans or as necessary to help trap sediment on the site. Daily remove sediment and other debris trapped by the barriers.

D. Maximum Ditch Side Slopes: 3 feet horizontal to 1 foot vertical.

E. Maintenance of the ditches during construction shall include as applicable mowing, re-grading, sediment removal, re-hydromulching, bank repair and debris removal.

F. Sediment removed from the ditches may be respread on the site as approved by the Owner and Engineer.

3.7 FILL AND CUT SLOPES

A. Fill slopes in all cases shall be no steeper than 3:1 unless specifically stated on the plans or approved by the Owner's soils engineer.

B. When cut slopes exceed 2:1 for depths over 3 feet, proper bracing and shoring per OSHA requirements shall be used and maintained.

3.8 REMOVAL AND CLEANING

A. Remove SWPPP controls at completion of construction and restore and stabilize areas disturbed during construction.

B. Coordinate final walk-through with Owner.

END OF SECTION

SECTION 01 58 13

TEMPORARY PROJECT IDENTIFICATION SIGN

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary project identification sign.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Show text and graphics layout for signs. Provide message list, typestyles, graphic elements, and layout for sign at a scale of not less than 1-1/2 inches per foot.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Professional sign painter with a minimum of five years experience in the painting of graphics and signs of the type similar to that specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Section 06 10 53 - Miscellaneous Carpentry
   1. Sign: 3/4-inch thick, A-B grade EXT - APA plywood sheet.
   2. Posts: Pressure treated 4-inch by 4-inch No. 2 yellow pine.
   3. Braces: Pressure treated 2-inch by 4-inch No. 2 yellow pine.

C. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.

2.2 FABRICATION

A. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

B. Engage an experienced sign painter to apply graphics for Project identification signs. Generally the sign shall indicate project name, Owner's name, Contractor's name and Architect's name and logo.

C. Prepare temporary signs to provide directional information to construction personnel and visitors.

D. Construct signs of exterior-type high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
   1. Project Identification Sign: 8-feet wide by 4-feet high.
   2. Temporary Signs: Size as required to accommodate actual text.

E. Project Identification Sign Text and Graphics: Include the following:
   1. Name of Project.
   2. Name of Owner.
   3. Name of Contractor.
   4. Name of Architect.

F. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.

PART 3 EXECUTION

3.1 GENERAL

A. Project identification sign shall be located as shown on the Drawings or as directed by the Architect.

B. Contractor may install their own separate job sign with the approval of the Owner and Architect, and in location as directed.

3.2 INSTALLATION

A. Excavation: In firm, undisturbed or compacted soil, drill or (using a post-hole digger) hand-excavate holes for posts to diameters and spacing required to accommodate signs.

B. Project identification sign, Contractor's job sign, and Architect's job sign shall each be installed and erected in a substantial manner.

C. Signs shall be installed with the bottom edge a minimum of 3'-0" above the ground.

D. Posts shall be set at a minimum of 3'-0" into the ground and each post braced with 2 x 4 lumber braces to resist anticipated wind loads.

E. Install signposts and sign panels plumb, level, and square and in proper planes with other work.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
   1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Identification of basis-of-design product, fabrication, or installation method to be replaced, including Specification Section number and title, and Drawing numbers and titles.

B. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 - Submittal Procedures. Show compliance with requirements.

D. Substitution: Refer to Section 01 25 00 - Substitution Procedures for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
   1. Each Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between Contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 COORDINATION

A. Coordinate affected Work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Provide a secure location and enclosure at Project site, at location approved by Owner for storage of materials and equipment.
   2. Store products to allow for inspection and measurement of quantity or counting of units.
   3. Store materials in a manner that will not endanger Project structure.
   4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   5. Store cementitious products and materials on elevated platforms.
   6. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   8. Protect stored products from damage and liquids from freezing.
   9. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 - Closeout Procedures.

1.8 PROHIBITION ON INCORPORATION OF HAZARDOUS MATERIALS

A. Architect and its consultants have not knowingly specified for incorporation into the work, materials or products containing hazardous materials or toxic substances (including asbestos).

B. Contractor (including its subcontractors, sub-subcontractors, and material suppliers/fabricators under its control) is prohibited from incorporating any material or products into the work containing hazardous materials or toxic substances.

C. As part of completed materials and products list required herein, Contractor shall assemble, for the Owner’s records, the Material Safety Data Sheets (MSDS) for all materials and products incorporated into the work. These MSD sheets shall be updated upon final completion of the work to incorporate changes which have occurred during the course of the work due to approved substitution requests and other modifications. Architect will not review, nor approve, the MSD sheets. The Contractor, also as a pre-requisite to achieving final completion, shall provide a certificate to the Owner indicating that no hazardous or toxic materials or products were incorporated into the work.

D. Architect and its consultants are not responsible for the presence of hazardous materials or toxic substances in or around the work, nor the exposure to persons who construct or subsequently occupy the work. The Architect will not provide certifications regarding the presence or absence of such materials or substances.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
      a. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00 - Substitution Procedures.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
      a. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00 - Substitution Procedures.
   3. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
      b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
         1) Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00 - Substitution Procedures.
   4. Manufacturers:
      a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
      b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
         1) Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00 - Substitution Procedures.
   5. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

6. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer.
   a. Submitted in accordance with provisions of Section 01 25 00 - Substitution Procedures.
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
   a. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00 - Substitution Procedures.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
   1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 - Substitution Procedures for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
   1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
   2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
   3. Full Industry Range: Where Specifications include the phrase "full industry range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from any listed manufacturer's product line that includes both standard and premium items.
   4. "Custom Color as selected by Architect" or "to match color on file in Architect's office", "match Architect's sample" means that the color selected is custom and requires custom formulations and submissions of color to obtain Architect's approval prior to application.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   5. Samples, if requested.

B. Submitted in accordance with provisions of Section 01 25 00 - Substitution Procedures.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 73 00

EXECUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Coordination of Owner-installed products.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit two copies signed by land surveyor.

D. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examination of the Site and Records of Existing Construction and Conditions: Examine the site, the records of existing construction, and the conditions under which the Work is to be performed. Notify the Architect immediately if existing conditions discovered will affect the Work as shown on the Contract Documents

B. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping, underground electrical services, and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Existing Conditions Depicted in the Contract Documents: The Contract Documents are based upon the information furnished to the Architect by the Owner. Such information is available from the Owner. The records are furnished for information only and may not represent all conditions that will be encountered. The records of existing construction represent conditions known to the Owner. Other construction, of which no records are available, may be encountered. Dimensions of existing construction are based on information provided to the Architect by the Owner. The Contractor and each subcontractor shall field verify dimensions of existing conditions.

D. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

E. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

F. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 - Project Management and Coordination.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Owner promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.

6. Notify Architect and Owner when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Owner.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect and Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Precautions Against Movement or Settlement: The Contractor shall take precautions, including bracing, shoring, underpinning, or other retaining structures, to guard against movement or settlement of existing or new construction. Assume responsibility for the design, safety, and support of such construction, and for movement, settlement, damage, or injury resulting from the construction.

C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

G. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

H. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

I. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

J. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 - Temporary Facilities and Controls.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 - General Commissioning Requirements.

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 - Quality Requirements.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative and procedural requirements for cutting and patching.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

C. Cutting and patching is performed for coordination of the Work, to uncover Work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

D. Restoring or removing and replacing non-complying work is specified separately from cutting-and-patching but may require cutting-and-patching operations as specified herein.

1.3 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.
   1. Coordinate with Owner if Cutting and Patching Conference will be required.
   2. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
      a. Contractor's superintendent.
      b. Trade supervisor responsible for cutting operations.
      c. Trade supervisor(s) responsible for patching of each type of substrate.
      d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
   3. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Coordinate with Owner if Cutting and Patching Plan will be required.
2. Extent: Describe reason for and extent of each occurrence of cutting and patching.
3. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
4. Products: List products to be used for patching and firms or entities that will perform patching work.
5. Dates: Indicate when cutting and patching will be performed.
6. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 QUALITY ASSURANCE

A. Comply with requirements for and limitations on cutting and patching of construction elements.
    1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
    2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
    3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
    4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Owner and Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Temporary Support: Provide temporary support of Work to be cut.

C. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, prepare substrate, and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
   4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

D. Fire Rated Construction: At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 13 - Penetration Firestopping, to full thickness of the penetrated element.

E. Roofing: Where penetrations are made through the roof system to accommodate mechanical, electrical, or plumbing systems, or any other reason associated with the Work, repair in accordance with the original manufacturer’s requirements. Install curbs, cants, flashing and other roof system components in accordance with Specifications within this Project Manual and recommendations by the manufacturer of the roof system presently in place. Return assembly to weather-tight condition. Also refer to Division 07 Section on roof modifications or repairs.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous construction waste.
   2. Recycling nonhazardous construction waste.
   3. Disposing of nonhazardous construction waste.

1.2 RELATED REQUIREMENTS

A. Section 02 41 19 - Selective Demolition for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

G. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable and reusable material.

H. Waste Management Plan: A project-related plan for the collection, transportation and disposal of waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material becoming landfill.

1.4 PERFORMANCE GOALS

A. Salvage/Recycle Goals: Owner's goal is to salvage and recycle as much nonhazardous construction waste as possible including the following materials:
   1. Construction Waste:
      a. Site-clearing waste.
      b. Masonry and CMU.
      c. Lumber.
      d. Wood sheet materials.
      e. Wood trim.
      f. Metals.
      g. Roofing.
      h. Insulation.
      i. Carpet and pad.
      j. Gypsum board.
      k. Piping.
      l. Electrical conduit.
      m. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
         1) Paper.
         2) Cardboard.
         3) Boxes.
         4) Plastic sheet and film.
         5) Polystyrene packaging.
         6) Wood crates.
         7) Plastic pails.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 WASTE HANDELING

A. Site AccessSite Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor prepared list of items to be completed or corrected, prepared for the Architect's use prior to Owner, Owner's Agent, and Architect's inspection (Design Team Punchlist), to determine if the Work is substantially complete.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For cleaning agents.
   2. Contractor's List of Incomplete Items: Initial submittal at time of request for Substantial Completion Inspection.
   3. Certified List of Incomplete Items: Final submittal at Final Completion.

B. Closeout Submittals:
   1. Certificates of Release: From authorities having jurisdiction.
   2. Certificate of Insurance: For continuing coverage.
   3. Field Report: For pest control inspection.

C. Maintenance Material Submittals:
   1. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. "Substantial Completion" is the stage in the progress of Work when Work or designated portion thereof is sufficiently complete in accordance with Contract Documents so Owner can occupy or utilize Work for use which it is intended.

1. Work will not be considered suitable for Substantial Completion review until all systems and equipment are operational; all designated or required governmental inspections and certifications have been made and posted, designated instruction of Owner's personnel in operation of systems and equipment has been completed, operation and maintenance data has been satisfactorily turned over to the Owner, and all finishes are in place. In general, the only remaining Work shall be minor in nature, such that the Owner could occupy project or designated portion thereof on following day, and completion of Work by Contractor would not materially interfere or hamper Owner's normal business operations.
2. Contractor shall certify that all remaining Work will be completed within a reasonable time, agreed upon by Owner, following date of Substantial Completion. Failure of the Contractor to complete the Work within the stipulated time shall automatically re-institute the provisions for liquidated damages due Owner as contained elsewhere in Contract Documents, or as provided by law for such period of time as may be required by Contractor to fully complete Work whether Owner has occupied the Project or not.

B. Contractor's List of Incomplete Items: Using Web-based Project Information Management Systems, prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

C. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
    a. Accessibility standard inspection for compliance with ANSI A117.1, Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local requirements if more stringent.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.

6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

D. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 - Demonstration and Training.
6. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
7. Advise Owner of changeover in heat and other utilities.
8. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Complete final cleaning requirements, including touchup painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

E. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request and the Contractor’s list of incomplete items, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 29 00 - Payment Procedures.

2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or substantially similar form, and forward to Architect at time of request for Substantial Completion inspection. Architect may use same form for Architect’s supplemental items to Contractor.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.
4. Submit list of incomplete items in the following format:
   a. PDF electronic file. Architect will return annotated file.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Refer to Section 01 78 23 - Operation and Maintenance Data.

1.8 PROJECT RECORD DOCUMENTS

A. Refer to Section 01 78 39 - Project Record Documents.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
   1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 50 00 - Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Emergency procedures manuals.
   3. Operation manuals for systems, subsystems, and equipment.
   4. Product maintenance manuals.
   5. Systems and equipment maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
   1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

1.4 COORDINATION

A. Where operation and maintenance documentation include information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.

2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:
1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.3 EMERGENCY PROCEDURES MANUALS

A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION AND MAINTENANCE MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.

2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Digital Data Files.
   3. Record Specifications.
   4. Record Product Data.
   5. Miscellaneous record submittals.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Initial Submittal:
      a. Submit PDF electronic files of Contractor's marked-up record documents.
      b. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
   2. Final Submittal:
      a. Submit PDF electronic files of scanned record documents.
      b. Print each drawing, whether or not changes and additional information were recorded.
   3. Final Submittal:
      a. Submit record digital data files.
      b. Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Model: Comply with Owner's requirements.

C. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

D. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

PART 2 PRODUCTS

2.1 RECORD DRAWINGS

A. Maintain a marked-up copy of Contract Drawings and Shop Drawings, incorporating new items and revisions as modifications are issued.
   1. Preparation: Mark record documents to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record documents.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record documents to corresponding archive photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.
      n. Record information on the Work that is shown only schematically.
   3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record documents.
   4. Mark record sets in red. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original Drawings.
   6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD DIGITAL DATA FILES

A. Immediately before inspection for Certificate of Substantial Completion, review marked-up record documents with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record documents. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with digital data files of the original Contract Drawings for use in recording information.
    a. Architect makes no representations as to the accuracy or completeness of Electronic Drawings as they relate to the Contract Drawings.
    b. Digital Data Software Program: The electronic files will be made available in the digital data software program in which they were produced by the Architect. Contractor is responsible for any necessary conversions to an alternate software program.
    c. See Section 01 33 00 - Submittal Procedures and "Electronic File Transfer Agreement" form for requirements related to use of Architect's digital data files.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location
1. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
2. Identification: As follows:
    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS".
    d. Name of Architect.
    e. Name of Contractor.

2.3 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic file(s).

2.4 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Product Data as scanned PDF electronic file(s).
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s).
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Instruction in operation and maintenance of systems, subsystems, and equipment.
   2. Demonstration and training video recordings.
   3. Descriptions and responsibilities for commissioning demonstration and training requirements.

1.2 SUBMITTALS

A. Informational Submittals:
   1. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
      a. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products.
   2. Attendance Record: For each training module, submit list of participants.

B. Closeout Submittals:
   1. Demonstration and Training Video Recordings: Submit within seven days of end of each training module.
      a. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 78 23 - Operation and Maintenance Data.

1.3 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect and Owner.

1.4 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
      h. Performance curves.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.
      b. Systems and equipment operation manuals.
      c. Systems and equipment maintenance manuals.
      d. Product maintenance manuals.
      e. Project Record Documents.
      f. Identification systems.
      g. Warranties and bonds.
      h. Maintenance service agreements and similar continuing commitments.
   3. Emergencies: Include the following, as applicable:
      a. Instructions on meaning of warnings, trouble indications, and error messages.
      b. Instructions on stopping.
      c. Shutdown instructions for each type of emergency.
      d. Operating instructions for conditions outside of normal operating limits.
      e. Sequences for electric or electronic systems.
      f. Special operating instructions and procedures.
   4. Operations: Include the following, as applicable:
      a. Startup procedures.
      b. Equipment or system break-in procedures.
      c. Routine and normal operating instructions.
      d. Regulation and control procedures.
      e. Control sequences.

f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

1.5 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 - Operation and Maintenance Data.

B. Set up instructional equipment at instruction location.

1.6 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner with at least 10 days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.7 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. Digital Video Recordings:
   1. Submit video recording by method acceptable to Owner.
   2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
   3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.

END OF SECTION

SECTION 01 81 19

CONSTRUCTION INDOOR AIR QUALITY REQUIREMENTS

PART 1- PRODUCTS

1.1 DESCRIPTION OF WORK

A. This Section includes requirements for the development of a Construction Indoor Air Quality Management Plan (herein referred to as the Plan). The Plan shall be developed by the Contractor and approved by the Owner and Architect. The Plan shall be implemented throughout the duration of the Project construction under the direction of the Contractor's IAQ Representative and shall be documented per the Submittal Requirements in Part 1 of this Section.

1.2 CONSTRUCTION IAQ MANAGEMENT GOALS FOR THE PROJECT

A. The Owner has established that this Project shall minimize the detrimental impacts on Indoor Air Quality (IAQ) resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site, and poor housekeeping, shall be minimized.

1.3 DEFINITIONS

A. Volatile Organic Compounds (VOC's): Carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at normal room temperatures. These compounds are common in and emitted by many building products, including solvents in paints, coatings, adhesives and sealants, wood preservatives; composite wood binder, and foam insulations. Not all VOC's are harmful, but many of those contained within building products contribute to the formation of smog and may irritate building occupants or construction workers by their smell and/or health impact.
   1. Materials that act as "sinks" for VOC contamination: absorptive materials, typically dry and soft (such as textiles, carpeting, acoustical ceiling tiles and gypsum board) that readily absorb VOC'S emitted by "source" materials and release them over a prolonged period of time.
   2. Materials that act as "sources" for VOC contamination: products with high VOC contents that emit VOC'S either rapidly during application and curing (typically "wet" products, such as paints, sealants, adhesives, caulks and sealers) or over a prolonged period (typically "dry" products such flooring coverings with plasticizers and engineered wood with formaldehyde).
      a. Minimum efficiency reporting value (MERV): Filter rating established by ASHRAE and determined according to ASHRAE standard 52.2-2007. MERV categories range from 1 (very low efficiency) to 16 (very high efficiency),

1.4 REFERENCE STANDARDS

A. ANSI/SMACNA 008-2008, "IAQ Guidelines for Occupied Buildings Under Construction", Second Edition 2007, Chapter 3, The Sheet Metal and Air Conditioner National Contractors Association (SMACNA), www.smacna.org.

B. ANSI/ASHRAE 52.2-2007, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size", www.ashrae.org.

C. EPA PB90200288 – Compendium of Methods for the Determination of Air Pollutants in Indoor Air, U.S. Environmental Protection Agency (EPA), 1990, available from National Technical Information Service, www.ntis.gov

1.5 CONSTRUCTION IAQ MANAGEMENT PLAN (DURING CONSTRUCTION) - OVERVIEW

A. The Contractor shall prepare and submit a Construction IAQ Management Plan for the construction and pre-occupancy phases of the Project to the Owner and Architect. The Construction IAQ Management Plan shall meet the following criteria:
   1. Construction activities shall be planned to meet or exceed the minimum requirements included in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction", as listed in Part 1 of this Section.
   2. Absorptive or porous materials shall be protected from moisture damage when stored on-site and after installation. Contractor shall not install water damaged materials in the building.
   3. Filtration media shall be installed to protect ductwork and/or HVAC equipment used during the construction process, per the requirements of Part 2 of this Section.
   4. The use of tobacco products shall be prohibited inside the building and within 25 feet of the building entrance during construction.
   5. Only low-emitting and low- or no-VOC products shall be installed in the field on the interior of the Project. Examples of such products include, but are not limited to, adhesives, sealants, paints, coatings, and carpet.
   6. A Sequence of Finish Installation Plan shall be developed, highlighting measures to reduce the absorption of VOCs by materials that act as "sinks".
   7. Upon approval of the Plan by the Owner and Architect, it shall be implemented by the Contractor and Subcontractors throughout the duration of the construction process and documented in accordance with the Requirements of this Section.
   8. All occupiable and habitable spaces within the Project shall be subject to either an air flush-out or air testing after construction and immediately prior to occupancy, as directed by the Owner and described in Part 1 of this Section.

1.6 CONSTRUCTION IAQ MANAGEMENT PLAN (DURING CONSTRUCTION) – DETAILED REQUIREMENTS

A. The SMACNA "IAQ Guidelines for Occupied Buildings Under Construction" (Chapter 3) outline IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format and shall address measures to be implemented by the Contractor and/or Subcontractors in each of the five SMACNA categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this project should be listed as such.
   1. HVAC Protection:
      a. Return Side.
      b. Central Filtration.
      c. Supply Side.
      d. Duct Cleaning.
   2. Source Control:
      a. Product Substitution.
      b. Modifying Equipment Operation.
      c. Changing Work Practices.
      d. Local Exhaust.
      e. Air Cleaning.
      f. Cover or Seal.
   3. Pathway Interruption:
      a. Depressurize Work Area.
      b. Pressurize Occupied Space.
      c. Erect Barriers to Contain Construction Areas.
      d. Relocate Pollutant Sources.
      e. Temporarily Seal the Building.
   4. Housekeeping:
      a. Suppressing dust.
      b. Cleaning and excess applications of products containing solvents.
      c. Addressing spills, water conditions, and accumulated water.
      d. Vacuuming.
      e. Protecting porous materials and other building systems from exposure to moisture and contamination.
   5. Scheduling:
      a. Sequencing installation of materials.
      b. Installation during unoccupied periods.
      c. Avoid building occupancy while construction-related pollutants are still present.

B. Protection of Materials from Moisture Damage: Under the Housekeeping section of the Plan, describe measures to prevent installed materials or material stored on-site from moisture. This section should also describe measures to be taken if moisture damage does occur to absorptive materials during the course of construction.
   1. Store materials on elevated platforms or pallets under cover and in a dry location.
   2. If materials are not stored in an enclosed location, cover tops and sides of materials with waterproof sheeting, securely tied.

3. Phase construction such that absorptive materials are installed only in areas that are weather-tight.

C. Protection of Ductwork: Under the HVAC Protection section of the Plan, describe measures to protect air handling and distribution equipment and air supply and return ducting during construction.
   1. All ductwork arriving on site shall have the ends and openings sealed with plastic sheeting and stored on pallets or dunnage until installed. Plastic seals shall be remain in place during ductwork installation and shall be repaired or replaced as necessary to maintain continuous protection throughout the duration of construction.
   2. The Contractor shall cover and protect all exposed air inlets and outlets, openings, grilles, ducts, plenums, etc. to prevent water, moisture, dust and other contaminant intrusion.
   3. All ductwork shall be stored on site above the ground or floor slabs.
   4. Ducting runs shall be protected at the end of each day's work.
   5. The Contractor shall apply protection immediately after ducting.
   6. The Contractor's designated IAQ Representative shall inspect work and monitor subcontractor(s) to ensure compliance.

D. Temporary Filtration: The Contractor shall inspect temporary filtration weekly and replace as required to maintain the proper ventilation rates in the building.

E. Filtration Media shall meet the requirements as listed in Part 2 of this Section.

F. Replacement of Filtration Media: Under the HVAC Protection section of the Plan, provide a description of the filtration media in all ventilation equipment used during construction. The description shall include replacement criteria for filtration media during construction and confirmation of filtration media replacement for all equipment immediately prior to occupancy.
   1. Filtration media shall meet the requirements of Part 2 of this Section. At the end of construction the Contractor shall provide a confirmation that all filtration media were replaced prior to occupancy.

G. Sequence of Finish Installation for Materials
   1. Absorptive materials should be installed after the installation of materials or finishes which have high short-term emissions of VOC's, formaldehyde, particulates, or other air-borne compounds.
      a. Absorptive materials ("sinks") include, but are not limited to: carpets; acoustical ceiling panels; fabric wall coverings; insulations (exposed to the air stream); upholstered furnishings; and other woven, fibrous or porous materials.
      b. Materials with high short-term emissions ("sources") include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paints, wood preservatives and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; finish processes and products associated with gypsum board installation; and composite or engineered wood products with formaldehyde binders.

2. The Contractor shall develop a Sequence of Finish Installation Plan and schedule that identifies how the sequencing of finish material installation will occur for the project. The schedule shall be submitted to the Owner and Architect in accordance with the Submittal Requirements of this Section.

H. Ventilation during installation of materials and finishes: outside air shall be provided during the installation of materials and finishes, beginning after the building is substantially enclosed. If permanent building HVAC systems are used to supply the ventilation air, filtration media shall be installed per the requirements of Part 2 of this Section.

1.7 SUBMITTAL REQUIREMENTS

A. The Contractor shall submit the following required records and documents:
1. Prior to start of construction, submit the following:
   a. A construction schedule outlining the start-up date and expected duration of all Construction IAQ Management Plan control measures.
   b. A copy of the Construction IAQ Management Plan and the Sequence Installation Plan for approval by the Owner and Architect, as defined in Part 1 of this Section.
2. Product cut-sheets for all filtration media used during construction and installed immediately prior to occupancy, with MERV values highlighted and meeting the criteria for filtration media in Part 2 of this Section. Cut sheets shall be submitted with the Contractor's 'approved' stamp as confirmation that the products submitted are the same products installed on the project.
3. At end of construction, submit the following:
   a. Photographs that document the implementation of the Construction IAQ Management Plan throughout the course of the project construction. Submit a minimum of (18) photographs, (6) photographs taken on at least (3) different occasions during construction, each labeled with the SMACNA control measure illustrated. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage to prevent moisture damage. Photographs shall include integral date stamping and shall be submitted with brief descriptions or be referenced to project meeting minutes or similar project documents.
   b. Construction IAQ Management Summary Report.

1.8 QUALITY ASSURANCE

A. Contractor IAQ Representative: IAQ Engineer with five (5) years experience performing IAQ supervision on projects of comparable size and scope.

B. IAQ Testing Agency: Independent testing and inspecting agency, subject to approval by the Owner and with minimum of five (5) years experience in performing the types of testing specified herein on projects of comparable size and scope.

PART 2 - PRODUCTS

2.1 FILTRATION MEDIA

A. Construction filters: If permanently installed air handlers are used during construction, filtration media must be installed at each return grill and air handling unit, having a Minimum Efficiency Reporting Value (MERV) of at least 8 as determined by ASHRAE Standard 52.2-2007. All construction filtration media shall be replaced immediately prior to occupancy.

B. Flush-out filters: If the Flush-out option will be pursued as described in Part 1 of this Section, new filtration media shall be installed at air handling units having a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE Standard 52.2-2007.

C. Final filters: Replace all filtration media immediately prior to occupancy. For all ventilation systems that supply outside air, install filters having a Minimum Efficiency Reporting Value (MERV) of 13 or better as determined by ASHRAE Standard 52.2-2007.

2.2 BUILDING MATERIALS

A. Low-emitting products specified in technical Sections of the Project Manual. VOC content shall comply with requirements in Division 02-28 sections.

B. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches, commencing with installation of finishes inside the Project.

2.3 CLEANING SUPPLIES

A. Use low toxicity cleaning supplies for surfaces, equipment and workers personal use, during periodic and final cleaning. Comply with requirements for closeout and final cleaning specified in Division 01.

PART 3 - EXECUTION

3.1 IMPLEMENTATION AND COORDINATION

A. The Contractor shall be responsible for implementation of the Construction IAQ Management Plan and for the coordination of the Plan with all affected trades per the requirements of Part 1 of this Section.
   1. The Contractor shall designate one individual as the Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner and Architect on a regular basis and for assembling the required documentation.
   2. The Contractor shall include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order or to rectify non-compliant conditions.

B. The Contractor shall include procedures related to IAQ Management on the agenda during pre-construction meetings and during regularly scheduled meetings on the jobsite. Minutes shall be recorded at all such meetings.

C. Trade subcontractors shall be responsible for the implementation of specific control measures, as specified in the Construction IAQ Management Plan. Subcontractors shall coordinate their responsibilities through the Contractor and their designated Construction IAQ Representative.

END OF SECTION

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

1.2 DEFINITIONS

A. BoD: Basis of Design.

B. CxA: Commissioning Authority.

C. OPR: Owner's Project Requirements.

D. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

E. TAB: Testing, Adjusting, and Balancing.

1.3 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:
1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.4 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
1. Coordination meetings.

2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Testing meetings.
4. Demonstration of operation of systems, subsystems, and equipment.

C. Provide utility services required for the commissioning process.

D. Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Provide utility services required for the commissioning process.

B. Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
1. Participate in design- and construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in operation and maintenance training sessions.
4. Participate in final review at acceptance meeting.
5. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
7. Review and approve final commissioning documentation.

C. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
1. Participate in design- and construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in procedures meeting for testing.
4. Participate in final review at acceptance meeting.
5. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
6. Provide information to the CxA for developing construction-phase commissioning plan.
7. Participate in training sessions for Owner's operation and maintenance personnel.
8. Provide updated Project Record Documents to the CxA on a daily basis.
9. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified in Division 01 Section "Operation and Maintenance Data."
10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.

1.6 CXA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Prepare a construction-phase commissioning plan. Collaborate with Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.

C. Review and comment on submittals from Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.

E. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; and Project completion.

F. Observe and inspect construction and report progress and deficiencies. In addition to compliance with the OPR, BoD, and Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.

G. Prepare Project-specific test and inspection procedures and checklists.

H. Schedule, direct, witness, and document tests, inspections, and systems startup.

I. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.

J. Certify date of acceptance and startup for each item of equipment for start of warranty periods.

K. Review Project Record Documents for accuracy. Request revisions from Contractor to achieve accuracy. Project Record Documents requirements are specified in Section 01 78 39 - Project Record Documents.

L. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the OPR, BoD, and Contract Documents. Operation and maintenance documentation requirements are specified in Section 01 78 23 - Operation and Maintenance Data.

M. Prepare operation and maintenance training program and provide qualified instructors to conduct operation and maintenance training. Operation and maintenance training is specified in Section 01 79 00 - Demonstration and Training

N. Videotape and edit training sessions.

O. Videotape construction progress including hidden shafts.

P. Prepare commissioning reports.

Q. Assemble the final commissioning documentation, including the commissioning report and Project Record Documents.

1.7 COMMISSIONING DOCUMENTATION

A. Index of Commissioning Documents: CxA shall prepare an index to include storage location of each document.

B. OPR: A written document, prepared by Owner, that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

C. BoD Document: A document, prepared by Architect, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

D. Commissioning Plan: A document, prepared by CxA, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:
   1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
   2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
   3. Identification of systems and equipment to be commissioned.
   4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
   5. Identification of items that must be completed before the next operation can proceed.
   6. Description of responsibilities of commissioning team members.
   7. Description of observations to be made.
   8. Description of requirements for operation and maintenance training, including required training materials.
   9. Description of expected performance for systems, subsystems, equipment, and controls.
   10. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
   11. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.

12. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
13. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
14. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.

E. Test Checklists: CxA shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist. Specific checklist content requirements are specified in Division 23 Section "HVAC Commissioning Requirements." Each checklist, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
1. Name and identification code of tested item.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Deficiencies.
8. Issue number, if any, generated as the result of test.

F. Certificate of Readiness: Certificate of Readiness shall be signed by Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.

G. Test and Inspection Reports: CxA shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

H. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

I. Issues Log: CxA shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the OPR, BoD, and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.
1. Creating an Issues Log Entry:
    a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
    b. Assign a descriptive title of the issue.

c. Identify date and time of the issue.
d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
e. Identify system, subsystem, and equipment to which the issue applies.
f. Identify location of system, subsystem, and equipment.
g. Include information that may be helpful in diagnosing or evaluating the issue.
h. Note recommended corrective action.
i. Identify commissioning team member responsible for corrective action.
j. Identify expected date of correction.
k. Identify person documenting the issue.

2. Documenting Issue Resolution:
   a. Log date correction is completed or the issue is resolved.
   b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
   c. Identify changes to the OPR, BoD, or Contract Documents that may require action.
   d. State that correction was completed and system, subsystem, and equipment is ready for retest, if applicable.
   e. Identify person(s) who corrected or resolved the issue.
   f. Identify person(s) documenting the issue resolution.
3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, CxA shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, CxA shall include the following information in the issues log and expand it in the narrative:
   a. Issue number and title.
   b. Date of the identification of the issue.
   c. Name of the commissioning team member assigned responsibility for resolution.
   d. Expected date of correction.

J. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BoD, and Contract Documents. The commissioning report shall include, but is not limited to, the following:
   1. Lists and explanations of substitutions; compromises; variances in the OPR, BoD, and Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the OPR, BoD, and Contract Documents and those that do not meet requirements of the OPR, BoD, and Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.
   2. OPR and BoD documentation.
   3. Commissioning plan.
   4. Testing plans and reports.

5. Corrective modification documentation.
6. Issues log.
7. Completed test checklists.
8. Listing of off-season test(s) not performed and a schedule for their completion.

K. Systems Manual: CxA shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:
1. OPR and BoD, including system narratives, schematics, and changes made throughout the Project.
2. Project Record Documents as specified in Section 01 78 39 - Project Record Documents.
3. Final commissioning plan.
4. Commissioning report.
5. Operation and maintenance data as specified in Section 01 78 23 - Operation and Maintenance Data.

1.8 SUBMITTALS

A. Commissioning Plan Prefinal Submittal: CxA shall submit three hard copies of prefinal commissioning plan. Deliver one copy to Contractor, one to Owner, and one to Architect. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final construction-phase commissioning plan.

B. Commissioning Plan Final Submittal: CxA shall submit three hard copies and two sets of electronically formatted information of final commissioning plan. Deliver one hard copy and one set of discs to Owner, and two copies to Architect. The final submittal must address previous review comments. The final submittal shall include a copy of the prefinal submittal review comments along with a response to each item.

C. Test Checklists and Report Forms: CxA shall submit sample checklists and forms to Contractor quality-control manager and subcontractors for review and comment. Submit three copies of each checklist and report form.

D. Certificates of Readiness: CxA shall submit Certificates of Readiness.

E. Test and Inspection Reports: CxA shall submit test and inspection reports.

F. Corrective Action Documents: CxA shall submit corrective action documents.

G. Prefinal Commissioning Report Submittal: CxA shall submit two hard copies of the prefinal commissioning report. Include a copy of the preliminary submittal review comments along with CxA's response to each item. CxA shall deliver one copy to Owner and one copy to Architect. One copy, with review comments, will be returned to the CxA for preparation of final submittal.

H. Final Commissioning Report Submittal: CxA shall submit two hard copies and two sets of electronically formatted information of the final commissioning report. CxA shall deliver one hard copy and one set of discs to Owner, and one copy to Architect. The final submittal must address previous review comments and shall include a copy of the prefinal submittal review comments along with a response to each item.

1.9 QUALITY ASSURANCE

A. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

B. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.10 COORDINATION

A. Coordinating Meetings: CxA shall conduct biweekly coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.

B. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested.

C. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

D. Manufacturers' Field Services: CxA shall coordinate services of manufacturers' field services.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. Training Preparation Conference: Before operation and maintenance training, CxA shall convene a training preparation conference to include Owner's operation and maintenance personnel, Contractor, and subcontractors. In addition to requirements specified in Section 01 79 00 - Demonstration and Training, perform the following:
   1. Review the OPR and BoD.
   2. Review installed systems, subsystems, and equipment.
   3. Review instructor qualifications.
   4. Review instructional methods and procedures.
   5. Review training module outlines and contents.
   6. Review course materials (including operation and maintenance manuals).

7. Inspect and discuss locations and other facilities required for instruction.
8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

B. Training Modules: Develop an instruction program that includes individual training modules for each system, subsystem, and equipment as specified in Section 01 79 00 - Demonstration and Training.

END OF SECTION

SECTION 02 61 00.13

HANDLING AND DISPOSAL OF EXCAVATED SOIL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section specifies requirements for the excavation, handling, stockpile and disposal of excavated soil, and handling, treatment, and disposal of dewatering effluent.

B. The work shall include the excavation, stockpiling, and backfill of excavated soil, the loading, hauling, and disposal of surplus excavated soil, the pumping of water, return of the water to the excavation or on-site treatment specified herein.

C. The Engineer collected soil samples to pre-characterize and facilitate acceptance of surplus excavated materials by off-site reuse, recycling and/or disposal facilities. The Contractor shall profile surplus excavated materials based on the pre-characterization results provided as attachment to these specifications. The Engineer will provide soil acceptance request letters and appropriate back-up information for the Contractor's use in obtaining acceptance for excavated materials prior to commencing with the excavation work. As described herein, the Contractor is required to supplement the pre-characterization as needed to expedite readiness to haul and dispose.

1.2 RELATED WORK

A. SECTION 01 33 00, SUBMITTAL PROCEDURES

B. SECTION 31 00 00, EARTHWORK

C. SECTION 31 23 19, DEWATERING

D. SECTION 31 50 00, SUPPORT OF EXCAVATION

1.3 SUBMITTALS

A. The Contractor shall submit to the Engineer for review, an Excavated Material Management Plan (EMMP), which includes at a minimum the information required by Paragraph 1.03.B of this Section, not more than 14 days after issuance of the Notice to Proceed.

B. The Contractor's EMMP shall include the following:

1. Plans outlining the proposed procedures and sequence for the excavation of material to be reused on-site and disposed/recycled off-site, procedures used to track excavated materials to be transported off-site and a proposed implementation schedule.

2. All pertinent information relating to the transport of excavated material, at a minimum, shall include:

a. Name and address of all transporters.

b. Transporter identification number (USEPA or Massachusetts Department of Transportation Transporter) and expiration date.

c. Dust control measures.

3. The Contractor shall identify appropriate reuse sites and/or disposal/recycling facilities that will accept each category of excavated material identified in Paragraph 3.06 of this Section. The Contractor shall submit names of a minimum two (2) sites or facilities for each category. Disposal/recycling facilities listed in the EPA Superfund Program will not be accepted for this Work. For each facility, the Contractor shall submit the following information:

a. General Information:

1) Facility Name

2) Facility Address

3) Name of Contact Person

4) Title of Contact Person

5) Telephone Number of Contact Person

6) Permit Number

b. The facility shall specify the volume of material that can be accepted from the site on a weekly and total basis.

c. The facility shall provide written confirmation that they are permitted to accept and will accept the excavated material and/or accumulated sediment of the general quality and quantity described by these Specifications.

d. The facility shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of the soils or materials specified in this Contract.

e. The Contractor shall submit a complete list of the reuse sites and each disposal/recycling facility's permitted allowable contaminant levels and physical characteristic requirements for contaminated material, and list any required regulatory approvals for individual waste streams.

f. After the Contractor obtains approval for off-site reuse and/or disposal/recycling of surplus excavated materials, the Contractor shall submit to the Engineer, approvals or letters of intent and facility information for each facility proposed, prior to transporting material off-site.

4. The Contractor shall include procedures for decontamination of vehicles and equipment in the EMMP.

5. The Contractor shall include procedures for the monitoring and control of dust in the EMMP.

C. Submit a site specific Health and Safety Plan (HASP). Contractor shall prepare HASP that addresses all of the expected physical and chemical hazards likely to be encountered during the work of this Section.

D. Contractor shall provide to the Engineer copies of all weight slips, both tare and gross, for every load weighed and disposed of at the disposal or recycling facilities. The Owner will only allow progress payment after receipt of these weight slips.

1.4 REFERENCES

A. Massachusetts Department of Environmental Protection (DEP) Policy Numbers:

1. WSC-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils.
2. WSC-94-320, Construction Activities in Contaminated Areas.
3. COMM-97-001, Reuse and Disposal of Contaminated Soils at Massachusetts Landfills.
4. WSC-13-500, Similar Soils Provision Guidance

B. 310 CMR 40.0000, the Massachusetts Contingency Plan

1.5 EXISTING CONDITIONS

A. The Contractor shall note that the work will involve handling soil containing metals and total petroleum hydrocarbons (TPH) and groundwater containing dissolved metals, total iron, and extractable petroleum hydrocarbons (EPH).

B. Prior to construction, the Engineer performed environmental subsurface investigations to pre-characterize on-site soil that is expected to be generated as excess soil during construction activities. A summary of the environmental testing results is provided as an attachment. The Contractor shall profile excavated materials based on the pre-characterization data. Additional testing to meet off-site receiving facility acceptance criteria is the Contractor’s responsibility.

1.6 PERMITS

A. Contractor shall obtain all local, State, and Federal permits required for the transport and disposal of all liquid and solid waste resulting from the performance of this Work.

PART 2 - PRODUCTS

2.1 CLEANUP MATERIALS

A. Containers and truck beds used by the Contractor for storing and/or hauling the excavated material shall be constructed of steel, in good condition and designed for the intended purpose of safe, secure storage of contaminated and hazardous material during loading and transport. The containers shall have a secure cover that will prevent release of material from trucks during transportation. The containers and covers shall be provided at no additional cost to the Owner and shall be approved by the Engineer prior to mobilization of any trucks/containers. The containers must be approved by and labeled in accordance with the U.S. Department of Transportation (DOT). The containers shall be sift proof and water resistant in accordance with the DOT.

B. The Contractor shall have available, and all personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection for this work as indicated in the site-specific Health and Safety Plan.

2.2 FILL MATERIALS

A. The backfill material shall conform to the requirements indicated on the drawings and Section 31 00 00, EARTHWORK.

B. Contractor shall notify the Owner, Property Owner, and Engineer as to the source of the backfill material and provide samples as requested by the Engineer.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All open excavations shall be adequately safeguarded by temporary barricades, fencing, caution signs, lights, and any other means necessary to prevent accidents to persons, or damage to property. The length or size of the excavation will be controlled by the site-specific surrounding conditions. Contractor shall take all precautions not to create a hazardous situation and shall implement special construction procedures, as necessary.

B. All removal and excavation work of the project shall proceed in a timely manner and in such a way that assessment of excavation(s) is not hampered or slowed by other components of the work.

C. If contaminated soil or groundwater (staining or unnatural odors) is encountered, the Contractor shall notify the Owner, Property Owner, and Engineer immediately. The Engineer may momentarily stop work to field screen or collect samples for laboratory analysis. The work shall not resume until so directed by the Engineer, and upon review of the laboratory results, if necessary.

D. Soil within the work zone has been pre-characterized for the Contractor’s use profiling and obtaining acceptance for surplus excavated materials to be transported off-site. The Contractor shall select and appropriate off-site facility based on the 2025 pre-characterization data provided and the excavated material categories listed in Paragraph 3.06. The Engineer will provide a signed LSP Opinion Letter along with all required facility acceptance forms and shipping documents for the Contractor’s use in securing acceptance letters for the material after approving the Contractor’s intended disposal facilities identified in the EMMP.

E. The Contractor shall maximize the reuse of all excavated materials on-site as backfill. The excavated materials shall be reused as backfill in the general area where they were generated. Coordinate reuse of excavated soil with all applicable section of the specifications, including Section 31 00 00 – EARTHWORK.

F. The Owner will be the generator of all excavated materials removed from the site and will sign all Material Shipping Records and Massachusetts Bills of Lading. The Contractor shall be the generator of material contaminated as a result of the Contractor or Sub-Contractor’s release of oil/hazardous materials on the site caused by them.

G. The Owner shall have final approval over all reuse/disposal/recycling options based on the analytical data.

H. If an Imminent Hazard, Potential Imminent Hazard, or any other condition requiring an Immediate Response Action as defined in the Massachusetts Contingency Plan 310 CMR 40.0000 is encountered, activities shall be suspended and the Engineer notified immediately.

3.2 DISPOSAL CHARACTERIZATION SAMPLING – GENERAL

A. Pre-characterization sampling soil data and the associated laboratory reports are provided as an attachment to these specifications. No additional samples shall be collected without approval by the Engineer.

B. If necessary, the Contractor shall perform any additional sampling and characterizing of excavated material for the purpose of obtaining approvals from reuse/disposal/recycling facilities. No additional sampling or analysis shall be performed in lieu of profiling excavated materials using the pre-characterization data collected by Engineer, only where supplementing the existing data set is required to obtain approval by off-site receiving facilities.

C. The Owner may conduct additional sampling upon excavation of the work site. The Engineer may stop the Contractor's work in a particular location at any time in order to have samples taken and analyzed. If necessary, the Contractor shall assist the Engineer in collecting samples. The work shall not resume in that area until required by the Engineer. Stoppage of work for this reason, or until laboratory results are delivered to the Engineer, shall not be a cause for the Contractor to request additional compensation or and extension of time to the Contract or to other intermediate Contract deadlines.

3.3 EXCAVATION

A. Provide any sheeting, temporary bracing and temporary supports that may be required to ensure the integrity of the excavation and to protect any facilities outside the limits of the excavation that are to remain in service. All sheeting, bracing, and temporary supports shall be in full compliance with all applicable regulatory requirements. All sheeting, bracing and associated items shall be carefully removed upon completion of the work.

B. If contamination is encountered, the Contractor shall initiate the excavation and the Owner's Representative, or the Engineer will field screen the excavated material for volatile organic compounds with a photo ionization detector at the rate of approximately one screening every 20 cubic yards. Soil suitable for reuse as backfill, as determined by the Owner's Representative or the Engineer, shall be stockpiled apart from contaminated materials. The Contractor shall not mix stockpiles of different contaminant types. Owner shall be responsible for performing all sampling and analysis to fulfill all testing requirements of the selected disposal or recycling facilities.

C. If not live loaded for disposal, all excavated soil shall be stored in stockpiles on 6-mil polyethylene sheeting and covered with 6-mil polyethylene sheeting. Stockpiles shall be bermed in such a manner as to prevent migration of any contaminants contained therein. All surplus contaminated soil shall be removed from the site within thirty (30) calendar days of the initial excavation. Stockpile covers shall be maintained and repaired throughout the duration of the work.

D. Any excavations left open overnight shall be covered with supported 6-mil polyethylene sheeting and shall be protected from rainfall runoff entering the

excavation. Contractor shall be responsible for collection and disposal of all accumulated contaminated water at Contractor's expense. Excavations shall be thoroughly barricaded, illuminated, and otherwise always protected when work is not in progress.

E. In the event there is visible petroleum product remaining in an excavation, the Contractor shall immediately remove it by approved method and in accordance with appropriate regulations. Pump petroleum saturated soil until all visible product is removed to the satisfaction of the Owner's Representative or the Engineer. Should petroleum product appear on the surface of any groundwater within the removal, similar removal procedures shall be undertaken.

F. Excavated contaminated soil deemed acceptable for on-site reuse by the Owner's Representative shall be used to the maximum extent possible.

3.4 ADDITIONAL EXCAVATION

Additional excavation of contaminated soil shall not be undertaken beyond that required to complete the work unless directed by the Engineer.

3.5 EXCAVATED MATERIAL CATEGORIES

A. Excavated materials shall be categorized and managed as described in this Section. The Contractor shall transport the material for off-site disposal or treatment at a DEP-approved landfill or facility based on the following categories and the pre-characterization analytical data appended to these specifications.

1. Group A – Excavated material with contaminant concentrations less than (<) MCP Reportable Concentrations, category S-1 (RCS-1), that meet the acceptance criteria for in-state soil reclamation project or similar soils reuse facilities with a written Soil Management Plan (SMP) and approved Administrative Consent Order (ACO) from MassDEP. Excess excavated materials categorized as Group A shall be transported using a Material Shipping Record (MSR).

2. Group B – Excavated material with contaminant concentrations greater than or equal to MCP Reportable Concentrations category S-1 (RCS-1) which meets DEP criteria for acceptance at in-state landfills. The material must not exceed the contaminant levels listed in DEP Policy #COMM-97-001. Alternatively, receiving facilities for this category of excavated materials included licensed asphalt recycling facility or meets the criteria for thermal treatment at a thermal treatment processing facility. Excess excavated materials categorized as Group B shall be transported off-site using an MSR or Bill of Lading (BOL), as required by the Engineer and Licensed Site Professional (LSP).

B. Contaminated material shipped to a Group A or B disposal facility must meet the selected facility's chemical and physical acceptance criteria. Selected facilities must be established, fully operational, appropriately insured, and be operating in compliance with all applicable local, state, and federal regulations.

C. Subsurface soil generated from proposed construction will be managed according to the excavation cells provided in pre-characterization summary to be provided.

3.6 WEIGHT AND MEASUREMENT

A. The Contractor shall provide certified tare and gross weight slips for each load received at the accepted facility and these shall be attached to each returned hazardous waste manifests, Massachusetts Bill of Ladings or Material Shipping Records, within 21 days of obtaining all final signatures from a representative of the reuse/disposal/recycling facility, the Contractor (transporter), Engineer (if applicable), and the Owner.

B. Measurement for payment will be based on the actual weight in tons of material excavated and disposed of as measured at the receiving facility.

3.7 TRANSPORT OF EXCAVATED MATERIAL

A. The Contractor shall not be permitted to transport excavated materials off-site until all applicable disposal or recycling facility documentation has been received, reviewed, and approved by the Engineer. The Contractor shall transport the excavated material under a Material Shipping Record and Massachusetts Bill of Lading and the requirements of this Section.

B. The Contractor shall take all precautions and any actions necessary, at no additional cost to the Owner, to prevent cross-contamination from transport vehicles to areas outside the Limit of Work.

C. The Contractor shall transport excavated materials from the site to the storage, disposal, reuse of recycling facility or off-site reuse location in accordance with all United States DOT, USEPA, DEP, and applicable state and local regulations.

D. The Hauler(s) shall be appropriately licensed in all states affected by transport.

E. The Contractor shall be responsible for ensuring that free liquid is properly transported. "Wet soils" shall not be loaded for transport. The Contractor shall dewater "wet soils", and properly dispose of free liquid in accordance with local, State, and Federal regulations and at no additional cost to the Owner. The Contractor shall also dispose of any free liquids that may result during transportation in accordance with local, State, and Federal regulations and at no additional cost to the Owner.

F. Transporters shall submit proof of permit, license, or authorization to transport excavated material, when applicable, in all affected states.

3.9 CONTAMINATED GROUNDWATER DISCHARGE

A. Water pumped or drained from excavations or water courses encountered in the work shall be disposed of in strict compliance with pertinent federal, state, and local environmental regulations. Any damage caused by or resulting from dewatering operations shall be the sole responsibility of the Contractor. Contractor shall be responsible for maintaining the effluent quality (i.e., turbidity, volatile organic compounds and petroleum products) of water-discharged offsite from dewatering operations in accordance with pertinent regulations and permits.

B. Dewatering requirements are provided in Section 31 23 19.

END OF SECTION

SECTION 03 05 00

FIELD CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section covers concrete and all related items necessary to place and finish the concrete work.

B. Concrete thrust, and anchor blocks, to be provided at all water main bends, tees, plugs and wyes and at other locations required by the Engineer shall be installed in accordance with the details shown on the drawings and as specified in this section.

C. Concrete encasement for piping with shallow cover and for encasement of telephone, and electrical duct bank when specified shall be installed in accordance with the details shown on the drawings and as specified in this section.

1.2 RELATED WORK

A. Section 31 00 00, EARTHWORK

B. Section 33 11 13.13, DUCTILE IRON PIPE AND FITTINGS

1.3 REFERENCES

A. The following standards form a part of this specification:

American Concrete Institute (ACI)

ACI PRC-304 Guide for Measuring, Mixing, Transporting, and Placing Concrete

ACI 305 Specification for Hot Weather Concreting

ACI 306 Specification for Cold Weather Concreting

ACI MNL-66 ACI Detailing Manual

ACI 318 Building Code Requirements for Structural Concrete and Commentary

ASTM International (ASTM)

ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM C33/C33M Standard Specification for Concrete Aggregates

ASTM C94/C94M Standard Specification for Ready-Mixed Concrete

ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete

ASTM C150 Standard Specification for Portland Cement

ASTM C260/C260M Standard Specification for Air Entraining Admixtures for Concrete

ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete

ASTM C595/C595M Standard Specification for Blended Hydraulic Cements

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

PART 2 - PRODUCTS

2.1 CONCRETE

A. All concrete, reinforced or non-reinforced, shall have a 28-day compressive strength of 3000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.

B. Concrete shall conform to ASTM C94/C94M. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143/C143M.

C. Admixtures shall be as specified in subsection 2.05. No additional admixtures shall be used unless approved by the Engineer.

D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.2 REINFORCING:

Reinforcing as shown on the plans or as required by the Engineer, shall conform to ACI 318 and ASTM A615/A615M and shall be detailed in accordance with ACI MNL-66. All Steel reinforcing bars shall be grade 60.

2.3 CEMENT

A. The cement shall be an approved brand of American manufactured Portland Cement, Type IL conforming to ASTM C595/C595M. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately

following award of contract. Only one color of cement, all of the same manufacture, shall be used for the work.

2.4 AGGREGATES

A. Except as otherwise noted, the aggregate shall conform to the requirements of ASTM C33/C33M.

B. Maximum size aggregate shall be 3/4-inch.

2.5 ADMIXTURES

A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.

B. Air entraining agent shall be in accordance with ASTM C260/C260M and shall be Darex AEA, as manufactured by GCP Applied Technologies, Inc.; MasterAir AE90, as manufactured by Master Builders Solutions; Sika AIR as manufactured by Sika Corporation; or an approved equal product.

C. Water reducing agent shall be WRDA 82, as manufactured by GCP Applied Technologies, Inc.; EUCON NW, as manufactured by Euclid Chemical; Sika Plastiment as manufactured by Sika Corporation; or an approved equal product.

D. Water reducing agent-retarder shall be Daratard," as manufactured by GCP Applied Technologies, Inc.; Sika Plastiment as manufactured by Sika Corporation; DHS Retarder as manufactured by Darcole Products, Inc., or an approved equal product.

2.6 WATER

A. Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.7 CONCRETE FORMS

A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.

B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.

C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as L&M EZ strip by Laticrete International, Inc.; Magic Kote by Dayton Superior; Duogard N.E. by W.R. Meadows, or approved equal.

D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete

PART 3 - EXECUTION

3.1 PREPARATION

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.

B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.

C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

3.2 THRUST AND ANCHOR BLOCKS

A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks shall be as shown on the drawings.

B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

3.3 FILL CONCRETE

A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3000 psi.

B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before the grout has dried or set.

C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

3.4 CONCRETE PLACING DURING COLD WEATHER

A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40oF, or is expected to fall to below 40oF, within 73 hours, and the concrete after placing shall be protected by covering, heat, or both.

B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Engineer. All procedures shall be in accordance with the provisions of ACI 306.

3.5 CONCRETE PLACING DURING HOT WEATHER

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays, which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (90oF or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90oF, when ready for placement, will not be acceptable, and will be rejected.

3.6 FIELD QUALITY CONTROL

A. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28-day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28-day cylinders does not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.

C. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1. SUMMARY

A. Section Includes

1. Furnish, install, and remove formwork, shoring and temporary structural supports for cast-in-place concrete.
2. Installation of inserts, anchors and other embedded items.

B. Related Sections

1. 03 20 00 – Concrete Reinforcing.
2. 03 30 00 – Cast-in-Place Concrete.

1.2. REFERENCES

A. American Concrete Institute (ACI).

1. ACI 117 – "Tolerances for Concrete Construction and Materials".
2. ACI 301 – "Specification for Structural Concrete for Buildings".
3. ACI 318 – "Building Code Requirements for Structural Concrete"

1.3. SUBMITTALS

A. General: Review of submittals is of a general nature only, and responsibility for conformance with intent of drawings shall remain with the Contractor. Review does not imply or state that fabricator has correctly interpreted the construction documents.

B. Submit Shop Drawings to showing location and layout of construction joints, reveals, form joints, sleeves, openings, textures, locations of tie holes or plugs, and location of embedded items, and other items which will be exposed on the finish wall.

C. When a mock-up is required submit shop drawings of the mock-up.

D. Submit a shoring / reshoring plan that defines when shoring / reshoring will be used and for how long. Show how forces will be transferred to the reshores. Show that procedures will not cause damage to the structure nor result in additional permanent deflections. Provide calculations by a Professional Engineer.

E. Submit manufacturer's data for formwork release agent. Indicate the form surfaces where the formwork release agent will be used.

1.4. QUALITY ASSURANCE

A. Formwork and Shoring Design:

1. Form, shoring, and reshoring design shall be the sole responsibility of the Contractor; resultant concrete to conform to required shape, line and dimensions.

2. A Professional Engineer licensed in the State of Massachusetts shall design forms, falsework supports and reshoring.

B. PRODUCT DELIVERY, STORAGE AND HANDLING

C. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Forming Materials:

1. Formwork materials shall be appropriate for the specified finishes.
2. Polystyrene Foam: ASTM C 578 – Type IV
3. Chamfer Strips: rigid PVC; 3/4-inch by 3/4-inch size; maximum possible length. Material usage shall be consistent for each application
4. Form Gaskets (for sealing form panel joints) Gaskets shall be closed cell, completely skinned, foam rubber or neoprene, with pressure sensitive paperbacked adhesive on surfaces to be bonded to forms. Gaskets shall be of sufficient thickness, widths and compressibility for specific use.

2.2. FORM HARDWARE

A. All form ties shall be a type which does not leave an open hole through the concrete and which permits neat and solid patching at every hole.

B. When forms are removed, all metal shall be not less than one inch from the surface.

C. Use commercially manufactured formwork accessories. Do not use wire ties and wood spreaders.

D. Where wall is exposed to view in final structure use form ties with cones.

E. Form Ties: Ties shall leave a hole of not more than 3/4" in diameter on the concrete surface, and no metal closer than 1" from the surface. Use stainless steel leave in material.

2.3. FORMWORK RELEASE AGENTS

A. Use commercially manufactured form release agents.

B. Formwork release agents and sealers shall not harmfully affect the appearance, discolor or change texture of finished concrete surface or inhibit proper application of any surface finishes, coatings or bonding agents.

C. Formwork release agents shall prevent the adhesion of forms to concrete.

2.4. EMBEDDED ITEMS

A. Expansion joint filler: Premolded expansion joint filler conforming to ASTM D 994, ASTM D 1751, or ASTM D 1752.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Inspection:
   1. Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that such Work is completed to the point where this installation may properly commence.
   2. Verify that forms are constructed in accordance with all applicable codes and regulations, the referenced standards, and the design documents.

B. Discrepancies:
   1. In the event of discrepancy or conflict, immediately notify the Architect.
   2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2. CONSTRUCTION OF FORMS

A. When a mock-up of the concrete is required do not construct forms for concrete, other than for mock-up, until mock-up has been accepted.

B. Earth Forms: Unless otherwise indicated or required by the Construction documents, concrete for foundations that will remain in permanent contact with the soil, may be placed directly against vertical excavated surfaces provided the material will stand without caving and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as detailed on Drawings.

C. Layout:
   1. Form all required cast-in-place concrete to the shapes, sizes, lines, and dimensions indicated on the Drawings. Camber forms where camber is indicated.
   2. Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar, and able to limit deflection when filled with wet concrete.
   3. Make proper provision for all openings, offsets, sleeves, recesses, anchorage, blocking, reglets, chases and other features of the Work as shown or required.
   4. Provide openings as required for placing and consolidation of concrete. Provide temporary holes in formwork to facilitate cleaning and inspection.
   5. See Drawings for boards, strips, or other methods of creating patterns, textures, and reveals on concrete surfaces.
   6. For exposed or smooth surfaces minimize, to a practical minimum, the number of seams.
   7. Form Ties for Exposed Surfaces: Locate as shown on drawings. Unless otherwise indicated arrange in a symmetrical regular pattern in level horizontal rows and plumbed vertically. Coordinate variations or changes in pattern from those shown on the drawings, with the Architect.
   8. For all spans greater than 30 ft in length, forms shall have a minimum camber at the center of the span of 1/8 in x span length in ft/10 in inches. Camber of joists and girders shall be additive.

9. Conform to the provisions in sections 2.3.1.1 and 2.3.1.3 through 2.3.1.5 of ACI 301.

A. Construction Joints
   1. Construction joints in exposed surfaces shall be made only at revealed form joint locations as indicated on the Architectural drawings or at the joints in the forms.
   2. Where joints in addition to those shown are desired, Contractor shall propose location of construction joints in submittal. Location of construction joints shall be based on provisions in section 2.2.2.5 of ACI 301
   3. Revisions to reinforcing necessary to accommodate contractors proposal will be at Contractors expense.
   4. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints sufficient to develop reinforcement.

B. Tolerances
   1. Concrete surfaces shall not exceed the tolerances as specified in ACI 117. The class of surface for offset between adjacent pieces of formwork for formed surfaces shall be to Class Cas defined in ACI 117.
   2. Maximum deflection of form facing material between studs as well as deflection of studs and walers shall be limited to 1/360 of the span nor more than 1/8-inch.
   3. In addition conform to section 2.2.2.4 of ACI 301.

C. Construction:
   1. Tape all joints at forms for concrete exposed in the finished structure, including joints between form panels and trim strips.
   2. Provide 3/4-inch chamfers in the corners of formwork on permanently exposed surfaces. Do not bevel re-entrant corners or edges of formed joints.
   3. Make all form panel joints, tight butt joints with all edges true and square.
   4. Do not install inside forms until reinforcing installation has been inspected.
   5. For slabs on grade verify top of subgrade is compatible with slab thickness shown.
   6. Remove loose concrete, dust, and other material from the existing concrete surface prior to the erection of forms.
   7. Reveal Formers and Reformers for Exposed Surfaces: Fabricate and fasten to avoid protruding splinters which may become embedded in the concrete.

D. Finishes:
   1. Formed Finishes:
      a. For concrete surfaces exposed to view, unless otherwise noted, forms shall impart a smooth uniform appearance to the concrete without mottles and color variations caused by non-uniform absorption of moisture or chemical reaction.
      b. Concrete surfaces not exposed to view shall have a smooth uniform appearance.
   2. Textures: Except as noted under Concrete Finishes, the forms will be smooth and impart no texture to surface of concrete.

3. Provide formwork for Architectural Grade concrete with the intent to provide a smooth, glossy finish, upon removal of the form, with no patching, stoning or other form of repair. Wash only.
4. Vertical form joints are to be plumb and horizontal joints level.
5. Fasten all contact material to supports with fasteners arranged in a symmetrical pattern. Fasteners shall be aligned horizontally and vertically.

E. Form Release Agents:
1. Apply form release agent on formwork in accordance with manufacturer's recommendations.
2. Apply form release agents prior to placing reinforcing steel and embedded items.
3. Keep form release agents away from reinforcing steel, embedded items, and concrete against which fresh concrete will be placed.

3.3. EMBEDDED ITEMS

A. Prior to concrete placement install and build into the work anchorage devices, inserts, and other items embedded in cast-in-place concrete. Use setting drawings, diagrams, instructions and directions for items to be attached thereto.

B. Install concrete accessories and embedded items in accordance with manufacturer's recommendations: straight, level, and plumb. Tolerances of embedded items shall be compatible with the systems they are a part of when more restrictive than specified for concrete work.

C. Provide pipe sleeves when pipes pass through concrete.

D. Fill voids in sleeves, inserts, and anchor slots with readily removable material to prevent entry of concrete into voids.

E. Notify the Architect whenever any embedded item interferes with the placing of the reinforcing steel or placement of concrete.

F. Comply with ACI 301, sections 2.3.1.10 and 2.3.1.11.

G. Use templates to securely hold anchor bolts other embedded items in place during construction, and take care that no displacement occurs during the pouring of concrete.

H. Conduits and Pipes in Concrete:
1. Do not run conduits, wires and pipes in concrete unless specifically indicated on the Drawings.

I. Waterstops: Comply with ACI 301, section 2.2.3.5. Wire tie waterstops at top to prevent displacement.

3.4. PREPARATION FOR PLACEMENT

A. Clean and prepare existing concrete surfaces prior to installing forms.

B. Clean and inspect forms, embedded materials, and existing concrete surfaces immediately before placing concrete.

C. The formwork for second placement of construction joints shall be gasketed and held tight to the in place concrete to prevent fluid loss.
   1. Comply with ACI 318 section 6.3 for conduits and pipes embedded in concrete.
   2. Maintain specified concrete cover for all conduits in concrete.
   3. Reinforcing should not be displaced form required position due to conduits and pipes.

3.5. SHORES AND BRACES

A. Provide support for concrete until the structural system is substantially completed and has obtained its specified strength. If a lower compressive strength is proposed for removal of formwork and shoring, submit detailed plans for review and acceptance. As a minimum forms, shoring, and reshoring shall comply with the provisions of sections 6.1 and 6.2 of ACI 318.

B. Protect the concrete from cracking due to early application of loads or from loads in excess of those shown on the drawings.

C. Shores shall transfer loads from successive parts of the structure directly through falsework without creating bending, tensile, or shearing stresses in the concrete.

D. Reshoring shall comply with section 2.3.3 of ACI 301.

3.6. REMOVAL OF FORMS

A. Time of form removal shall depend on the strength of the concrete and the curing. When concrete mix contains fly ash, has been exposed to cold weather, curing has not been effective, or concrete strengths are lower than expected, defer form removal.

B. Forms and shoring used to support the weight of concrete shall remain in place until the concrete has reached its specified strength. Forms may be removed at an earlier time if acceptable justification is provided.

C. Forms shall be removed without damage to the concrete.

D. Formwork removal shall comply with section 2.3.2 of ACI 301

E. All forms below ground surface along with all shores and braces, shall be removed before backfilling.

F. Bolts, wires, clamps, rods, etc., not necessary to the Work, shall be removed to a minimum of one inch from the surface. Use care to eliminate any danger of rust stains from unprotected materials embedded in or adjacent to exposed concrete surface.

G. Whenever the formwork is removed during the curing period, the exposed concrete shall be cured by one of the methods specified in Section 03 30 00.

H. Removal of forms shall comply with weather protection requirements in Section 03 30 00.

3.7. RE-USE OF FORMS

A. Re-use of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtained if all of the forms were new, nor shall quality, appearance, or performance of the final structure be reduced.

END OF SECTION

SECTION 03 11 00

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

This section of the specifications covers the furnishing and installation of forms for cast-in-place concrete.

1.2 RELATED WORK

A. Section 01 45 33, CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

B. Section 03 30 00, CAST-IN-PLACE CONCRETE

1.3 REFERENCES

A. The following standards form a part of this specification:

American Concrete Institute (ACI)

ACI	301	Specifications for Concrete Construction
ACI	347	Guide to Formwork for Concrete

Unified Facilities Guide Specifications (UFGS)

UFGS	03 30 00	Cast-in-Place Concrete

1.4 SAMPLES

A. Prior to ordering any materials, the Contractor shall submit three (3) samples to the Owner's Representative for selection and approval. Do not order materials until Owner Representative's approval has been obtained. Delivered materials shall exactly match the approval samples.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For the cast-in-place concrete wall, the basis of design form liner shall be the Sika Wood Design Series.

B. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.

C. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.

D. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as L&M EZ Strip by LATICRETE, Bethany, CT and "Magic Kote" by Dayton Superior Corp., Miamisburg, OH or approved equal.

E. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

PART 3 - EXECUTION

3.1 PREPARATION

Surfaces of forms to be in contact with concrete shall be greased with nonstaining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

3.2 CONSTRUCTION

A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Engineer.

B. Formwork shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.

C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.

D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp corners and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

3.3 REMOVAL OF FORMS

A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees [whichever is the longer]:

Forms for	Day-Degree*
Beams and Slabs	500
Walls and vertical surfaces	200

* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 deg F equals 300 day-degrees. Temperatures below 50 deg F are not to be considered in determining Day-Degree.

B. Where beams, girder, columns, walls and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 deg. F in accordance with American Concrete Institute standards.

C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.

D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

END OF SECTION

SECTION 03 15 26

UNDER-SLAB SHEET VAPOR BARRIER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sheet materials for controlling vapor diffusion through concrete slabs on grade.

1.2 SUBMITTALS

A. Action Submittals:
   1. Written certification from the manufacturer that the materials and their application as noted in this Specification and on the Drawings is appropriate and approved for this project.
   2. Product Data: Manufacturer’s product data, specifications, and installation instructions. Include vapor barrier manufacturer’s requirements for placement, seaming and pipe boot installation.
   3. Submit evidence that Installer’s existing company has minimum of 5-years continuous experience in application of specified materials.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is acceptable to manufacturer, who has completed applications similar in material and extent to that required for this Project, and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Vapor Barrier and components to be from one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in clean, dry area in accordance with manufacturer's instructions.

C. Protect materials during handling and application to prevent damage or contamination.

D. Ensure membrane is stamped with manufacturer's name, product name, and membrane thickness at intervals of no more than 85-inches (220 cm).

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written recommendations for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting material performance.

B. Close areas to traffic during installation and for time period after application recommended in writing by manufacturer.

1.6 COORDINATION

A. Coordinate placement of sheet vapor barrier with applicable Division 03 and 31 Sections.

B. Job Conditions: Do not install vapor barrier until below-slab fill and utility work are complete, tested, and backfilled.

C. Coordinate installation with scheduled concrete pours to avoid delays. Make provisions for installation of work by other trades.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Vapor Barrier:
1. Type: 15 mil polyolefin film meeting requirements of ASTM E1745, Class A.
2. Water Vapor Transmittance (After mandatory condition per ASTM E154/E154M sections 8,11,12,13): Maximum perm rating of 0.01 as tested in accordance with ASTM E1745 Section 7.
3. Strength: ASTM E1745: Class A.
4. Products:
   a. Meadows, W. R., Inc.; Perminator HP 15 mil.
   b. Reef Industries, Inc.; Griffolyn 15 mil Green.
   c. Stego Industries, LLC; Stego Wrap 15 mil Class A.

B. Accessories:
1. Bonding Agent: Manufacturer’s approved or recommended vapor barrier bonding agent.
2. Sealing and Seaming Tape: High density polyethylene tape compatible with vapor barrier membrane, and manufactured by or recommended by vapor barrier membrane manufacturer. Tape for joints shall have at least the same permeability rating as the vapor barrier specified.
3. Vapor Proofing Mastic: Manufacturer’s approved or recommended vapor proofing mastic with the same permeability rating as the vapor barrier specified.
4. Pipe Boot: Construct pipe boots from vapor barrier material and pressure sensitive tape in accordance with manufacturer’s instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

B. Do not proceed until under-slab plumbing and electrical rough-in work is complete, and specified fill or subgrade material has been placed, compacted, and tested; and is smooth, level, and without voids.

3.2 PREPARATION

A. Level or tamp or roll aggregate, sand or granular base.

3.3 VAPOR BARRIER INSTALLATION

A. Place, protect, and repair vapor barrier sheets according to ASTM E1643 and manufacturer's written instructions.

B. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour.

C. Install vapor barrier without tears, voids, and holes. Lap ends and edges as recommended by manufacturer, but not less than 6-inches over adjacent sheets. Seal laps with tape.

D. Turn up sheets at perimeter, at footings and vertical walls, and against penetrations, and seal joints with tape.

E. Seal joints, tears, holes, perimeter, and penetrations through vapor with tape in accordance with manufacturer's recommendations.

F. Point exposed edges with pointing mastic to prevent water from traveling under membrane.

G. Adhere membrane to vertical surfaces with adhesive.

3.4 PROTECTION

A. Do not permit unnecessary foot or vehicular traffic on unprotected horizontal membrane.

B. Protect completed membrane from damage. Prior to pouring concrete, inspect membrane for punctures or other damage and repair as required to maintain vapor barrier integrity.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1. DESCRIPTION

A. Work Included - Furnish and place all reinforcing steel and accessories.

B. Related Work Specified Elsewhere:
   1. 03 10 00 – Concrete Forming and Accessories.
   2. 03 30 00 – Cast-in-Place Concrete.

1.2. REFERENCES

A. American Concrete Institute (ACI).
   1. ACI 301 - "Specification for Structural Concrete for Buildings."
   2. ACI 318 - "Building Code Requirements for Reinforced Concrete".

B. American Society for Testing and Materials (ASTM).
   1. A 82 - "Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement".
   2. A 615 - "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".
   3. A 616 - "Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement".
   4. A 617 - "Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement".
   5. A 706 - "Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement".
   6. A 1064 – "Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete".

C. American Welding Society (AWS).
   1. AWS D1.4 - "Structural Welding Code - Reinforcing Steel".

1.3. SUBMITTALS

A. General: Review of submittals is for general conformance with the design concept of the project and information shown on the contract documents only. The Contractor is responsible for conforming, correlating and coordinating dimensions in the field for tolerance, clearances, quantities, fabrication and installation processes means and methods of construction, coordination of this work with other trades and performing work in a safe and satisfactory manner.

B. Shop Drawings:
   1. Submit fully detailed shop drawings for review. Shop drawings shall include:

a. Placing drawings, bending schedules and bending diagrams showing size and location of reinforcing steel.

b. Elevations of beams and walls.

c. Details of areas of congestion. Identify where reinforcing steel will interfere with the placement of embedded items such as anchor bolts, anchors, inserts, conduits, sleeves and any other items which are required to be cast in concrete.

2. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the Architect and returned.

3. Direct copies of the contract documents are not acceptable as a submission from the Contractor.

C. Mill Certificates: Submit steel producer's certificates of mill analysis, including steel source, description, heat number, yield point, ultimate tensile strength, elongation percent, bend test and the chemical composition of each heat as determined by ladle analysis, before delivery of steel to site. Where steel is required to be welded, mill reports shall be used to help verify the weldability of the steel.

D. Manufacturers Certification: Furnish electrode manufacturer’s certification that the electrode meets the requirements of its AWS classification.

E. Welding Procedures: Submit welding procedures for all reinforcement welding.

1.4. QUALITY ASSURANCE

A. Owner's Testing Laboratory

Shop and field testing and inspection of steelwork will be performed by an independent laboratory engaged by the Owner ("Inspector"). The inspector shall be currently certified as a AWS Certified Welding Inspector.

B. Qualifications of Welders:

1. All welding shall be performed by operators who are qualified for the types of welds used. Each operator shall have been qualified within the preceding one year as prescribed by AWS. Welder qualification shall include passing the Charpy tests when specified for the electrode.

2. Require welders to retake the qualification test if, as determined by the Architect, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify, he shall not perform any welding on the project.

3. Pay all costs associated with welder qualification.

1.5. PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver reinforcement to jobsite bundled, tagged and marked. Use tags that indicate bar size, lengths and marks corresponding to markings shown on shop drawings.

B. Storage: Store reinforcement at the jobsite in a manner to prevent damage and accumulation of dirt and rust, moisture and grease or any other substance that may impair bond to concrete. Do not use damaged, reworked or deteriorated material.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Reinforcing Bars ASTM A 615, Grade 60 or ASTM A706.

B. Reinforcing Bars to be Welded: ASTM A 706.

C. Plain Wire: ASTM A 82.

D. Deformed Wire: ASTM A 496.

E. Welded Wire Fabric: ASTM A 185 for plain wire fabric or ASTM A 497 for deformed wire fabric.

F. Tie Wire: American Wire 16 gauge or heavier black annealed wire.

G. Spiral Reinforcement: ASTM A82 if specified as wire or ASTM A615-Grade 60 if specified by bar size.

H. Accessories:

1. Metal or plastic spacers, supports, ties, precast concrete blocks, etc., as required for spacing, assembling, and supporting reinforcing in place.
2. Legs of accessories to be of type that will rest on forms without embedding into forms.
3. Galvanize metal items where exposed to moisture, or use other acceptable non-corrodible, non-staining supports.
4. Do not use wood, brick, or stone supports.
5. Where supports bear on earth, use concrete blocks or supports with sand plates.
6. On surfaces of walls to be sandblasted or where exposed to view in the final structure supporting chairs, spacers, or bolsters, shall be of stainless steel.

I. Electrodes for Welding Reinforcing Steel: As required by AWS D1.4.

J. Reinforcing Couplers: Lenton rebar couplers as manufactured by Erico or equal. Connection shall develop in tension or compression as required at least 125 percent of specified yield strength of the bar.

K. Mechanical Splices:

1. Cadweld full tensile strength splices as manufactured by Erico. Splices to be capable of developing 125 percent of reinforcement yield strength.
2. Lenton full tensile strength coupler as manufactured by Erico or approved alternate. Splices to be capable of developing 125 percent of reinforcement yield strength.
3. Notify mechanical splice supplier of rolling mill that rolled reinforcement to be spliced.

L. Deformed Bar Anchors: Nelson, flux filled deformed bar anchors, type D2L, as manufactured by Nelson Stud Welding Division of TRW or approved alternate.

2.2. FABRICATION

A. General: Fabricate reinforcing bars in accordance with the tolerances of ACI 117.

B. Bending:
   1. Minimum bend diameters and hook extensions as shown on the drawings.
   2. Reinforcing bars are to be bent cold unless heating is permitted.
   3. Do not bend or kink reinforcing except as shown on the Drawings.
   4. Do not bend or straighten reinforcing bars in a manner that will injure the material.
   5. Do not rebend reinforcement that has previously been bent within 6 inches of new bend except as allowed in section 3.3.2.8 of ACI 301.

C. Spirals: Provide a minimum of 1-1/2 finishing turns top and bottom.

D. Install reinforcing couplers and mechanical splices in accordance with the manufacturer's recommendations.

E. Install deformed bar anchors in accordance with the manufacturer's recommendations.

2.3. MATERIAL TESTING

A. No testing will be required for domestically, manufactured reinforcing steel if the mill reports show the material conforms to these specifications. Testing by the Owners Testing Laboratory will be required for all reinforcing steel of foreign manufacture, and for all reinforcing steel of domestic manufacture that cannot be identified with mill reports.

B. Testing
   1. Identify reinforcing steel and make one series of tests (tensile, bend and chemical) from each five tons, or fraction thereof, of each size and kind of foreign or unidentified reinforcing steel to demonstrate its compliance with the specified reinforcing. If reinforcing steel is from foreign sources, testing is required from each five tons, or fraction thereof, from each source.
   2. Use full section of the reinforcing steel "as-rolled" for test specimens Sections machined or reduced in accordance with ASTM A 615, Section 9, "Test Specimens" will not be acceptable.
   3. Include two samples of sufficient length to allow tests to be made on the ""as-rolled" reinforcing steel.
   4. Perform other tests (such as dimensions and weight) as necessary to establish compliance with specifications.

PART 3 - EXECUTION

3.1. PREPARATION

A. Prior to Work specified in this Section, carefully inspect the installed Work of other trades and verify that such Work is complete to the point where this installation may properly commence.

B. The Contractor shall verify all dimensions prior to starting construction.

C. Discrepancies:
   1. Notify the Architect of any discrepancies or inconsistencies.
   2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.2. INSTALLATION

A. General: Wherever embedded items interfere with placing of reinforcement notify the Architect and obtain approval before placing any concrete. Do not bend or field cut bars around openings or sleeves.

B. Placing:
   1. Do not exceed the tolerances specified in ACI 117.
   2. Do not place reinforcement in floor slabs or beams until concrete has been placed in columns and walls, except where bars extend down into columns or walls.
   3. Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowel may be tied, No 3 bars (minimum) shall be added to provide proper support and anchorage.
   4. Use templates for placement of column dowels.
   5. Install welded wire fabric in as long lengths as practicable.

C. Field bending or straightening in accordance with section 3.3.2.8 of ACI 301.

D. Welding:
   1. Not permitted unless specifically shown on Structural Drawings.
   2. Welding, where required, shall comply with AWS D 1.4 and shall be continually inspected during welding.
   3. Welding material, wire cuttings, and tramp metal shall be thoroughly cleaned from forms for exposed concrete before any concrete is placed.
   4. No tack welds not incorporated into other welds will be allowed without written acceptance.
   5. Do not weld within 2 bar diameters of where bars have been bent cold.

E. Spacing of Reinforcing: Where Drawings do not show the spacing of the reinforcing, the minimum clear spacing shall conform to ACI-318 Section 7.6.

F. Concrete Cover: Place reinforcement to obtain as a minimum the coverages for concrete protection specified in section 3.3.2.3 of ACI 301.

G. Splicing: Make splices only at those locations shown on the Drawings or as accepted by the Architect. Stagger splices in adjacent bars wherever possible.

H. Reinforcing Supports:
   1. Reinforcement shall be accurately located in the forms and held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. The use of wood supports and spacers inside the forms is not permitted.

2. Support reinforcement supported from the ground on precast concrete reinforcement supports.
3. Do not use reinforcing supports or reinforcing to support concrete conveying equipment and similar construction loads.

I. Tying:
1. Reinforcing shall be rigidly and securely tied with steel tie wire. Tie wires, after cutting, shall be bent in such a manner that concrete placement will not force the wire ends to surface of exposed concrete.
2. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
3. Reinforcing in concrete members that have one or more surfaces exposed, whether painted or unpainted finish, shall be tied with galvanized wire. Uncoated tie wire in exposed members will not be accepted.

J. Install deformed bar anchors in accordance with the manufacturer's recommendations.

K. Install mechanical splices and reinforcing couplers in accordance with manufacturers' recommendations.

L. Installation of manufactured products as per Part 2 of this specification and according to manufacturers' recommendation.

M. Cleaning:
1. Clean reinforcement to remove loose rust and mill scale, earth and other materials which might reduce or destroy bond with concrete.
2. Where there is a potential of rust staining adjacent finish surfaces, take necessary steps to prevent staining.

3.3. FIELD QUALITY CONTROL

A. Before any concrete is poured on any particular portion of the building, the reinforcing steel and form dimensions will be inspected by the Owners testing laboratory. Any errors or discrepancies shall be corrected before concrete is placed.

B. Notify both the testing laboratory and the Architect at least 48 hours before concrete is to be poured or reinforcing is covered up.

C. As a minimum, all testing and inspection as per the requirements of the International Building Code 2018. Reinforcing steel to be assumed to have been designed for calculated stresses in excess of 70 percent of the basic allowable values.

D. Installation of deformed bar anchors to be tested in accordance with Section 7.1 of AWS D1.1.

E. Welding of Reinforcement:
1. There shall be continuous inspection during all welding of reinforcement.
2. All butt welds to be inspected using radiographic testing.

3. At the Owners option recognized non-destructive tests such as resistance, Magnetic Partical Examination, and Liquid Penetrant Inspection may be used to inspect the welds.

F. Testing and inspection of mechanical splices and reinforcing couplers to conform to manufacturer's recommendations and ICC approval.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

This Section covers all concrete and all related items necessary to place and finish the concrete work. Cast-in-place concrete shall be tinted as shown on the plans and specified herein.

1.2 RELATED WORK

A. Section 01 45 33, CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

B. Section 03 11 00, CONCRETE FORMWORK

C. Section 07 92 00, JOINT SEALANTS

D. Section 09 00 00, PAINTING

E. Division 22, PLUMBING

F. Section 31 00 00, EARTHWORK

G. Items furnished under other Sections and installed under this Section include, but are not limited to:

Items embedded in concrete, including anchors, sleeves, floor drains, castings, frames for hatches, angles, nosings, and other miscellaneous metals.

1.3 REFERENCES

A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI	30l	Specifications for Concrete Construction
ACI	302.1R04	Guide for Concrete Floor and Slab Construction
ACI	PRC-304	Guide to Measuring, Mixing, Transporting, and Placing Concrete
ACI	305R	Guide to Hot Weather Concreting
ACI	306R	Guide to Cold Weather Concreting
ACI	318	Building Code Requirements for Structural Concrete and Commentary
ACI	PRC-347	Guide to Formwork for Concrete
ACI	350	Code Requirements for Environmental Engineering Concrete Structures and Commentary

ASTM International (ASTM)

ASTM C33/C33M	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C87	Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
ASTM C94/C94M	Standard Specification for Ready-Mixed Concrete
ASTM C143/C143M	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C231/C231M	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494/C494M	Standard Specification for Chemical Admixtures for Concrete
ASTM C595/C595M	Standard Specification for Blended Hydraulic Cements
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM E96/E96M	Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E1745	Standard Specification for Plastic Water Vapor Retarders Used in Contact With Soil or Granular Fill Under Concrete Slabs
ASTM F1249	Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

1.4 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Shop drawings of the materials specified herein. Three (3) samples of tinted concrete shall be provided to the Owner's Representative for review and approval.

B. Statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94/C94M shall be submitted to the Engineer within one week following award of the contract.

C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94/C94M.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete used as fill under foundations, and elsewhere approved by the Engineer, shall be the 3,000 psi mix.

TABLE

Minimum Comp. Strength at 28 days (psi)	Maximum Water/Cement ratio (gallons per bag of cement)*	Cement Factor: 94 lb. Bags per cubic yard minimum**
3000	0.59 (6.9)	5.5
4000	0.48 (5.6)	6.5
5000	0.40 (4.7)	7.4

* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.

** These are minimum amounts; increase as necessary to meet mix requirements.

B. Concrete shall conform to ASTM C94/C94M. One copy of the Certificate of Delivery required by ASTM C94/C94M shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.

C. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.

D. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 3 to 6 percent for l-l/2-inch aggregate and 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C23l/C231M.

E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494/C494M.

F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8-inches. Any concrete having a slump greater than 4-inches (8-inches with superplasticizer) shall be promptly removed from the site.

G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.

H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.2 CEMENT

A. The cement shall be an approved brand of American manufactured Portland Cement, Type IL conforming to ASTM C595/C595M. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award of contract. Only one color of cement, all of the same manufacture, shall be used for the work.

B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

2.3 ADMIXTURES

A. Air entraining agent shall be in accordance with ASTM C260/C260M.

B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494/C494M, Type A.

C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.

D. Superplasticizer agent shall be in accordance with ASTM C494/C494M, Type F or Type G and contain no more than 0.1% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

E. The basis of design for integral coloring shall be the SikaColor-100P Powder Integral Concrete Colorant U-28.

2.4 AGGREGATES

A. Except as otherwise noted, the aggregate shall conform to the requirements of ASTM C33/C33M.

B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33/C33M.

C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33/C33M.

D. The following designated sizes of aggregate shall be the maximum employed in concrete.

1. 2-inch for mass concrete

2. 1½-inch for reinforced sections 18-inch and over in thickness

3. 3/4-inch for reinforced and unreinforced sections less than 18-inch thickness.

2.5 WATER

Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.6 GROUT

Grout shall be mixed in the proportions of one part Portland Cement to 2 parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Engineer shall be obtained for the use of proprietary grouts, and the instructions of the Engineer shall be followed in their use.

2.7 CURING MATERIALS

A. Curing compound shall be a curing/hardener compound such as AH-1 by Anti Hydro, Sika Antisol-250W by Sika Corporation, 1300-Clear by W.R. Meadows or approved equal.

B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM Cl7l.

2.8 JOINT FILLER

A. Preformed joint filler strip shall conform to ASTM Dl75l or Dl752, having a thickness as indicated on the drawings.

B. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted.

2.9 JOINT SEALANT:

A. Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol 2235M, non-sag, hardness: 25-30 Shore A.

PART 3 - EXECUTION

3.1 GENERAL

Under no circumstances shall concrete that has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.

3.2 PREPARATION

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.

B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground in accordance with ACI 302.1R. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating not exceeding 0.01 perms (Perms [grains/ft2*hr.*in. Hg]) per ASTM F1249 or ASTM E96) and 10 mils thickness (49 lbs/MSF). The moisture barrier shall be a high-performance underslab vapor retarder made from polyethylene resins that exceed ASTM E1745, Class A. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape or as recommended by the manufacturer. The vapor barrier should have all laps, seams, penetrations and terminations sealed and should carry across footings.

C. When no moisture barrier is used, the earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.

E. Concrete surfaces that act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.

F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Engineer. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before the grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Engineer.

G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

3.3 MIXING

A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and in the presence of the Engineer.

B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the nameplate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed

for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.

C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI PRC-304 and ASTM C94/C94M.

D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

3.4 INSTALLATION/APPLICATION/ERECTION

A. Placing

1. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI PRC-304 and as approved by the Engineer.

2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.

3. Segregation of the concrete shall be prevented during handling; should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over l to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.

4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.

5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.

6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.

7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.

8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.

9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.

10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

B. Concrete Placing During Cold Weather

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.

2. The temperature of concrete surfaces shall not be permitted to drop below 50ºF. for at least 7 days after placement of the concrete.

3. All details of the Contractor’s handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with the provisions of ACI 306R.

C. Concrete Placing During Hot Weather

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays that will result in excessive mixing of the concrete after arrival on the job.

2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305R. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.

3. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

D. Pipes And Embedded Metals

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.

2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.

3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.

4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.

5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.

6. Inserts required for hanging mechanical and electrical items shall be provided and installed in the forms under the mechanical and electrical sections of the specification.

7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items that would delay the prosecution of the work, the openings shall be subject to the approval of the Engineer. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of l: l-l/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.

8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to the Engineer, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. Curing

1. Concrete curing shall be performed as specified in ACI 30l and as stated herein. All curing procedures shall have prior approval of the Engineer.

2. Concrete Floors

Concrete floors which are to receive paint, concrete fill, mortar setting beds, grout fill, or any other subsequent finish shall be cured by one of the following procedures immediately after completion of placement and finishing:

a. Ponding or continuous sprinkling.

b. Application of absorptive mats or fabric kept continuously wet.

c. Application of sand kept continuously wet.

d. Application of waterproof sheet materials conforming to ASTM Cl7l.

e. Application of curing compounds conforming to ASTM C309, if it can be demonstrated to the Engineer's satisfaction that the compound is applicable and that it will not prevent bonding of the subsequent finish to be received. Compound shall be placed at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

3. Curing procedure shall be continued for at least 7 days.

a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.

b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.

c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. Bracing And Supports

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.

2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Engineer.

3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28-day strength.

G. Removing Forms and Supports

1. Removal of forms shall take place in accordance with ACI PRC-347. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of day-degrees or attained 50 percent strength. (Day-degrees equals the total number of days times the average daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

Location	Day-Degrees
Beams and Slabs	500
Walls and Vertical Surfaces	200

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and also sufficient strength to support safely its own weight and the construction loads upon it.

H. Patching

1. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least one-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance,

and firmly imbedded in the parent concrete, subject to Engineer's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 1-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated, thicker repairs shall be made with mortar suitable for vertical and overhead repairs by Sika or approved equal.

2. For concrete areas exposed to serious abrasion and/or impact forces, the Engineer may order the use of grout with a non-shrink metallic aggregate (Sika Grout-885MF or approved equal) as an additive in the proportions listed below:

	Small Patches		Large Formed Patches	
Material	Volumes	Weights	Volumes	Weights
Cement	1.0	1.0	1.0	1.0
Metal Aggregate	0.15	0.25	0.2	0.33
Sand	1.5	1.5	1.5	1.0
Pea Gravel	--	--	1.5	1.5

I. Finishing Of Formed Surfaces

1. All concrete that is to be left exposed to view shall be scraped to remove projecting imperfections left by voids in the forms.

2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of SikaWall-510 Stucco Base Sanded, as manufactured by Sika Corporation or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations.

3. In addition to scraping, interior concrete surfaces which will be exposed to view and concrete surfaces which are to be prepared and painted as specified in Section 09 90 00, PAINTING, shall receive a smooth rubbed finish, in accordance with ACI 301 and as described below.

4. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.

5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.

6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the

appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.

7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

J. Testing

1. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. The laboratory shall supply testing equipment, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

   a. The Testing Laboratory shall conform to the requirements of ASTM E-329 as modified in 780 CMR 110.R1 in the MA State Building Code. The State Board of Building Regulations and Standards shall license them.

2. At least one slump test shall be performed from each truckload of concrete. The sample for slump shall be taken from the middle third of a truckload. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.

3. The Contractor shall advise the Engineer of its readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.

4. A minimum of four standard compression test cylinders shall be made and tested for each 100 cubic yards or fraction thereof for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality; such tests will be at the Owner’s expense.

5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'c, and no individual strength test (average of two cylinders) result falls below the specified strength f'c by more than 500 psi.

6. In the event the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

K. Failure To Meet Requirements

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.

2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.

3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.

4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.

5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.

6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

   D equals 0.001 (L x L)/t

   in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.

N. Test For Watertightness

1. All concrete shall be watertight against leakage or groundwater infiltration. Special care shall be taken in the construction joints and any noticeable leakage or seepage causing wet spots on the concrete walls or slabs shall be repaired by and at the expense of the Contractor and by methods approved by the Engineer.

2. All liquid holding concrete structures shall be tested for leakage before backfilling and after the concrete has attained the specified minimum 28-day design strength, as indicated by test cylinders.

3. The structure shall be filled with water to the overflow level, allowed to stand for at least 24-hours, and refilled to overflow to begin the test. After 72 hours, the liquid loss per 24 hour period shall be determined, either by measuring the amount required to refill the tank to overflow, by measuring the drop in water level, or by an equivalent procedure approved by the Engineer. Evaporative losses shall be calculated and deducted from the measured loss to determine net liquid loss (leakage). If the leakage per 24-hour period exceeds the allowable, the structure shall be repaired and retested until the leakage falls within the allowable limit.

4. For structures designed to hold water, one twentieth of one percent leakage will be allowed during a 24-hour period. No leakage (zero leakage) will be permitted for structures designed to hold liquid chemicals or fuels.

5. The Contractor shall pay all costs (including water) incurred in the testing for watertightness.

6. The Engineer shall be given a minimum notice of 48 hours prior to commencement of the leakage test.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1. DESCRIPTION

A. Work Included: The work in this Section includes the cast-in-place concrete work as shown on the drawings and specified herein, including, but not limited to, the following
   1. Substructure and footings.
   2. Concrete slab on grade.
   3. Retaining walls.
   4. Superstructure of the building.

B. Related Work Described Elsewhere:
   1. Section 03 10 00 – Concrete Forming and Accessories.
   2. Section 03 20 00 – Concrete Reinforcing.
   3. Section 03 35 00 – Concrete Finishing.

1.2. REFERENCES

A. American Concrete Institute (ACI).
   1. ACI 301-10 - "Specification for Structural Concrete for Buildings."
   2. ACI 318-14 - "Building Code Requirements for Reinforced Concrete."

B. American Society for Testing and Materials (ASTM).
   1. C 31 - "Standard Method of Making and Curing Concrete Test Specimens in the Field."
   2. C 33 - "Standard Specification for Concrete Aggregates."
   3. C 39 - "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens."
   4. C 94 - "Standard Specification for Ready-Mixed Concrete."
   5. C 143 - "Standard Method of Test for Slump of Portland Cement Concrete."
   6. C 150 - "Standard Specification for Portland Cement."
   7. C 157 - "Standard Method of Test for Length Change of Hardened Cement Mortar and Concrete."
   8. C 192 - "Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory."
   9. C 233 - "Testing Air-Entraining Admixtures for Concrete."
   10. C 260 - "Standard Specification for Air-Entraining Admixtures for Concrete."
   11. C 309 - "Standard Specification for Liquid Membrane - Forming Compounds for Curing Concrete."

12. C 330 - "Standard Specification for Lightweight Concrete Aggregate for Structural Concrete."
13. C 494 - "Standard Specifications for Chemical Admixtures of Concrete."
14. C 618 - "Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete."
15. D 1751 - "Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous Types)."
16. E 329 - "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction."

C. American Association of State Highway and Transportation Officials (AASHTO).
1. AASHTO TP23 – "Standard Test Method For Water Content of Freshly Mixed Concrete Using Microwave Oven Drying."
2. AASHTO T260 – "Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials."

1.3. DEFINITIONS

A. Architectural Concrete: All concrete exposed to view in the completed structure including but not limited to walls, columns, curbs, beams, parapets, slabs, or stairs, and as indicated on the Drawings.

1.4. QUALITY ASSURANCE

A. Qualification of Workmen:
1. Provide one or more persons who shall be present at all times during the execution of this portion of the Work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all Work performed under this Section.
2. The individual directing this work shall have at least 5 years of foreman experience with 'As-cast' Architectural concrete.
3. For finishing of exposed surfaces of the concrete, use only thoroughly trained and experienced journeymen concrete finishers.

B. Owner's Testing Laboratory:
1. Plant and field inspection and testing of concrete will be performed by an independent testing laboratory employed by the Owner.
2. The Owners use of a Testing Laboratory shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Drawings.
3. If Contractor wants the Testing Laboratory to perform additional compression tests in order to establish compliance with specification requirements at an earlier date, he shall notify the Owners testing laboratory and reimburse the Owner for the expense.

C. Construction Conference:
1. Within 30 days prior to the start of concrete work, the Contractor shall schedule a meeting at a mutually agreeable time to include the Architect, appropriate

Architects Consultants, [General Contractor][the Construction Manager], and appropriate subcontractors, the Concrete Supplier to discuss materials, methods of work, forming system and mixes for all classes of concrete.

2. The contractor shall send a pre-concrete conference agenda to all attendees 20 days prior to the scheduled date of the conference.

D. Records:

1. Keep a record and make available for inspection at the site, showing time and place of each pour of concrete, together with transit batch tickets per ASTM C94. Batch tickets shall include the time water was added to dry mix in addition to the other information required.
2. Make the records available to the Architect for his review upon request.

1.5. SUBMITTALS

A. General

1. Review of submittals is for general conformance with the design concept of the project and information shown on the contract documents only. The Contractor is responsible for conforming, correlating and coordinating dimensions in the field for tolerance, clearances, quantities, fabrication and installation processes means and methods of construction, coordination of this work with other trades and performing work in a safe and satisfactory manner.
2. Prior to final approval of Shop Drawings for exposed architectural concrete surfaces the Mock-up specified herein shall be completed and approved. Any modifications of the Mock-up formwork shall be incorporated into the Shop Drawings and other submittals.

B. Shop Drawings

1. Submit detailed drawings showing locations of all concrete joints (construction, contraction, and expansion), curbs, depressions, sleeves and openings.
2. Submit plans and other details showing sequence of concrete pours. This will be reviewed only for impact on the performance of the completed structure.
3. Submit details drawings indicating position of waterstops and details to be used for all water tight construction.
4. Submit shop drawings showing formwork features that impact the concrete finishes and textures including but not limited to form joints.
5. Submit shop drawings detailing Mock-up if a mock up has been specified.

C. Submit proposed methods for Cold and/or hot weather concreting when contemplated.

D. Concrete Mix Design:- Submit proposed mix designs for each class of concrete on the Mix Design Submittal form included at the end of this specification. Include the following:

1. Copies of mix designs. Mix designs shall be prepared by an independent testing laboratory.
2. The mix design submittal shall list:
   a. All materials and admixtures and their proportions.

b. Water and cement content, water cemetitious material ratio, slump, and combined aggregate gradation (percent retained on every sieve size).
c. Compressive strength documentation of how the strength was determined.
d. Information on concrete materials as per paragraph 4.1.2.3 of ACI 301.
e. Whether mix is appropriate for pumping.
f. Indicate where each mix will be used.

3. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. Include all calculations and tests required by ACI 318 Section 26.4.
4. Test results of total chloride in content.
5. Where shrinkage limit is specified submit shrinkage test results.
6. For lightweight aggregate used submit test results per ASTM C330.
7. For normal weight aggregate submit test results per ASTM C33.

E. Product Data: Submit product data for following products showing compliance with project specifications, manufacturer's recommendations, as well as known limitations. Provide certification that the following materials conform to the standards referenced in this section.
1. Curing materials.
2. Slab treatments.
3. Non-shrink grout.
4. (Shake on) hardeners.

F. Certifications: Submit certification by the manufacturers that each admixturer conforms to requirements specified in this section and that the admixtures are compatible with one another.

G. Submit cement mill tests.

H. Upon completion of the concrete Work, deliver the records of concrete placement and the concrete batch tickets to the Architect.

1.6. MOCK-UP AND SAMPLES OF WORKMANSHIP

A. Provide a mockup of the portion of the structure denoted on the Drawings.

B. Mock-up when accepted will serve as the minimum standard by which workmanship will be measured.

C. The mock-up shall be constructed using the same mixes, materials, products, procedures, and methods as will be used for the perminant construction.

D. Shop Drawing and submittal requirements for the mock-up shall be the same as for the permanent construction.

E. Testing and inspection for the mock-up will be the same as for the permanent construction.

1.7. STORAGE OF MATERIALS

A. Comply with ACI 301 Paragraph 4.1.4.

PART 2 – PRODUCTS

2.1. MATERIALS

A. General:
   1. Materials used shall be the same as those submitted and from the same source.
   2. When it is proposed to change materials from those submitted, conform to paragraph 4.2.1.5 of ACI 301.
   3. It is the responsibility of the contractor to ensure that all products used are comptaible with each other.

B. Cement:
   1. Portland Cement Type I or II, ASTM C 150.
   2. The temperature of cement delivered to the plant shall not exceed 150 degrees F.
   3. Architectural Concrete blended with white cement as required to match color of mock-up / samples.
   4. One brand from the same source shall be used throughout the project.
   5. There shall be no detrimental reaction between the cement and the aggregates used.

C. Normal Weight Aggregates:
   1. ASTM C 33. Aggregates shall be evaluated for reactivity per Appendix XI.
   2. Aggregates shall be from a source of supply which have shown by actual service to produce concrete of the required quality.

D. Lightweight Aggregates: ASTM C 330,

E. Water: clean, potable, and free of deleterious matter. In addition conform to ASTM C94 including the optional chemical tests.

F. Admixtures:
   1. Except where specified herein do not use admixtures without the written acceptance of the Architect. Where more than one is used, admixtures shall be compatible.
   2. Admixtures containing Calcium Chloride Thiocyanates or more than 0.05 percent chloride ions are not permitted.
   3. Do not use admixtures that will negatively impact the visual finish of concrete exposed to view. For concrete exposed to view the finish shall not varry as a result of changes in the use of admixtures.
   4. Water Reducing Admixtures: ASTM C 494, Type A.
   5. Water Reducing, Retarding Admixtures: ASTM C494, Type D.
   6. Non Chloride, Non-corrosive Accelerating Admixtures: ASTM C494, Type C or E. The admixture manufacturer must have long term non-corrosive test data (of at least a year’s duration) from an independent testing laboratory using an acceptable accelerated corrosion test method such as that using electrical pltential measures.

7. Air Entraining Admixtures: ASTM C 260.
8. High Range Water Reducing Admixtures (Superplasticizers): ASTM C 494, Type F or G.
9. Fly ash or possolan admixtures:- ASTM C 618, Type C or Type F.

G. Non-Slip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packed rust-proof, and non-glazing, and is unaffected by moisture and cleaning materials.

H. Liquid Densifier/Sealer: "Euco Diamond Hard" by The Euclid Chemical Co or approved equal.

I. Penetrating Anti-Spalling Sealer:
1. ASTM C957-15.
2. Sealer shall be siloxane-based compound which has a 92% chloride ion screen and a repellency factor of 92% when tested in accordance with NCHRP #244, Test Method.
3. Sealer treated concrete shall exhibit no scaling when exposed to 125 cycles of freezing-and-thawing.
4. Tests to establish compliance shall be by an independent testing laboratory.

J. Non-Oxidizing Metalic Floor Hardener: "Diamond-Plate" by the Euclid Chemical Co or approved equal.

K. Metallic Floor Hardener: "Euco-Plate HD" by the Euclid Chemical Co. or "MasterTop 200" by BASF Master Builders or approved equal.

L. Mineral Aggregate Hardener: "Surflex" by the Euclid Chemical Co. or "MasterTop 100" by BASF Master Builders or approved equal.

M. Synthetic Fibers:
1. "Fiberstrand" by The Euclid Chemical Co."
2. "Forta" by Forta Corp.
3. "Fibermesh" by Propex Fibermesh.

N. Curing Materials:
1. Fiber reinforced asphaltic vapor barrier building paper.
2. Polyethylene sheet 4-mil thickness.
3. Curing compound ASTM C 309, Type 1, clear or transparent and shall not discolor finished concrete surface or inhibit proper application or performance of any surface finishes or treatments. In addition curing compound shall limit maximum moisture loss to 0.03 g/cm^2 at the coverage used on this project.

O. Concrete Sealer: "Super Aqua-Cure VOX" or "Super Diamond Clear VOX" as manufactured by the Euclid Chemical Company.

P. Premolded Joint filler: ASTM D 1751.

Q. Vapor Barrier: Polyethylene sheeting 10 mils thick of approved manufacturer.

R. Water stops: Bentonite waterstops

2.2. CONCRETE MIXES

A. General
   1. Contractor shall be responsible for the design of the concrete mixes.
   2. Assume full responsibility for the strength, consistency, water cemetitious material ratio and handling of concrete.
   3. Admixtures and products shall be used in accordance with the manufacturer's recommendations.
   4. No change of brand or source of any of the concrete ingredients or of the mix proportions will be allowed until submittals have been resubmitted and approved.

B. Proportions:
   1. Proportion concrete for strength and workability in accordance with Section 4.2.3 of ACI 301 and the contract documents.
   2. Contractor to verify that aggregate size specified for each location is consistent with the forms and dimensions of the section being placed, along with the location and spacing of the reinforcing steel.
   3. If the trial batch method is used, use an approved independent testing facility for preparing and reporting the proposed mix designs. Bear all costs in connection with these tests and for the design of the concrete mixes.
   4. Adjust the required average compression strength based on subsequent test results for the mix design.
   5. Combined aggregate gradation shall result in 8% - 18% being retained on every sieve size except for the top size and No. 100.
   6. Limit chloride ion concentrates so as not to exceed the limit set in paragraph 4.3.1 of ACI 318 for "Reinforced concrete that will be dry in service".

C. Fly Ash shall be limited as per section 4.2.2.8.b of ACI 301. Concrete to be assumed to be exposed to deicing chemicals.

D. When lightweight aggregates are used the coarse aggregate shall not exceed 9 cubic feet per cubic yard of concrete.

E. Concrete used over metal deck shall be compatible with the recommendations of the ICBO approval for the metal decking.

F. Admixture usage:
   1. All concrete slabs, less than 8 inches in thickness, placed at air temperatures less than 50° F, shall contain non-corrosive, non-chloride accelerator.

G. Mixes:
   1. Class "A": For use in foundation, normal weight aggregate, f'c=4000 psi, 1-1/2 inch aggregate, 4 inch maximum slump with water reducing admixture or 8 inch maximum slump with High Range Water Reducing Admixture. Water/cement ratio 0.55 maximum.

2. Class "B": Typical concrete, normal weight aggregate, f'c=4000 psi, 1 inch aggregate, 4 inch maximum slump with water reducing admixture or 8 inch maximum slump with High Range Water Reducing Admixture, water/cement ratio 0.55 maximum, drying shrinkage limit of 0.045 percent.
3. Class "C": Exterior concrete exposed to freezing and thawing, normal weight aggregate, f'c=4000 psi, 1 inch aggregate, 4 inch maximum slump with water reducing admixture or 8 inch maximum slump with High Range Water Reducing Admixture, water/cement ratio 0.50 maximum, Air content of 4.5% to 7.5%, [drying shrinkage limit of 0.045 percent].
4. Class "D": For use over metal decking, lightweight coarse aggregate (115 pcf maximum air dry), f'c=4000 psi, 1/2 inch aggregate, 4 inch maximum slump with water reducing admixture or 8 inch maximum slump with High Range Water Reducing Admixture, water/cement ratio 0.50 percent. Lightweight concrete should have a minimum average 28-day splitting tensile strength of [300 psi] as per Table 2 of ASTM C330.
5. Class "E": For use as fill when footing was over-excavated, normal weight aggregate 1-1/2 inch aggregate, f'c=500 psi, 4 inch maximum slump with water reducing admixture or 8 inch maximum slump with High Range Water Reducing Admixture.
6. Class "F": For filling metal stair pans, normal weight aggregate, f'c=2,500 psi, 1/2 inch aggregate, 4 inch maximum slump, water/cement ratio 0.50.
7. Class "G": For exposed polished concrete topping slab, normal weight aggregate, f'c=5,000 psi , ¾ inch aggregate, 4" maximum slump with water reducing admixture, water/cement ratio .45 maximum, no added air entrainment, maximum admixture 2% of total mix weight, plasticizers, slag, fly ash or other products replacing Portland cement to be a maximum of 10% of Portland cement volume.

H. Clarification of Mix Properties:
1. f'c is the minimum compressive strength at 28 days, tested in accordance with ASTM C39.
2. Slump specified is maximum not to exceed tested in accordance with ASTM C143. If superplasticizers are used higher slumps will be allowed providing this will not lead to segregation of the aggregate and providing that the mix without the superplasticizer meets the slump requirements.
3. Aggregate size is the largest of the coarse aggregate.
4. Air content is by volume.
5. Water/cement ratio is specified by weight.
6. Concrete weight is maximum air dry weight. Unless noted otherwise weight shall be 150 pcf.
7. Drying shrinkage limit is percentage change in length when tested as per ASTM C157 with 4 inches x 4 inches x 11 inches specimen. The specimens shall be stored using the air store option. Measurements shall be taken at the times required by the standard with the measurement taken after eight weeks of air storage to be used to determine compliance with the specified limits.

2.3. MORTARS AND GROUTS

A. Bonding Grout: Approximately 1 part Portland cement to 1 part fine sand passing a No 30 sieve, mixed to a creamy consistency.

B. Patching Mortar for exposed concrete shall be made of the same material and of approximately the same proportions as used for concrete, except that coarse aggregate shall be omitted and mortar shall consist of not more than 1 part Portland cement to 2-1/2 parts damp loose sand by volume.
   1. Combine white and gray Portland cement as necessary to match color specified by Architect. Use no more mixing water than necessary for handling and placing.
   2. Mix patching mortar in advance and allow to stand with frequent mixing with trowel without adding water until it has reached the stiffest consistency that will permit placing.

C. Drypack for Base Plates: Refer to section 05 12 00 Structural Steel Framing.

D. Non-Shrink Grout for Base Plates: Refer to section 05 12 00 Structural Steel Framing.

E. High Flow Grout:
   1. Where high fluidity and/or increased placing time is required, use high flow grout.
   2. ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)".
   3. When placed at a fluid consistency there shall be at least 95% bearing under an 18"x36" base plate.

F. Epoxy grout for anchoring fasteners or reinforcing in concrete shall be HIT-HY 200-R as manufactured by Hilti, or SET-3G as manufactured by Simpson Strong-Tie, or AC200+ by Dewalt.

2.4. BONDING AND REPAIR MATERIAL

A. Polymer Patching Mortar: These patching mortars may be used when color match of the adjacent concrete is not required. Prior approval by the Engineer is required.
   1. "Thin-Top Supreme" or "Concrete-Top Supreme" by Euclid Chemical Company (horizontal repairs); "Verticoat or Verticoat Supreme" (vertical and overhead repairs) by Euclid Chemical Company.
   2. "Sikatop 121 Plus or 122 Plus" (horizontal repairs), "Sikatop 123 Plus" (vertical and overhead repairs) by Sika Chemical Corp.

B. Low Shrinkage Structural Repair Mortar: All horizontal, vertical and overhead areas, so indicated on the plans, or otherwise designated by the Engineer to be repaired, shall use the specified low shrinkage structural repair mortar. This one component polymer, microsilica modified, high strength concrete repair mortar. Product shall be "EucoRepair V100" by the Euclid Chemical Co.

C. Epoxy Adhesive:
   1. The compound shall be a two (2) component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces.
   2. Designated repairs shall be made, with prior approval of the Engineer, as to method and procedure, using these epoxy adhesives and/or epoxy mortar.

Where epoxy injection procedures must be used, an approved low viscosity epoxy made by these manufacturers shall be used.

"Euco #452 MV or Euco #620 Epoxy System" by the Euclid Chemical Co.

"Sikadur Hi-Mod" by the Sika Chemical Corp

D. Underlayment Compound: Free-flowing, self-leveling, pumpable cementitious base compound.
   1. "Flo-Top" by the Euclid Chemical Co.

E. Repair Topping: Self-leveling, polymer modified high strength topping. Product shall be "Thin-Top Supreme" by the Euclid Chemical Co. The topping shall exhibit the following properties:

   Chaplin Abrasion Test - 0.02 mm (0.0079") maximum @ 28 days

   (British Standard 8204)

2.5. QUALITY ASSURANCE

A. Testing Laboratory will review concrete mix designs.

PART 3 – EXECUTION

3.1. SURFACE CONDITIONS

A. Examination: Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that such Work is complete to the point where this installation may properly commence.

B. Discrepancies:
   1. In the event of discrepancy, immediately notify the Architect.
   2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.2. GENERAL

A. Particular care shall be used when starting a concrete pour to maintain the continuity of appearance. Use all means necessary to avoid blemishes, imperfections, or changes in the finish. Cured colored concrete shall be consistent in color and appearance.

B. Note that the appearance of exposed concrete surfaces depends upon uniform color and texture within any one area and between adjacent areas and exercise strict batching, mixing, placing, curing, etc. controls to achieve this end.

C. Cutting and/or patching made necessary by failure or delay in complying with these requirements shall be at no additional expense to the Owner. No cutting or patching of exposed concrete shall be done without Architects approval.

D. All concrete work shall comply with the tolerances specified in ACI 117.

3.3. PREPARATION

A. Clear away debris and excess water from areas where concrete will be placed. Remove any material from in-place concrete or steel which will impair bond.

B. For concrete placed on soil, the subgrade shall be thoroughly wetted prior to placing.

C. Sandblast all construction joints and under baseplates to clean and roughen the entire surface of the joint, exposing coarse aggregate solidly embedded in mortar matrix. Roughen joint to a full amplitude of minimum ¼-inch. Roughen concrete surface while concrete is still green where possible. Do not leave laitance, loosened particles of aggregate or damaged concrete at surface. Forms and reinforcing shall be cleaned of drippings.

D. Dampen contact surfaces of construction joints, leaving them free of standing water, before placing fresh concrete.

E. Form clean-out openings and removable sections shall be placed and secured only after inspection of forms.

3.4. MIXING CONCRETE

A. Ready Mix and Site Produced Concrete
   1. Comply with ASTM C 94.
   2. The batching plant shall be equipped with an electric metering device capable of determining moisture content of sand.
   3. The addition of water at the site is contingent upon full time inspection of the process by the owners testing laboratory and the acceptance of the Inspector, Comply with ACI 301, section 4.3.2.1.
   4. Begin the mixing operation within thirty minutes after the cement has been intermingled with the aggregates.

B. Lightweight Concrete: Mix lightweight concrete in accordance with the directions of the approved lightweight aggregate manufacturer.

3.5. PLACING CONCRETE

A. Inspection: Do not place concrete until forms and reinforcement as well as other required inspections have occurred and the Inspector is present to perform observations and tests during placing.

B. Before placing concrete remove snow, ice, frost, water, and other foreign material from surfaces, including reinforcement and embedded items against which concrete will be placed.

C. Method:
   1. Convey concrete from mixer to place of final deposit by methods that will prevent separation and loss of materials. Do not use aluminum pipes or chutes.
   2. Deposit concrete as nearly as possible to its final position to avoid segregation due to re-handling and flowing.

3. Place concrete at a consistency that allows proper placement and consolidation. Do not exceed the maximum specified slump.
4. Comply with ACI 301, Section 5.3.2.4
5. The unconfined vertical drop of concrete from the end of hoses or other conveying equipment to the placement surface shall not be greater than 10 feet for concrete containing High Range Water Reducing Admixture and 6 feet for all other concrete.

D. Sequence: Place concrete in columns, beams and joist stems prior to pouring concrete slabs.

E. Rate of Placement:
1. Place concrete at such a rate that concrete is at all times plastic and flows readily between bars.
2. When placing is once started, carry it on as a continuous operation until placement of the panel or section is complete. Construction joints to be made only where indicated on the Drawings or on approved shop drawings. Prevent the formation of cold joints at other locations.
3. Do not pour a greater area at one time than can be properly consolidated and finished without cracking or causing other problems. During hot or dry weather adjust the area as necessary.
4. Insure that concrete is in its final position within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather reduce this time limit so that no stiffening of the concrete shall occur until after it has been placed.

F. Weather Considerations
1. Follow the provisions of sections 5.3.1.5 and 5.3.1.6 of ACI 301.
2. Implement the cold weather procedures submitted prior to placing concrete when the temperature is less than 40 degrees F or is expected to drop below 40 degrees F in the following three days.
3. Temperature of the concrete shall not exceed 90 degrees F. Implement hot weather procedures as necessary to limit concrete temperature.
4. Comply with the temperature requirements of ASTM C94, section 4.2.2.7 of ACI 301, and section 5.3.2.1.c of ACI 301.
5. Comply with section 5.3.2.1.a of ACI 301.

G. A sample load of each of the specified mixes of strength equal or greater than for footings, may be poured in the foundation to check workability of the concrete.

H. Consolidation
1. Use all means necessary to provide fully filled out, smooth, clean, and properly aligned surfaces free from honeycomb,all pockets, planes of weakness, and unsightly blemishes.
2. During the pour, use suitable tools along the faces of the forms to force large particles away from the forms and to bring mortar to the surface of the forms.

3. Vibration shall be by means of mechanical vibrators in direct contact with the concrete, and not by vibrating the forms or reinforcing. Vibration shall continue until water shows the first sign of rising.
4. A mechanical vibrator shall be employed at each point of deposit. A stand-by vibrator in good working condition, but not in use, shall be kept on the job until all concrete is placed.
5. During placement when placing more than one layer of concrete, extend vibrator into the previous layer.
6. Workers shall be experienced in the use of vibrators. All vibrating operations of architectural concrete shall be performed by the same skilled person responsible for vibrating acceptable concrete in the mock-ups.

3.6. CONCRETE FINISHES AND TREATMENTS

A. General:
1. Take care that the concrete meets the screeds accurately and does not rise above or below them.
2. When placing concrete on metal deck, maintain top of slab at specified elevation adjusting for deflection in metal decking and steel beams.
3. Carefully provide slab depression as required for the finishes indicated on the Drawings.
4. Tolerances of all non-formed concrete finishes shall be in accordance with ACI 117.

B. Finishing Horizontal Surfaces:
1. Unless otherwise noted make all slabs even and uniform in appearance and, finish.
2. Finished floor tolerances to be measured as specified in section 4.8.5 of ACI 117. All finished floors shall achieve level tolerances of F_f 25/F_l 20 (F_f 35 for high-density storage on rails and areas to receive thin-set ceramic tile or vinyl tile). Floor levelness (F_l) criteria does not apply to elevated slabs on metal deck.
3. Where floor drains or floor slopes are indicated, slope slabs uniformly to provide even fall for drainage.
4. Unless otherwise noted, trowel all interior slabs to a troweled finish as per section 5.3.4.2.c of ACI 301.
5. Non-Oxidizing Metallic Floor Hardener:
   a. All slabs, in the loading dock area, or other areas noted on the drawings, shall receive an application of the non-oxidizing, metallic floor hardener applied at the rate of 1.5 lbs/ft^2. Immediately following the first floating operation, uniformly distribute approximately 2/3 of the required weight of the non-oxidizing metallic floor hardener over the concrete surface, by mechanical spreader, and embed by means of power floating. The hardener shall be floated in and the second application made. The surface shall be floated again to properly bond the hardener to the base concrete slab. The surface shall then be troweled, at least twice, to a smooth dense finish.
   b. After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by

hardener manufacturer. Apply curing compound immediately after final finishing.

6. Mineral Aggregate Hardener:
    a. All slabs, in areas noted on the drawings, shall receive an application of the mineral aggregate hardener applied at the rate of 1.2 lbs/ft^2. The hardener shall be applied in two applications by mechanical spreader. The first shake shall comprise 2/3 of the specified amount of hardener. This application shall be made after the initial floating operation unless climatic conditions dictate earlier application. The hardener shall be floated in and the second application made. The surface shall be floated again to properly bond the hardener to the base concrete slab. The surface shall then be troweled, at least twice, to a smooth, dense finish.
    b. After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by hardener manufacturer. Apply curing compound immediately after final finishing.

C. Finish of Formed Concrete Surfaces
    1. Unless otherwise stated formed concrete surfaces shall have a smoothed formed finish. {how defined.

D. Finish of Flatwork
    1. Type of finish shall be in accordance with the architectural drawings.

E. Treatments and Repairs
    1. Repairs of Tie Holes.
        a. Immediately after form removal, form ties shall be removed from exposed surfaces, and holes shall be pointed flush with mortar composed of one part Portland Cement and one part sand.
        b. Except where form tie holes are to be left exposed, fill tie holes solid with patching mortar to match finish of adjacent surface.
    2. Repairs of Defects Other Than Tie holes.
        a. It is the intent of these specifications that the work will be of such quality that no patching of concrete will be required. In the event remedial patching is required, patch only areas designated by Architect.
        b. Prepare repair samples for Architect's approval at areas designated by Architect.
        c. Comply with provisions of section 5.3.7.3 of ACI 301.
        d. Slabs on Grade: After entire slab is finished any shrinkage cracks that are greater than 1/16 inch wide, shall be repaired.
            1). As approved by the Architect, fill cracks larger than 1/32 inch wide with cement grout and strike off level with surfaces.

F. Concrete Surfaces to Receive Cement Plaster: Lightly sandblast to remove loose material and roughen surface in preparation for cement plaster.

3.7. CURING CONCRETE

A. Curing shall comply with ACI 301 Section 5.3.6.

3.8. CONCRETE FILL

A. Install concrete fill on a continuous wire mesh of not less than 14 gage welded wire fabric, 2 in square, supported approximately ½ in above the bottom of pans. Screed concrete fill level and finish with wood float.

B. Screeding the concrete finish level, permit it to stand until it will bear the weight of workmen standing on boards. At this time the abrasive aggregate, having previously been soaked in clean water for about ten minutes, shall be sprinkled uniformly on the surface and immediately wood floated into the cement finish.

3.9. LIQUID DENSIFIERS, SEALERS AND DUSTPROOFING

A. Sealer/Dustproofer

1. Apply the specified sealer/dustproofer to exposed slabs subject to pedestrian traffic and as noted on the plans. Compound should be applied in strict accordance with the directions of the manufacturer just prior to completion of construction.
2. Apply according to manufacturer's instructions in a consistent manner to all surfaces.

B. Liquid Densifier/Sealer:

Apply the compound on exposed interior floors subjected to vehicular abrasion and shake on hardener slabs as indicated on the drawings.] [Apply to hardened concrete surfaces exposed to the elements that are not otherwise protected.] Application shall be made in strict accordance with the directions of the manufacturer and just prior to completion of construction. Spray, squeegee or roll on liquid densifier to clean, dry concrete surface. The liquid should be scrubbed into the surface with a mechanical scrubber. Keep the surface wet with the densifier during the application process. When the product thickens, but not more than 60 minutes after initial application, the surface shall then be squeegeed or vacuumed to remove all excess liquid.]

3.10. PROTECTION

A. During curing period protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock and excessive vibration.

B. Protect surfaces from damage due to paints, oils, rust or other stains and from impact damage.

3.11. GROUTING

A. Mix grout in accordance with the manufacturer's instructions to a consistency which will permit placement. Place grout in accordance with manufacturers recommendations. Place grout so as to ensure complete bearing and elimination of air pockets.

3.12. BASE PLATE GROUTING

The setting of steel base plates is specified under section 05 12 00 Structural Steel.

3.13. INSTALLATION OF EPOXY GROUTED ANCHORS

A. Holes to receive epoxy grouted reinforcing steel or threaded rods shall be drilled ¼-inch larger than the embedded item.

B. Install the grout according to the manufacturer's recommendations with due care given to cleaning hole prior to injection of grout.

C. Use care to insure that reinforcing steel or threaded rods to be embedded in epoxy grout are clean of oil and other substances that impact the bond to the grout.

D. Remove excess grout on the surface of the existing concrete. Use sandblasting or other mechanical means.

E. Use care when drilling holes so as not to cut existing reinforcing steel.

3.14. INSTALLATION OF CEMENTITIOUS GROUTED ANCHORS

A. Holes to receive cementitious grouted reinforcing steel or threaded rods shall be drilled with an annular space of ½-inch, i.e. hole diameter shall be 1 inch larger than the maximum diameter (e.g. out-to-out of bar deformations) of the embedded item.

B. Install the grout according to the manufacturer's recommendations with due care given to cleaning hole of all grease, oil, dirt and loose particles prior to placement of grout.

C. Saturate surface 24 hours just prior to grouting. Remove all free water prior to grouting. The surface shall be saturated surface dry at the time of grouting.

D. Install grout and anchors with due care to ensure continuous bonding between surfaces and that there are no voids in the grout.

E. Use care to ensure that reinforcing steel or threaded rods to be embedded in grout are clean of oil and other substances that impact the bond to the grout.

F. Remove excess grout on the surface of the existing concrete. Use sandblasting or other mechanical means.

G. Use care when drilling holes so as not to cut existing reinforcing steel.

3.15. CLEANUP

A. Remove all form release agents, bond breakers, curing compounds or other materials inconsistent with the specified finishes or that would prevent proper application of sealants, liquid waterproofing, or other finishes or treatments specified.

B. Clean all concrete surfaces that are to be exposed to view. Remove all cement and concrete droppings or splatters. Remove stains, and other discolorations which mar the appearance of the concrete.

C. Take care not to damage surrounding surfaces or leave residue from cleaning agents.

3.16. FIELD QUALITY ASSURANCE

A. General:
   1. Notify the Architect and Testing Laboratory at least 48 hours prior to start of placement of concrete.
   2. All testing specified in this section, including preparation of samples, shall be done by Testing Laboratory retained by the Owner.
   3. The Testing Laboratory shall have free access to all places where concrete materials are stored, proportioned, or mixed and all materials, equipment, and methods used shall be subject to this inspection and test. Provide assistance as needed by the testing laboratory.
   4. As a minimum, all testing and inspection as per the requirements of the International Building Code 2018.

B. Sampling and Field Tests:
   1. Take a sample from each 50 cubic yards of each grade of concrete or fraction thereof, or from each 2000 square feet of surface area for slabs or walks placed each day. No less than one sample to be taken for any one days operation. Each sample shall consist of:
      a. Five identical test cylinders made and stored in accordance with ASTM C-31.
      b. Slump test in accordance with ASTM C143 at point concrete is discharged into forms.
      c. Air entrainment test ASTM C173 or ASTM C231.
      d. Temperature of concrete and air.
      e. Water content in accordance with AASHTO TP23.
   2. In addition to the normal samples make a slump test at 2-hour interval during concrete placement.
   3. When shrinkage limit is specified take a shrinkage sample at the first pour for the mix design.

C. Testing:
   1. Specimens to be cured in the laboratory in accordance with ASTM C 192 and tested in accordance with ASTM C 39.
   2. Test two cylinders of each sample at 7 days for information and two cylinders at 28 days for acceptance. Keep the additional cylinder for later testing.
   3. The strength level of the concrete will be acceptable if the averages of all sets of three consecutive 28 day strength tests results equal or exceed the specified strength, and no individual strength test result fall below the specified strength by more than 500 psi.
   4. Test shrinkage in accordance with ASTM C-157.

D. Periodically inspect batch plant operations during production of concrete.

E. Notify Architect and Testing Laboratory when reinforcing steel or threaded rods are to be installed in grouted holes so the Testing Laboratory can observe work and proof test bars. A minimum of 25 percent of the bars or rods to be proof tested to 100 percent of specified yield.

END OF SECTION

SECTION 03 33 00

ARCHITECTURAL CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for cast-in-place architectural concrete including form facings, reinforcement accessories, concrete materials, concrete mixture design, placement procedures, and finishes.

1.2 DEFINITIONS

A. Architectural Cast-in-Place Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.

B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

C. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.

D. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product indicated.
   2. Samples: For each of the following materials:
      a. Form-facing panel.
      b. Form ties.
      c. Form liners.
      d. Chamfers and rustications.
   3. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 by 2 inches (450 by 450 by 50 mm), of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.

B. Informational Submittals:
   1. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

a. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

2. Material Certificates: For each of the following, signed by manufacturer:
   a. Cementitious materials.
   b. Admixtures.
   c. Form materials and form-release agents.
   d. Repair materials.
3. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C1077 and ASTM E329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

C. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from one manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 6, "Architectural Concrete."
   2. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under sample submittals. Produce a minimum of 3 sets of full-scale panels, cast vertically, approximately 48 by 48 by 6 inches (1200 by 1200 by 150 mm) minimum, to demonstrate the expected range of finish, color, and texture variations.
   1. Locate panels as indicated or, if not indicated, as directed by Architect.
   2. Demonstrate methods of curing, aggregate exposure, sealers, and coatings, as applicable.

3. In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
4. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove field sample panels when directed.

G. Mockups: Before casting architectural concrete, build mockups to verify selections made under sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Build mockups of typical exterior wall of cast-in-place architectural concrete as shown on Drawings.
3. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
4. In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
5. Obtain Architect's approval of mockups before casting architectural concrete.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place architectural concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Cast-in-place architectural concrete subcontractor.
2. Review concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural concrete.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

A. General: Comply with Division 03 Section - Cast-in-Place Concrete for formwork and other form-facing material requirements.

B. Form-Facing Panels for As-Cast Finishes: Steel, glass-fiber-reinforced plastic, or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

C. Form-Facing Panels for As-Cast Finishes: Exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth architectural concrete surfaces, high-density overlay, Class 1, or better, complying with DOC PS 1, or Finish phenolic overlaid birch plywood.

D. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will provide surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

E. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.

F. Rustication Strips: Metal, rigid plastic, or dressed wood with sides beveled and back kerfed; nonstaining; in longest practicable lengths.

G. Chamfer Strips: Metal, rigid plastic, elastomeric rubber, or dressed wood, 3/4 by 3/4 inch (19 by 19 mm), minimum; nonstaining; in longest practicable lengths.

H. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 inch (6 mm) thick.

I. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or S, Grade NS, that adheres to form joint substrates.

J. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.

K. Form-Release Agent: Commercially formulated colorless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

L. Surface Retarder: Chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified.

M. Form Ties: Factory-fabricated, glass-fiber-reinforced plastic, internally disconnecting, or removable ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish ties with tapered tie cone spreaders that, when removed, will leave holes 3/4 inch (19 mm) in diameter on concrete surface.

2. Furnish internally disconnecting ties that will leave no metal closer than 1-1/2 inches (38 mm), after exposing aggregate, from the architectural concrete surface.
3. Furnish glass-fiber-reinforced plastic ties, not less than 1/2 inch (13 mm) in diameter, of color to match Architect's sample.
4. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT AND ACCESSORIES

A. General: Comply with Division 03 Section - Cast-in-Place Concrete for steel reinforcement and other requirements for reinforcement accessories.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice."
1. Where legs of wire bar supports contact forms, use gray, all-plastic, CRSI Class 1, gray, plastic-protected, or CRSI Class 2, stainless-steel bar supports.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I, gray. Supplement with the following:
a. Fly Ash: ASTM C 618, Class C.
b. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 5S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse Aggregate Size: 1 inch (25 mm).
2. Gradation: Uniformly graded.

C. Normal-Weight Fine Aggregate: ASTM C33/C33M or ASTM C144, manufactured or natural sand, from same source for entire Project.

D. Water: Potable, complying with ASTM C94/C94M except free of wash water from mixer washout operations.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

C. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
1. Color: As indicated by manufacturer's designation.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.
1. For integrally colored concrete, curing compound shall be pigmented type approved by color pigment manufacturer.
2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

2.6 REPAIR MATERIALS

A. Bonding Agent: ASTM C 1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed design mixtures based on laboratory trial mixtures.

B. Proportion concrete mixtures as follows:
1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).
2. Maximum Water-Cementitious Materials Ratio: 0.46.
3. Slump Limit: 3 inches (75 mm), plus or minus 1 inch (25 mm).
4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

C. Cementitious Materials: For cast-in-place architectural concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

E. Admixtures: Use admixtures according to manufacturer's written instructions.

F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXING

A. Ready-Mixed or Site-Mixed Architectural Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
1. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
2. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 FORMWORK

A. General: Comply with Division 03 Section "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.

B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.

C. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch (3.2 mm).

D. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
1. In addition to ACI 117, comply with the following tolerances:

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
2. Do not use rust-stained steel form-facing material.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of cast-in-place architectural concrete.

H. Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Coat contact surfaces of forms with surface retarder, according to manufacturer's written instructions, before placing reinforcement.

N. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent form liners from sagging and stretching in hot weather. Seal joints of form liners and form liner accessories to prevent mortar leaks. Coat form liner with form-release agent.

3.2 REINFORCEMENT AND INSERTS

A. General: Comply with Section 03 30 00 - Cast-in-Place Concrete for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.

B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.3 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
   1. Schedule form removal to maintain surface appearance that matches approved field sample panels.
   2. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.

B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for cast-in-place architectural concrete surfaces.

3.4 JOINTS

A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete. Align construction joint within rustications attached to form-facing material.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Do not permit vibrators to contact forms.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
   4. Do not use chemical accelerators unless otherwise specified and approved in design mixtures.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.6 FINISHES, GENERAL

A. Architectural Concrete Finish: Match Architect's design reference sample, identified and described as indicated, to satisfaction of Architect.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.
   1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

C. Maintain uniformity of special finishes over construction joints, unless otherwise indicated.

3.7 AS-CAST FORMED FINISHES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding specified limits on formed-surface irregularities.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects.

C. Rubbed Finish: Apply the following to smooth-form-finished as-cast concrete where indicated:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
   3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

3.8 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Begin curing cast-in-place architectural concrete immediately after removing forms from concrete. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:
   1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.
3. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

A. General: Comply with Section 03 30 00 - Cast-in-Place Concrete for field quality-control requirements.

3.10 REPAIRS, PROTECTION, AND CLEANING

A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.
   1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.

B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.

C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.

E. Wash and rinse surfaces according to concrete finish applicator's written recommendations. Protect other Work from staining or damage due to cleaning operations.
   1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION

SECTION 03 54 16

CEMENT-BASED UNDERLAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cement-based, polymer-modified, self-leveling underlayment for application below interior floor coverings.
   1. Fill under fiberglass shower pans as required for leveling and full support.
   2. Broad scope leveling of existing concrete floors scheduled to have existing flooring and associated adhesive removed, and new finish flooring applied.
   3. Transitioning leveling of floors to create uniform level height between different flooring materials.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product indicated.
   2. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

B. Informational Submittals:
   1. Qualification Data: For qualified Installer.
   2. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.
   3. Minutes of preinstallation conference.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.

C. Preinstallation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
   1. Place cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

1.6 COORDINATION

A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, to ensure compatibility of products.

B. Coordinate cement-based underlayment with requirements of fabricated shower pan products specified in Division 22.

PART 2 PRODUCTS

2.1 CEMENT-BASED UNDERLAYMENTS

A. Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thickness of 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.
   1. Products:
      a. Ardex; K-15 Self-Leveling Underlayment Concrete.
      b. BASF Construction Chemicals, Inc.; MBT Mastertop 110 Plus Underlayment.
      c. Dayton Superior Corporation; LeveLayer.
      d. L&M Construction Chemicals, Inc.; Levelex.
      e. MAPEI Corporation; Ultraplan 1 Plus.
   2. Cement Binder: ASTM C150/C150M, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C129.
   3. Compressive Strength: Not less than 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C109/C109M.

B. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

C. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
   1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.
   1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.
   1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
   2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.

D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 FORMWORK

A. Forms: To facilitate continuous and complete filling of space below prefabricated shower pans, forms shall be strong and tight enough to prevent leaking. Place underlayment directly in void space to reduce air entrapment. Maintain full contact of underlayment with underside of shower and concrete subfloor until it hardens.

B. Build forms leakproof that are strong and securely anchored to withstand underlayment pressures.

C. Anchor forms securely to prevent movement during placing or curing.

3.4 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.
   1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
   2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
   3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface. Sloping of 1/8 inch in 10’-0” maximum is permitted to produce level surface.
   1. Feather edges to match adjacent floor elevations.

D. Shower Pans: Apply underlayment fill under shower pans / enclosures immediately after setting, before additional load is applied. Do not dry pack.

1. Fluid State: Pour underlayment from slanted form surface only, to avoid air pockets. Ensure underlayment fills entire void and maintains constant contact to underside of shower pan.
2. Plastic State: Use rods, chains or tamping to compact underlayment and remove voids. Remove forms or cut back underlayment only after initial set.

E. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

F. Transitioning Leveling: Apply underlayment as required to create uniform level height between different flooring materials, where transition strips are not indicated on Drawings. Leveling shall extend out as needed to conform to ADA requirements.

G. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

H. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION

SECTION 04 00 00

MASONRY WORK (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
   a. The following should appear on the upper left hand corner of the envelope:
      1) Name of Sub-Bidder: Print Name of Sub-bidder
      2) Project: Insert project name
      3) Sub-Bid for Section: xxxx - Trade
2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
3. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
   1. 01-GENERAL Series.
   2. 04-STRUCTURAL Series.
   3. 05-ARCHITECTURAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. All Mock-Up Masonry Work of Section 01 43 39 - MOCKUP REQUIREMENTS.
   2. All Work of Section 04 20 00 - UNIT MASONRY
   3. All Work of Section 04 43 13.13 - Anchored Stone Masonry Veneer.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

(PART OF TRADE-BID SECTION 04 00 00 MASONRY WORK)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete masonry units.

B. Prefaced concrete masonry units.

C. Face brick.

D. Mortar and grout.

E. Steel reinforcing bars.

F. Masonry-joint reinforcement.

G. Ties and anchors.

H. Embedded flashing.

I. Miscellaneous masonry accessories.

J. Products Installed but not Furnished under This Section:
   1. Cast-stone trim in unit masonry.
   2. Steel lintels in unit masonry.
   3. Steel shelf angles for supporting unit masonry.
   4. Cavity wall insulation.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Shop Drawings: For the following:

a. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
b. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
c. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

3. Samples for Initial Selection:
   a. Colored mortar.
   b. Weep holes/cavity vents.
4. Samples: For each type and color of the following:
   a. Exposed CMUs.
   b. Face brick, in the form of straps of five or more bricks.
   c. Special brick shapes.
   d. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
   e. Weep holes and cavity vents.
   f. Accessories embedded in masonry.

B. Informational Submittals:
1. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   a. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
2. Qualification Data: For testing agency.
3. Material Certificates: For each type and size of the following:
   a. Masonry units.
      1) Include data on material properties.
      2) For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
      3) For exposed brick, include test report for efflorescence according to ASTM C67/C67M.
   b. Cementitious materials. Include name of manufacturer, brand name, and type.
   c. Mortar admixtures.
   d. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   e. Grout mixes. Include description of type and proportions of ingredients.
   f. Reinforcing bars.
   g. Joint reinforcement.
   h. Anchors, ties, and metal accessories.
4. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

a. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C91M for air content.
b. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

5. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
6. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.

B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 - Quality Requirements for mockups.
1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 36 inches (900 mm) high by full thickness.
2. Build sample panels facing south.
3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
   a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.
6. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   a. Build mockup of typical wall area as shown on Drawings.
   b. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
   c. Protect accepted mockups from the elements with weather-resistant membrane.
   d. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
      1) Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.

2) Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

e. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe, and hold cover in place.
3. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
4. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   a. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   b. Protect sills, ledges, and projections from mortar droppings.
   c. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   d. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

5. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
   a. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
6. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 402/602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet (6 m) vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
   1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

C. Pre-faced CMUs: ASTM C90.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Basis or Design: Spectra-Glaze Glazed Block, Spectra-Glaze ® II Units.
      1) CMU1: SPECTRA GLAZE CUSTOM SMOKE
      2) CMU2: SPECTRA GLAZE DP FROST (ACCENT WALLS)
2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
3. Density Classification: Normal weight.
4. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
5. Pattern and Texture:
   a. Standard pattern, Pre-faced finish. Match Architect's samples.
   b. Shapes: Provide shapes to suit the condition shown
6. Colors: As indicated by manufacturer's designations.

2.4 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: Facing brick complying with ASTM C216.

1. Grade: SW.
2. Type: FBX.
3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C67/C67M.
5. Efflorescence: Provide brick that has been tested according to ASTM C67/C67M and is rated "not effloresced."
6. Size: Manufactured to the following actual dimensions:
   a. Modular: 3-1/2 to 3-5/8 inches (89 to 92 mm) wide by 2-1/4 inches (57 mm) high by 7-1/2 to 7-5/8 inches (190 to 194 mm) long.
7. Application: Use where brick is exposed unless otherwise indicated.
8. Basis of Design Product:
   a. Smooth: Yankee Hill - Dark Red Smooth (or approved equal)
   b. Textured: Endicott - Medium Ironspot 46 - Vertical Score Modular (or approved equal)

2.6 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be manufactured within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

C. Hydrated Lime: ASTM C207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Davis Colors; True Tone Mortar Colors.
      b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
      c. Solomon Colors, Inc.; SGS Mortar Colors.

F. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Colored Portland Cement-Lime Mix:
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Essroc; i.design flamingo-BRIXMENT Blend.

2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
3) Lafarge North America Inc.; Eaglebond Portland & Lime.
4) Lehigh Hanson; HeidelbergCement Group; Lehigh Custom Color Portland/Lime Cement.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.

G. Aggregate for Mortar: ASTM C144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C404.

I. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Corporation; Construction Systems; Trimix-NCA.
b. Euclid Chemical Company (The); an RPM company; Accelguard.
c. GCP Applied Technologies Inc. (formerly Grace Construction Products); Morset.

K. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Corporation; Construction Systems; Rheopel Plus Mortar Admixture.
b. Euclid Chemical Company (The); an RPM company; Blocktite Mortar.
c. GCP Applied Technologies Inc. (formerly Grace Construction Products); Dry-Block Mortar Admixture.

L. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM C615/C615M or ASTM A996/A996M, Grade 60 (Grade 420).

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Heckmann Building Products, Inc.; #374: Steel-Wich.
      b. Hohmann & Barnard, Inc.; RB Rebar Positioner.
      c. Wire-Bond, Figure 8 Rebar Positioners.

C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
   1. Interior Walls: Hot-dip galvanized carbon steel.
   2. Exterior Walls: Hot-dip galvanized carbon steel.
   3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
   4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
   5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
   6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
   7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

E. Masonry-Joint Reinforcement for Multiwythe Masonry:
   1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus two side rods at each wythe of masonry 4 inches (100 mm) wide or less.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Hohmann & Barnard, Inc., Ladder Type No. 240.
         2) Wire-Bond, Ladder 4 Wire.
   2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch (16-mm) cover on outside face.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Hohmann & Barnard, Inc., 150 Truss Box-Mesh.
         2) Wire-Bond, Series 400 Ladder Fixed Tab.
   3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.5 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Hohmann & Barnard, Inc., Ladder Type No. 270.
         2) Wire-Bond, Series 800 Composite Hook & Eye.

F. Masonry-Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized carbon-steel continuous wire.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Hohmann & Barnard, Inc.,"#165 S.I.S. Truss Seismiclip Interlock System"
      b. Wire-Bond, Ladder Adjustable Tab Lock Seismic.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
   1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A641/A641M, Class 1 coating.
   2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A153/A153M, Class B-2 coating.
   3. Stainless-Steel Wire: ASTM A580/A580M, Type 304.
   4. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 (Z180) zinc coating.
   5. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
   6. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666/A666M, Type 304.
   7. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
   8. Stainless-Steel Bars: ASTM A276/A276M or ASTM A666/A666M, Type 304.

C. Corrugated-Metal Ties: Not acceptable.

D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
   1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units.
   2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
   3. Wire: Fabricate from 3/16-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.

E. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.
   2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

a. Products: Subject to compliance with requirements, provide one of the following:
   1) Heckmann Building Products, Inc., No. 315-B or 133 anchor section with No. 316 or 318-B tie section as required to conform to Drawings
   2) Hohmann & Barnard, Inc., No. 359H or 360 anchor section with No. VBT or 320W tie section as required to conform to Drawings.

3. Adjustable Strap and Wire Anchors (For attachment to weld-on channel slots):
   a. Strap Anchors: 1-1/4 inch (31 mm) wide, 0.060-inch (1.5 mm) thick, hot-dip galvanized ASTM A153/A153M, Class B-2, length as required to provide embedment within 1 inch (25 mm) of masonry face. Provide one of the following:
      1) Heckman Building Products, Inc., No. 134
      2) Hohmann & Barnard, Inc., No. 364.
   b. Triangular Wire Anchors: 3/16 inch (4.76 mm) diameter, hot-dip galvanized ASTM A153/A153M , Class B-2, 1.5 oz. (42.5 g), cold drain steel wire, ASTM A 82, configurations as noted on the Drawings, length as required to provide embedment within 1 inch (25 mm) of masonry face. Provide one of the following:
      1) Heckman Building Products, Inc., No. 123.
      2) Hohmann & Barnard, Inc., No. 363.

F. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- (1.52-mm-) thick steel sheet, galvanized after fabrication.
      a. 4-inch- (1.63-mm-) 0.108-inch- (2.74-mm-) thick, galvanized-steel sheet may be used at interior walls unless otherwise indicated.
   2. Tie Section: Triangular-shaped wire tie made from 0.108-inch- (2.74-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
   3. Products: Subject to compliance with requirements, provide one of the following:
      a. Heckman Building Products, Inc., No. 123.
      b. Hohmann & Barnard, Inc., No. 363.

G. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

H. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

I. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- (1.90-mm-) thick steel sheet, galvanized after fabrication.
3. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire unless otherwise indicated.
4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
    a. Products: Subject to compliance with requirements, provide products by one of the following:
        1) Heckmann Building Products, Inc.; "213" anchor section with "282" double pintle wire tie.
        2) Hohmann & Barnard, Inc.; HB-200/DA-213
        3) Wire-Bond; RJ-711.
6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a sheet metal anchor section, 1-1/4 inches (32 mm) wide by 6 inches (152 mm) long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch (16 mm) wide by 3-5/8 inches (92 mm) long, stamped into center to provide a slot between strap and base for inserting wire tie.
    a. Products: Subject to compliance with requirements, provide products by one of the following:
        1) Heckmann Building Products, Inc.; "315-D Anchor Plate with "316" Wire Tie.
        2) Hohmann & Barnard, Inc.; DW-10HS
        3) Wire-Bond; Type III Screw on Veneer Anchor.
7. Screw-Attached, Masonry-Veneer Anchors: Stainless steel wire tie and a corrosion resistant steel, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has factory-installed washers to seal to the face of the board insulation.
    a. Screw Length: As required to go thru board insulation and sheathing.
    b. Products: Subject to compliance with requirements, provide products by one of the following:
        1) Heckmann Building Products, Inc.; #75: Post-I-Tie.
        2) Hohmann & Barnard, Inc.; 2-Seal Wing Nut with 2-Seal Wire Tie.
        3) Wire-Bond; No. 4250 with Sure Tie Triangle.
8. Screw-Attached, Masonry-Veneer Anchors: Stainless steel wire tie and a steel steel, self-drilling, screw designed to receive plastic tie receiver / thermal break. Screw has spacer that seats directly against framing and is same thickness as sheathing and plastic tie receiver / thermal break seals to the face of the board insulation.
    a. Screw Length: As required to go thru board insulation and sheathing.
    b. Products: Subject to compliance with requirements, provide products by one of the following:

1) Heckmann Building Products, Inc.; #75-TC: Post-I-Tie ThermalClip with. Double Pintle Wire Tie.
2) Hohmann & Barnard, Inc.; Thermal 2-Seal Wing Nut with 2-Seal Wire Tie.

J. Seismic Masonry-Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint.
1. Seismic Masonry-Veneer Anchors: Connector section and rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having slotted holes for inserting vertical leg of connector section. Connector section consists of a rib-stiffened, sheet metal bent plate with down-turned leg designed to fit in anchor section slot and with integral tabs designed to engage continuous wire.
   a. Products: Subject to compliance with requirements, provide products by one of the following:
      1) Hohmann & Barnard, Inc.; HB 213 S.I.S. with Seismiclip.
      2) Wire-Bond; #2411 HCL-711.
2. Seismic Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section. Wire tie has sheet metal clip welded to it with integral tabs designed to engage continuous wire.
   a. Products: Subject to compliance with requirements, provide products by one of the following:
      1) Hohmann & Barnard, Inc.; 2-SEAL Byna-Lok with Seismiclip.
      2) Wire-Bond; #1004 Type III Screw on Veneer Anchor Seismic.
3. Seismic Screw-Attached, Masonry-Veneer Anchors: Stainless steel wire tie and a steel steel, self-drilling, screw designed to receive plastic tie receiver / thermal break. Screw has spacer that seats directly against framing and is same thickness as sheathing and plastic tie receiver / thermal break seals to the face of the board insulation.
   a. Screw Length: As required to go thru board insulation and sheathing.
   b. Products: Subject to compliance with requirements, provide products by one of the following:
      1) Heckmann Building Products, Inc.; #75-TC: Post-I-Tie ThermalClip with. Double Pintle Wire Tie with #370 Seismic Hook Tab.
      2) Hohmann & Barnard, Inc.; Thermal 2-Seal Wing Nut with Seismic 2X Hook.

K. Stainless-Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless-steel shank.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dayton Superior Corporation, Dur-O-Wal Division; Stainless Steel SX Fastener.
   b. ITW Buildex; Scots long life Teks.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
   1. Stainless Steel: ASTM A240/A240M or ASTM A666/A666M, Type 304, 0.016 inch (0.40 mm) thick.
   2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
   3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
         2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
      b. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
      c. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
      d. Fabricate through-wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself 3/4 inch (19 mm) at exterior face of wall and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
      e. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches (76 mm) into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.
      f. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
      g. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
      h. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
      i. Solder metal items at corners.

B. Flexible Flashing: Use one of the following unless otherwise indicated:
   1. Stainless Steel Core Flexible Flashing With Drainage Fabric: Engineered system, with high resistance to damage, composite sheet with a stainless steel core, non-asphalt adhesive polymer fabric laminated to one face of sheet, and non-woven drainage fabric laminated to opposing face with non-asphalt adhesive.

a. Stainless Steel: ASTM A240/A240M, Type 304, 0.011 inch (0.28 mm) thick. Recycled content: 60 percent.
b. Provide manufacturer's standard inside- and outside-corner units.
c. Products: Subject to compliance with requirements, provide one of the following:
   1) York Manufacturing, Inc.; Multi-Flash SS.
   2) STS Coatings, Inc.; Gorilla Flash Stainless Fabric.
   3) Hohmann & Barnard: Mighty-Flash.
d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
e. Use only where flashing is fully concealed in masonry.

2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.02 mm).
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
      2) Hohmann & Barnard, Inc.; Sando-Seal.
      3) Polyguard Products, Inc.; Polyguard 400 TWF Products
      4) R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
   b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to receive counterflashing, use metal flashing.
   2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
   3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal sealant stop.
   4. Where flashing is fully concealed, use metal flashing or flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 07 62 00 "Sheet Metal Flashing and Trim."
   1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
   2. Elastomeric Sealant: ASTM C920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Termination Bars for Flexible Flashing: Aluminum bars 0.075 inch by 1 inch (1.90 mm by 25 mm).

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

D. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
   1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.
      a. Products: Subject to compliance with requirements, provide products by one of the following:
         1) Advanced Building Products Inc.; Mortar Maze Cell Vents.
         2) CavClear/Archovations, Inc.; CavClear Weep Vents.
         3) Heckmann Building Products Inc.; No. 85 Cell Vents.
         4) Hohmann & Barnard, Inc.; QV Quadro-Vents.
         5) Wire-Bond; #3601 Cell Vent.
   2. Color: As selected by Architect.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Advanced Building Products Inc.; Mortar Break II.
      b. CavClear/Archovations, Inc.; Masonry Mat.
      c. Heckmann Building Products, Inc.; #84 Weep-Thru Mortar Deflector.
      d. Hohmann & Barnard, Inc.; Mortar Trap.
      e. Mortar Net Solutions; Mortar Net.
      f. Wire-Bond; Cavity Net.
   2. Configuration: Provide one of the following:
      a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail-shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.
      b. Strips, not less than 1-1/2 inches (38 mm) thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
      c. Sheets or strips, full depth of cavity and installed to full height of cavity.
      d. Sheets or strips not less than 1-1/2 inches (38 mm) thick and installed to full height of cavity, with additional strips 4 inches (100 mm) high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.
   3. Acoustic wall head restraints: Continuous angle bracket with closed cell EPDM rubber strip. shore 40-60A. Depth 1-inch greater than deflection gap.

2.11 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions; 202 New Masonry Detergent.
      b. EaCo Chem, Inc.; NMD 80.
      c. PROSOCO, Inc.; Sure Klean 600.

B. Prefaced CMU Cleaner: Use masonry detergent cleaners such as Spectra ® brand of cleaners, Vana-trol ® or Deox ® in strict accordance with each manufacturer’s directions. Do not use any product containing unbuffered hydrochloric acid or other unbuffered acids.

2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
   1. For masonry below grade or in contact with earth, use Type M.
   2. For reinforced masonry, use Type N.
   3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
   4. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product.
   1. Pigments shall not exceed 10 percent of portland cement by weight.
   2. Mix to match Architect's sample.
   3. Application: Use pigmented mortar for exposed mortar joints with the following units:
      a. Prefaced CMUs.
      b. Face brick.

c. Cast-stone trim units.

E. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 402/602 /ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476 Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C143/C143M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C67/C67M. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
   3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
   6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
   7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
   2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
   3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
   4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
   5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

6. Tuckpointing: Rake out joints at least 1/4”. Tuckpoint with the required mortar type.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
   3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 - Joint Firestopping.
   4. At acoustic rated partitions, apply acoustic head restraints. Apply acoustic sealant.

I. Patterned brick walls: Lay in bond patterns indicated, with colors, textures, face alignments and offsets indicated on the Drawings.
   1. Brick Type B.
   2. Brick Type C.
   3. Brick Type D.

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
   5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Rake out mortar joints at prefaced CMU to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
   1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.
   2. For patterned brick walls, cover exposed top edges of units with compacted mortar, sloped to drain.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

F. Cut joints flush where indicated to receive waterproofing, air barrier or similar coating or applied sheet, unless otherwise indicated.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:
   1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
      a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
   2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing with seismic masonry-veneer anchors to comply with the following requirements:
   1. Fasten seismic and screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
   2. Embed tie sections in masonry joints.
   3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

B. Anchor masonry veneers to wall framing with single-screw type seismic masonry-veneer anchors that support the board insulation to comply with the following requirements:
   1. Installing Cavity Wall Board Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, if required. Press insulation units firmly against substrate.
      a. Using a single self-drilling screw and fasten anchors through insulation and sheathing to wall framing. Verify screw head, washer, thermal block pushes snugly against insulation board. Do not crush insulation board.
      b. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.
      c. Install required ties and configure ties to prevent flow of water to anchor and to transfer lateral loads without excess mechanical play or deformation.
   2. Embed tie sections in masonry joints.
   3. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 25 inches (635 mm) o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.
   4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and horizontally. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 24 inches (610 mm), around perimeter.

C. Provide not less than 2 inches (50 mm) of airspace between back of masonry veneer and face of sheathing.
   1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.8 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:
1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:
1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches (100 mm) in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.

4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Section 07 92 00 - Joint Sealants.

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 - Joint Sealants, but not less than 3/8 inch (10 mm).
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and 1-1/2 inches (38 mm) into the inner wythe. Form 1/4-inch (6-mm) hook in edge of flashing embedded in inner wythe.
3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under air barrier, lapping at least 4 inches (100 mm). Fasten upper edge of flexible flashing to sheathing through termination bar.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

E. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
   1. Use specified weep/cavity vent products to form weep holes.
   2. Space weep vents 24 inches (600 mm) o.c. unless otherwise indicated.

F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

G. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
   1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.13 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/602/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67/C67M for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140/C140M for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

I. Prism Test: For each type of construction provided, according to ASTM C1314 at 7 days and at 28 days.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste.
   3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 04 43 13.13

ANCHORED STONE MASONRY VENEER

(PART OF TRADE-BID SECTION 04 00 00 MASONRY WORK)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Stone masonry anchored to concrete backup.
2. Stone masonry anchored to unit masonry backup.
3. Stone masonry anchored to cold-formed metal framing and sheathing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site] .

1.3 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Samples for Verification:
1. For each stone type indicated. Include at least [two] [three] [four] [five] Samples in each set and show the full range of color and other visual characteristics in completed Work.
2. For each color of mortar required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.
1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.

C. Material Test Reports:
1. Stone Test Reports: For[each] stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous [three] [five] years.

2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Protect accepted mockups from the elements with weather-resistant membrane.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for staining, compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.
   1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1.9 COORDINATION

A. Advise installers of adjacent Work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

B. Coordinate locations of dovetail slots installed in concrete that are to receive stone anchors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Stone: Obtain each variety of stone, from single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.2 GRANITE

A. Material Standard: Comply with ASTM C615/C615M.

B. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
   1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in stone masonry mortar.
   1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
      a. Davis Colors.
      b. Lanxess Corporation.
      c. Solomon Colors Inc.

D. Aggregate: ASTM C144 and as follows:
   1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
   2. White Aggregates: Natural white sand or ground white stone.
   3. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
      a. Match Architect's sample.

E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
      a. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
      b. GCP Applied Technologies Inc.
      c. Sonneborn Products.

F. Water: Potable.

2.4 STONE ANCHORS

A. Stone Anchors: Units fabricated with tabs or dowels designed to engage kerfs or holes in stone trim units and holes for fasteners or postinstalled anchor bolts for fastening to substrates or framing as indicated.
   1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
      a. Canaren Inc.

b. Heckmann Building Products, Inc.
c. Hohmann & Barnard, Inc.
d. Meadow Burke.

B. Materials: Fabricate anchors from stainless steel, ASTM A240/A240M or ASTM A666, Type 304. Fabricate dowels from stainless steel, ASTM A276, Type 304.

C. Fasteners for Stone Trim Anchors: Annealed stainless steel bolts, nuts, and washers; ASTM F593 (ASTM F738M) for bolts and ASTM F594 (ASTM F836M) for nuts, Alloy Group 1 (A1).

2.5 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing[, where flashing is exposed or partly exposed and where indicated,] complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Stainless Steel: ASTM A240/A240M, Type 304, 0.016 inch (0.4 mm) thick.
2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.6 m). Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall flashing with drip edge [where] [unless otherwise] indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees[and hemmed].
4. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees[and hemmed].

B. Flexible Flashing: For flashing unexposed to the exterior, use[one of] the following unless otherwise indicated:
1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive, rubberized-asphalt compound, bonded to a high-density, cross-laminated, polyethylene film to produce an overall thickness of not less than [0.030 inch (0.76 mm)] [0.040 inch (1.0 mm)].
a. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1) Advanced Building Products Inc.
2) Carlisle Coatings & Waterproofing Inc.
3) Fiberweb, a brand of Clark/Hammerbeam Corp.
4) GCP Applied Technologies Inc.
5) Heckmann Building Products, Inc.
6) Hohmann & Barnard, Inc.
7) Polyguard Products, Inc.
8) Williams Products, Inc.
9) Wire-Bond.

C. Application: Unless otherwise indicated, use the following:
1. Where flashing is fully concealed, use [metal flashing] [or] [flexible flashing].

D. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C920, chemically curing [urethane] [polysulfide] [silicone] sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flexible Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Weep/Vent Products: Use[one of] the following unless otherwise indicated:
1. Mesh Weep Holes/Vents: Free-draining mesh; made from polyethylene strands, full width of head joint and 2 inches (50 mm) high by thickness of stone masonry; in color selected from manufacturer's standard.
    a. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
        1) CavClear; a division of Archovations, Inc.
        2) Mortar Net Solutions.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
    a. Advanced Building Products Inc.
    b. CavClear; a division of Archovations, Inc.
    c. Mortar Net Solutions.
2. Provide one of the following configurations:
    a. Strips, full depth of cavity and 10 inches (250 mm) wide, with dovetail-shaped notches 7 inches (175 mm) deep that prevent mesh from being clogged with mortar droppings.
    b. Strips, not less than [3/4 inch (19 mm)] [1-1/2 inches (38 mm)] thick and 10 inches (250 mm) wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.
    c. Sheets or strips full depth of cavity and installed to full height of cavity.
    d. Sheets or strips not less than [3/4 inch (19 mm)] [1 inch (25 mm)] thick and installed to full height of cavity with additional strips 4 inches (100 mm) high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from being clogged with mortar.

2.7 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.
   1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
      a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
      b. EaCo Chem, Inc.
      c. Hydroclean; Hydrochemical Techniques, Inc.
      d. PROSOCO, Inc.

2.8 FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
   1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
   2. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

B. Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.

C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.

D. Cut and drill sinkages and holes in stone for anchors and supports.

E. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.
   1. Clean sawed backs of stone to remove rust stains and iron particles.

F. Thickness of Stone: Provide thickness indicated, but not less than the following:
   1. Thickness: As indicated.

G. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples and mockups.
   1. Finish: Thermal finish.

2.9 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride.
   2. Use portland cement-lime mortar unless otherwise indicated.

3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
4. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Stone Masonry: Comply with ASTM C270, [Proportion] [Property] Specification.
1. Mortar for Setting Stone: Type N.
2. Mortar for Pointing Stone: Type N.

D. Pigmented Mortar: Use colored cement product[or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products].
1. Pigments do not exceed 10 percent of portland cement by weight.
2. Pigments do not exceed 5 percent of [masonry cement] [or] [mortar cement] by weight.
3. Mix to match Architect's sample.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.

B. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.

C. Examine wall framing, sheathing, and weather-resistant sheathing paper to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Accurately mark stud centerlines on face of weather-resistant sheathing paper before beginning stone installation.

B. Coat concrete and unit masonry backup with asphalt dampproofing.

C. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 INSTALLATION OF STONE MASONRY

A. Perform necessary field cutting and trimming as stone is set.
   1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.

B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

C. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

D. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place.

E. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inch (6 mm) at narrowest points or more than 1/2 inch (13 mm) at widest points.

G. Provide sealant joints of widths and at locations indicated.
   1. Keep sealant joints free of mortar and other rigid materials.
   2. Sealant joints are specified in Section 079200 "Joint Sealants."

H. Install metal expansion strips in sealant joints at locations indicated. Build flanges of expansion strips into masonry by embedding in mortar between stone masonry and backup wythe. Lap each joint 4 inches (100 mm) in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.

I. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
   1. At multiwythe masonry walls, including cavity walls, extend flashing through stone masonry, turned up a minimum of [4 inches (100 mm)] [8 inches (200 mm)] [12 inches (300 mm)] [16 inches (400 mm)], and extend into or through inner wythe to comply with requirements in Section 042000 "Unit Masonry."
   2. At concrete backing, extend flashing through stone masonry, turned up a minimum of 8 inches (200 mm), and insert in reglet.
   3. Install metal drip edges beneath flexible flashing at exterior wall face. Stop flexible flashing 1/2 inch (13 mm) back from exterior wall face and adhere flexible flashing to top of metal drip edge.

J. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.

1. Use mesh weep holes/vents] [aluminum weep holes/vents] [vinyl weep holes/vents to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c.
3. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.

B. Variation from Level: For[bed joints and] lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.

C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.

D. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.

E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ANCHORED STONE MASONRY

A. Anchor stone with stone anchors where indicated. Install anchors by fastening to substrate and inserting tabs and dowels into kerfs and holes in stone units. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.

B. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.

C. Provide 2-inch (50-mm) cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.
1. Slope beds toward cavity to minimize mortar protrusions into cavity.
2. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.6 ADJUSTING AND CLEANING

A. Remove and replace stone masonry of the following description:
1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective joints.

3. Stone masonry not matching approved samples and mockups.
4. Stone masonry not complying with other requirements indicated.

B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
6. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.7 EXCESS MATERIALS AND WASTE

A. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 05 00 00

MISCELLANEOUS AND ORNAMENTAL IRON (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
   a. The following should appear on the upper left hand corner of the envelope:
      1) Name of Sub-Bidder: Print Name of Sub-bidder
      2) Project: Insert project name
      3) Sub-Bid for Section: xxxx - Trade
2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
3. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
1. 01-GENERAL Series.
2. 02-CIVIL Series.
3. 03-LANDSCAPE Series.
4. 04-STRUCTURAL Series.
5. 05-ARCHITECTURAL Series.
6. 06-FIRE PROTECTION Series.
7. 07-PLUMBING Series.
8. 08-MECHANICAL Series.
9. 09-ELECTRICAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. All Miscellaneous and Ornamental Iron Mock-Up Work of Section 01 43 39, MOCK-UP REQUIREMENTS.
2. All Work of Section 05 50 00 – METAL FABRICATIONS.
3. All Work of Section 05 51 13 – METAL PAN STAIRS
4. All Work of Section 05 51 19 - METAL GRATING STAIRS
5. All Work of Section 05 52 13 - STEEL PIPE AND TUBE RAILINGS
6. All Work of Section 05 70 00 - DECORATIVE METAL
7. All Work of Section 05 73 00 - DECORATIVE METAL RAILINGS

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1. SUMMARY

A. Section Includes

The structural steel as shown on the drawings and specified herein, including, but not limited to, the following:

1. Girders and beams.
2. Columns and diagonal bracing.
3. Miscellaneous steel shown on the structural drawings.
4. Grouting of base plates, leveling and bearing plates.
5. Bolts and other steel accessories.

B. Related Sections

1. 03 10 00 – Concrete Forming and Accessories.
2. 03 20 00 – Concrete Reinforcing.
3. 03 30 00 – Cast-in-Place Concrete.
4. 05 90 20 – Welding Details (Architectural assemblies)

1.2. REFERENCES

A. American Institute of Steel Construction (AISC).

1. AISC 360 - "Specification for Structural Steel for Buildings".
2. AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Research Council on Structural Connections (RCSC).

1. RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".

C. American Society for Testing and Materials (ASTM)

1. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".
2. ASTM A 27 "Specification for Steel Castings, Carbon, for General Application".
3. ASTM A 36 "Specification for Carbon Structural Steel".
4. ASTM A 53 "Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless".
5. ASTM A 148 "Specification for Steel Castings, High Strength, for Structural Purposes".
6. ASTM A 153 "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".
7. ASTM A 307 "Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength".

8. ASTM A 325 "Specification for Structural Bolts, Steel, heat Treated, 120/105 ksi Minimum Tensile Strength ".
9. ASTM A 449 "Specification for Quenched and Tempered Steel Bolts and Studs".
10. ASTM A 490 "Specification for Heat-Treated, Steel Structural Bolts, 150 ksi Minimum Tensile Strength".
11. ASTM A 500 "Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes".
12. ASTM A 501 "Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing".
13. ASTM A 514 "Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding".
14. ASTM A 563 "Specification for Carbon and Alloy Steel Nuts".
15. ASTM A 992 "Standard Specification for Steel for Structural Shapes for Use in Building Frame".
16. ASTM A 588 "Specification for High-Strength Low-Alloy Structural Steel with 50 ksi Minimum Yield Point to 4 in Thick".
17. ASTM A 618 "Specification for Hot-Formed and Seamless High-Strength Low-Alloy Structural Tubing".
18. ASTM A 687 "Specification for High-Strength Nonheaded Steel Bolts and Studs".
19. ASTM A 913 "Standard Specification for high-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST).
20. ASTM B 695 "Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
21. ASTM F 436 "Specification for Hardened Steel Washers".
22. ASTM F 959 "Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners".

D. American Welding Society (AWS).
   1. AWS D1.1 "Structural Welding Code - Steel".

E. American Association of State Highway and Transportation Officials (AASHTO).
   1. AASHTO "Standard Specifications for Highway Bridges".

F. Structural Steel Painting Council (SSPC).
   1. SSPC "Steel Structures Painting Manual, Volume 2, Systems and Specifications".

1.3. SUBMITTALS

A. Shop Drawings:
   1. Prepare complete shop drawings showing anchor rod setting plans, details of layout, fabrication, and erection.
      a. Indicate the materials used and beam marks.
      b. Reference shop drawings to specific location and detail number on the Drawings.
      c. Show extent of painting .

d. Indicate location and type of special finish requirements, including grinding of welds. Indicate architecturally exposed steel.

e. Copies of the Contract Documents will not be considered as meeting these requirements.

2. Provisions of AISC Code of Standard Practice for Steel Buildings and Bridges related to shop and erection drawings are applicable.

3. Submit shop drawings to Architect for review and obtain acceptance prior to start of fabrication.

4. Prior to submitting erection drawings submit plans of all levels showing dimensioned location of edge of slab, deck, and openings.

5. Submit fabricators identification mark system prior to fabrication.

B. Mill Reports

1. Submit copies of certified mill test reports for each heat of steel and for all fasteners, including nuts and washers prior to start of fabrication.

2. Mill test reports shall include ladle analysis and tensile elongation and bend tests. Perform mechanical and chemical tests for all material regardless of thickness or use.

3. Along with mill reports submit tests results of Charpy V-notch tests when Charpy V-notch criteria is specified.

4. Mill reports shall be traceable to individual pieces of steel used.

5. In addition to other requirements mill reports shall address the following elements: copper, columbium, chromium, nickel, molybdenum, silicone, and vanadium.

6. Provide mill reports for all welding consumables used on this project.

C. Submit certificates of compliance for:

1. Welding electrodes

2. Shear studs including manufacturers test reports.

3. Welder have passed qualification tests.

D. Welding Procedure Submittals:

1. Submit written Welding Procedures Specifications (WPSs) in accordance with AWS D1.1 requirements for each different welded joint proposed for use whether prequalified or qualified by testing. The manufacturer and specific electrode shall be stated in the WPS. Manufacturer and specific electrode shall be considered essential variables for the WPS.

2. In addition to the Welding Procedure Specifications submit fabrication and erection procedures where needed to control shrinkage, fabrication tolerances, or to insure proper inspection.

3. Procedure Qualification Record (PQR) in accordance with AWS D1.1 for all procedures qualified by testing.

4. Electrode manufacturers data.

5. When larger effective throat thicknesses of flare groove welds than allowed by Table J2.2 of AISC "Specification for Structural Steel for Buildings Allowable Stress Design and Plastic Design", submit data establishing by qualification the

consistent production of of such larger effective throat thicknesses. Qualification of effective throat thicknesses shall be as prequired by the AISC specification.

6. The WPS and PQR will be reviewed by the Testing Laboratory for conformance with the requirements of AWS D1.1.

E. Connection Design

1. The Contractor is responsible for the design of connections when they are not fully defined on the contract documents.
2. At the commencement of the project submit a letter signed and sealed by the Engineer that will supervise the steel connection design attesting to this responsibility.
3. At the end of the steel shop drawing submission phase submit a letter, signed and sealed by the Engineer supervising the steel connection design, attesting to the completion of the work.
4. Submit calculations of all connections. Calculations and details shall be clearly keyed to the appropriate members on the construction documents. Calculations shall bear the seal of the Engineer supervising design the of steel connections.
5. Contractor shall not proceed with steel erection until these requirements are fulfilled.

1.4. QUALITY ASSURANCE

A. Qualifications: Design of structural steel connections to be under the direct supervision of a Professional Engineer experienced in the design of such components and registered in the State of Massachusetts, and shall conform to the applicable national, state and city standards.

B. Owner's Testing Laboratory: Shop and field testing and inspection of steelwork specified in this document or requested by the Owner will be performed by an independent laboratory engaged by the Owner ("Inspector").

C. All work shall be performed by qualified operators experienced in their field of work and as otherwise required by these specifications.

D. Qualifications of Welders:

1. Qualify welders in accordance with AWS D1.1 for each process, position, and joint configuration. Each operator shall have been qualified as prescribed by AWS. Welder qualification shall include passing the bend test and Charpy tests when Charpy values are specified for the electrode.
2. Require welders to retake the qualification test if, as determined by the Architect, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify, he shall not perform any welding on the project.
3. Pay all costs associated with welder qualification.

E. MOCK-UP

1. Provide a full size mock-up of architecturally exposed steel if specified. Mock-up shall be representative of the finished work in all respects. Replace unsatisfactory work as direct. Mock-up shall be provided at the fabricator's plant. Mock-up assembly will be used as a standard for judging acceptability of work on project.

2. Apply finished paint system specified herein and in Section 09 90 00 "Painting" to exposed surfaces of mock-up.
3. After acceptance transport mock-up to job site and erect where directed. Provide foundation and bracing as required to maintain mock-up in a stable condition until completion of the work. Paint bracing and touch-up mock-up.

1.5. DELIVERY, STORAGE AND HANDLING

A. Store materials to permit easy access for inspection and identification. Support steel members off ground. Protect steel members and packaged materials from corrosion and deterioration. Materials showing evidence of damage will be rejected and shall be immediately removed from the site.

B. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Do not handle structural steelwork until paint has thoroughly dried. Care shall be exercised to avoid abrasions and other damage.

D. All fasteners and washers shall be delivered to the site, where they will be installed, in unopened containers.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Steel Shapes, Bars, and Plates:
1. ASTM A 992 Gr. 50 for all "W" shapes unless noted otherwise on drawings.
2. ASTM A 36 for: "M", "S", "C", "MC", "L" and bars and plates and where noted on drawings.
3. ASTM A 913 Gr. 50 where noted on drawings with a maximum yield stress of 65ksi. In addition the Additional Tension Test, Ultrasonic Examination, Maximum Carbon Equivalent, and Fine Austenite Grain Size as included in the added supplemental requirements shall apply.
4. ASTM A 913 Gr. 65 where noted on drawings. In addition the Additional Tension Test, Ultrasonic Examination, Maximum Carbon Equivalent, and Fine Austenite Grain Size as included in the added supplemental requirements shall apply.
5. Members that are noted as a part of moment frames, braced frames, eccentrically braced frames, or spliced in tension:
   a. ASTM A6 Group 3, 4 and 5 rolled shapes or plates more than 2 inches thick shall conform to Section A3.1.c of "Specification for Structural Steel Buildings", March 9, 2005 except that a Charpy V-Notch value of 20 ft.-lb at [21] degrees C is specified.
6. Rotary straightening shall not be used to straighten columns unless ASTM A913 steel is specified.
7. Weathering Steel: ASTM A 588 Grade A or B unless otherwise shown. Use one (1) grade throughout.

B. Square, Rectangular and Round Tubing: ASTM A 500 Grade B

C. Pipe: ASTM A 53, Type E or S, Gr. B

D. Steel Castings: ASTM A 27, Grade 65-35, Class 1 or ASTM A 148 Gr. 80-50, carbon steel as noted on Drawings.

E. Shear Studs or Headed Studs: Comply with AWS D1.1 Section 7 for type B studs (Table 7.1). Length noted is the installed length.

F. Welding Electrodes:
   1. Conform to AWS D1.1. Base selection of electrodes on the actual properties of the metal connected.
   2. Electrodes shall have a specified minimum tensile strength of at least 70 ksi.
   3. Use low hydrogen electrodes.
   4. For all welds in special moment frame connections (where noted on drawings), electrodes shall have minimum Charpy values of 20 ft. lb. and a minimum average value of 20 ft. lb. at 0°C.
   5. Electrodes for Weathering Steel: Conform to base metal manufacturer's recommendations for strength, atmospheric corrosion resistance and weathered appearance which shall match the base metal.

G. Metallic Filler: Plastic Steel Putty manufactured by Devcon Corporation.

2.2. FASTENERS

A. Unfinished Bolts and Nuts (Machine Bolts) and Threaded Rods:
   1. Bolts and Nuts: ASTM A 307, Grade A
   2. Washers: ASTM F 844

B. High Strength Bolts Nuts and Washers: ASTM A 325 Type 1 except use Type 3 bolts where ASTM A588 material is specified, Use ASTM A490 Type 1 bolts where noted.

C. Anchor Rods: ASTM F1554 unless otherwise noted.

D. Where fasteners are indicated as galvanized, provide units that are zinc coated in accordance with ASTM B 695, Class 50

E. Direct Tension Indicators: ASTM F 959, Type as required, at Contractor's option.

F. Expansion Bolts: Kwik-Bolt III as manufactured by Hilti Inc. or approved alternate.

G. Clevises and Turnbuckles: Dimensions and minimum capacities to conform to the values listed in Tables 8-27 and 8-29 of the "AISC Steel Construction Manual."

H. Sleeve Nuts: Strength of sleeve nut shall be such that when loaded axially the sleeve nut shall be stronger than the ultimate capacity of the connected parts.

I. Recessed-Pin Nuts: Dimensions and minimum capacities to conform to the values listed in the "AISC Steel Construction Manual."

J. Cotter Pins: Dimensions and minimum capacities to conform to the values listed in the "AISC Steel Construction Manual."

2.3. PRODUCTS

A. Structural Thermal Break Pads
   1. ½" thick "Fabreeka-TIM" structural thermal break by Fabreeka International
   2. ½" thick "Armatherm grade FRR" structural thermal break by Armatherm
   3. ½" thick TBM-1" Structural thermal break by Thermal Briding Solutions

B. Bearings
   1. Sliding Bearing Pads as indicated, one of the following: Seismic Energy Products "Fluorogold"; Lubrite Division, Merriman Inc "Lubrite"; The Duriron Co Inc. "Riload".
   2. Elastomeric Bearing Pads: Comply with AASHTO "Standard Specifications for Highway Bridges", Section 18, Durometer as shown.

C. Paint
   1. Shop Paint: SSPC, Paint 20, Type I, Inorganic, or Type II, Organic. Paint shall comply with the requirements of SSPC-PS 12.01.
   2. Primer paints shall be compatible with finishes specified by the architect.

D. Grout
   1. Nonmetallic Shrinkage-resistant Grout: Premixed, nonmetallic, non-corrosive, nonstaining product containing selected silica sands, Portland Cement, shrinkage compensating agents, plasticizing and water-reducing agents. Subject to compliance with requirements, provide: BASF MasterBuilders "MasterFlow 713" or Five Star Products "Five Star Grout".
   2. Non-Shrink Grout: Premixed non-shrink, non corrosive compound consisting of non-metallic aggregate, cement; water reducing and plasticizing agents capable of developing minimum compressive strength of 2,400 psi in 48 hours and 6,000 psi in 28 days; "Five Star Grout" manufactured by Five Star Products.
   3. Drypack: Euclid Chemical Company "Euco Dry Pack Grout", BASF MasterBuilders "MasterFlow 700", or equal. Mix to a plastic consistency.

2.4. CONNECTION DESIGN

A. Contractor shall design all steel connections not fully defined.

B. Type of Connections
   1. All connections shall be one of the following:
      a. High-strength bolts.
      b. Unfinished bolts.
      c. Welds.
   2. When the type of connection is shown on the drawings use that type of connection.
   3. Use a connection other than unfinished bolts where required by code and in the following locations:
      a. All connections indicated as such.
      b. Connections that are a part of the lateral force resisting system.

c. Connections for supports of running machinery or of other live loads which produce impact.

d. Connections carrying cooling tower loads.

e. Beams supporting columns or posts.

f. Connections for cantilevers.

g. All column splices.

C. Design Criteria.

1. Design connections for the loads and according to the requirements in the Contract Documents and the applicable building regulations.
2. Connections shall be adequate to provide for the reaction due to the maximum uniformly distributed load that the beam is capable of carrying for its span, based on the allowable unit stresses, except where other reactions are shown on the Drawings.
3. Minimum connections shall comply with appropriate tables headed "Framed Beam Connections" shown in the AISC "Manual of Steel Construction." Seated connections may be used only when they do not interfere with architectural features.
4. Bolts shall be at least 3/4 inches in diameter.

2.5. FABRICATION

A. General:

1. Fabrication to be performed in accordance with Chapter M of AISC "Specification for Structural Steel Buildings", the AISC "Code of Standard Practice for Buildings and Bridges" sections 3.2, 5, 6, 8 and the Drawings and Specifications.
   a. Assume all thermally cut edges are subject to substantial stresses.
   b. Paragraph M4.6 shall be considered deleted from Chapter M.
   c. The last sentence of paragraph M5.1 shall be deleted from Chapter M.
2. Provide holes and accessories required for securing other work to the work specified here.
3. Where thickness of material exceeds 7/8 inch or the diameter of hole, drill or ream holes after punching even when punching is allowed by referenced standards. Flame cut holes for fasteners are not acceptable.
4. Fabricate beams and girders with natural camber upward, unless otherwise shown or indicated on the Drawings.
5. Splice members only where indicated on Structural Drawings or where accepted by the Architect.
6. Remove burrs that would prevent solid seating of the connected parts.
7. When bending steel plate:
   a. Bend plates perpendicular to the rolling direction.
   b. Grind flame cut plate edges transverse to the bend line.
   c. Grind out nicks in plate edges transverse to the bend line.
   d. Round sharp corners on plate edges transverse to the bend line.
8. Weld sizes where shown shall be assumed to be the effective weld sizes.

B. Architecturally Exposed Steel
   1. All members exposed to view in the completed structure shall be classified as "Architecturally Exposed Structural Steel".
   2. Comply with the provisions of the AISC Code of Standard Practice for Steel Buildings and Bridges regarding architecturally exposed structural steel.
      a. Abutting cross sectional configurations shall match.
      b. Remove backing bars.
      c. Remove weld runoff tabs and grind smooth.
      d. All surfaces and welds exposed to view shall be treated as finished surfaces.
   3. Exposed Welds:
      a. All exposed fillet welds shall be made smooth of uniform convex contour, radius and dimension for their full length; grind smooth, if welds were not made to this criteria.
      b. All other exposed welds shall be milled or ground smooth and flush with the surfaces of the adjoining materials welded.
   4. Weld show-through shall not be permitted.
   5. Remove weld splatter on architecturally exposed steel.
   6. All exposed corners shall be square and sharp, eased to a radius of 1/4 in.

C. Bolting, General:
   1. Bolts shall be of a length that will extend not more than 1/4 in beyond the nuts unless noted otherwise.
   2. Washers shall be used on Bolts. Use beveled washers where bolts bear on sloping surface.
   3. Bolts shall be installed such that no threads occur in the shear plane when joining pieces 3/8” thick and thicker.
   4. Manufacturers symbol and grade markings shall appear on all bolts and nuts.
   5. Product containers must be marked so that correspondence with mill reports can be established.
   6. Holes in column baseplates shall be oversized per Section 14 of AISC Manual of Steel Construction, latest edition.
   7. Circular and slotted holes shall be as per Specification for Structural Joints Using ASTM A325 or A490 Bolts. For purposes of hole fabrication assume dynamically loaded connections.
   8. When bolt holes are subject to welding shrinkage stresses the holes shall be drilled.

D. Unfinished Bolts (Machine Bolts) and Anchor Rods:
   1. Install and tighten unfinished bolts in accordance with requirements for snug tightened bolts as defined in “Specification for Structural Joints Using ASTM A325 or A490 Bolts”.
   2. Mutilate bolt threads for unfinished bolts to prevent the nuts from backing off.

E. High-Strength Bolts

1. Install high-strength threaded fasteners in accordance with RCSC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts". Contact surfaces of bolted parts shall as a minimum comply with the class A requirements.
2. For slip critical (friction) type connections, tighten nuts using Direct Tension Indicator. Calibrated wrench and "Turn of Nut" methods are not acceptable.
3. When connection has bolts and welds, tighten bolts prior to welding with the exception that in moment connections the flange welds are completed prior to final tightening of high strength bolts.
4. When already tensioned bolts have had their tension relaxed, either re-torque the bolts using a calibrated wrench or replace the bolt and tension indicator and re-tighten.

F. Welding
1. Welding shall be in accordance with AWS D1.1 "Structural Welding Code".
   a. Contractor is responsible for selection of specific materials and procedures except as specifically noted in contract documents.
   b. Connections have varying levels of restraint and thus necessary steps shall be taken by Contractor to control or accommodate the restraint.
   c. Welding and fabrication procedures shall incorporate measures necessary to eliminate cracking. These measures shall include but are not limited to additional preheat, postheat, or retarded cooling.
   d. When selecting materials and procedures, consideration shall be given to the need for materials and procedures in excess of code requirements.
   e. The need for pre-heat and other procedures are to be based on the actual chemistry and mechanical properties of the steel and not solely on the specified properties of the steel.
   f. Limit maximum interpass temperatures so as not to decrease toughness and strength of the weld metal.
   g. Weld variables shall be consistent with the recommendations of the electrode manufacturer.
   h. Welding Procedure Specifications shall be readily available to all welders, inspectors, and supervisors during the production process.
   i. Weld only in accordance with the WPSs.
   j. Do not mix different electrodes in the same weld joint unless the interactions have been shown not to cause problems.
   k. Welding procedures shall incorporate low hydrogen practices.
   l. Use stringer beads only (no weaving).
2. No tack welds not incorporated into a weld will be allowed on the finished structure with the exception of backing plates that are not removed.
3. All groove or butt welds shall be full penetration unless noted otherwise on the Drawings.
4. Do not weld into the column flange to column web intersection.
5. Sequence the work as necessary to accommodate testing.
6. Remove run-off tabs and backup plates and grind surfaces smooth as required for inspection or testing.

7. At connections of members that are a part of "special moment frames" or "eccentrically braced frame":
   a. Remove backing bars and apply reinforcing fillet weld per note J of figure 2.4 of AWS D1.1.
   b. Remove weld runoff tabs and grind smooth.
   c. Delete "...root and ..." from subsection 4.14.1.5 of AWS D1.1
   d. Limit oscillation of FCAW electrodes to 3d, for d >= 3/32 inches, and to 5d, for d < 3/32 inch (d = wire diameter)
   e. Pay increased attention to uniform and adequate preheat.
   f. Maximum interpass temperature not to exceed 550 degrees F when notch toughness properties are specified.
   g. Complete individual weld layers prior to applying portions of subsequent layers. Ends of interrupted passes to be staggered. Minimize starts and stops within body of the weld.
8. Splices of members in tension, members of moment frames, members of braced frames, and members of eccentrically braced frames that are made from ASTM A6 Group 4 of 5 rolled shapes, and or plates more than 2 inches thick shall be made in conformance with Section J1.5 of "Specification for Structural Steel Buildings".
9. Shear Studs: Install shear studs in accordance with the manufacturer's recommendations and AWS D1.1.
10. Where tubes, pipes or other closed sections are exposed to the weather, provide seal welds where other specified welds do not provide a complete seal of the enclosed space.

G. Finishes of Architecturally Exposed Steel
   1. All surfaces of architecturally exposed structural steel members shall be uniform in appearance, including smoothness and texture, when viewed in direct sunlight at a distance of 10 feet, at angles of incidence 0 degree to 90 degree at completion of the following stages of work:
      a. "Surface Preparation" and "Shop Prime Painting,".
   2. Surface Appearance: The initial condition of steel to be exposed in use shall conform to SSPC-Vis 1 Rust Grade A. The exposed surfaces, edges and ends of all plates and other components shall be free of any surface defects including weld splatter, burrs, dents, gouges, occlusions, streak, ridges and recesses. Such defects may be repaired and surface restored with weld or other approved filler material and machining (milling, grinding or sanding) to match appearance, including smoothness and texture, of parent surface.

H. Shop Painting
   1. All structural steel exposed to the weather, classified as Architecturally Exposed Steel, or not completely concealed by interior finishes shall receive a shop coat of primer except as follows:
      a. Steel in contact with concrete or cementitious fireproofing.
      b. Contact surfaces of welded connections and areas within 4 in on each side of field welds.
      c. Machined surfaces.

d. Contact surfaces of high-strength bolted connections.
e. Reinforcing steel.
f. Exterior exposed surfaces of weathering steel.

2. Steel members not otherwise painted shall be painted when subjected to condensation from piping, are in shower or steam rooms, are exposed to chemical fumes or are exposed to other conditions of potentially aggressive corrosion.
3. The following surfaces shall be temporarily protected by a thin coating of varnish or lacquer:
   a. Unpainted area around field welds.
   b. Steel around high strength bolts.
   c. Machined surfaces.
4. Surface preparation and application shall be in accordance with SSPC-PS 12.01 "One-Coat Zinc-Rich Painting System".

2.6. SOURCE QUALITY CONTROL

A. Testing and inspection of structural steelwork will be performed by the Testing Laboratory. Provide the Inspector with the following:
   1. A complete set of accepted "Submittals"
   2. Cutting lists, order sheets, material bills, and shipping bills
   3. Representative sample pieces as requested by the testing agency
   4. Full and ample means and assistance for testing all material.
   5. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored or fabricated, and also in their erected position.

B. Scheduling of Tests and Inspections
   1. The Contractor shall notify the Inspector in sufficient time prior to fabrication or erection work to allow testing and inspection without delaying the work.
   2. Shop welds will be inspected in the shop before the work is painted or shipped.

C. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the Inspector can refer back to the person making the connection.

D. Non-destructive Testing and Inspections
   1. As a minimum the inspector will make all tests and inspections as required by the International Building Code 2018. The Inspector will make all the tests and inspections indicated in the Construction Documents.
   2. The Inspector will make all verification tests and inspections as required by AWS D1.1 "Structural Welding Code".
   3. Do not reduce testing frequency unless permission is obtained from Architect.
   4. Inspector shall be present during all welding operations.
   5. Verify that welders are certified.

6. Check materials, equipment and procedures. Verify meters on welding equipment are functioning and are accurate.
7. Visual Inspection:
   a. Visually inspect all welds.
   b. Visual inspection of multi-pass welds to be continuous.
   c. Visually inspect welds to Group 4 and 5 sections of at least 72 hours after completion of welding for the presence of cracks.
   d. Verify the effective throat thickness of flare groove welds is consistently obtained when flush to bar or section. This verification shall be based on test sections where necessary.
8. Test Methods:
   a. Butt welds will be tested using magnetic partical test methods and either ultrasonic or radiographic test methods.
   b. Butt welds to pipes and tubes to be tested using magnetic particle tests.
   c. Use magnetic partical test methods for filet welds and to supplement the testing requirements for butt welds.
   d. For radiographic a double film technique will be used. One copy of each film will be sent to the Architect, the other will be retained by the Inspector.
   e. In addition to the non-destructive testing specified other non-destructive test methods recognized by AWS D1.1 may be used at the Architects discretion and the results can be used to reject work under this contract.
9. Frequency of non-destructive examination is to be as follows:
   a. Full Penetration Butt Welds: 100 percent ultrasonic.
   b. Partial Penetration Butt Welds: 50 percent min. ultrasonic or radiographic inspection.
   c. Fillet and other welds not otherwise inspected: a minimum of 20 percent.
   d. Selection of welds to be examined: Where there is a requirement for less than 100% examination the method of selection of welds to be examined is to be agreed with the Architect before commencement of the work. If the Architect does not provide more specific criteria inspectors will select the welds to be tested. The inspectors will chose specific weld so as to obtain results that are representative of the conditions in the structure. In addition inspectors will emphasize those locations that experience has shown are more likely to have problems.
   e. On five percent of the full penetration butt welds (as chosen by inspector) at connections denoted as being a "special moment connection" as noted on the drawings, after removing, run-off tabs, grind the end of the weld sufficiently to allow determination of number and sizes of weld passes.
10. Testing of Base Metal: These provisions are in addition to other applicable requirements.
    a. For full penetration welds where they are part of moment frame or eccentrically braced frames the edges of material to be welded will be ultrasonically examined for evidence of laminations, inclusions or other discontinuities.

b. Ultrasonically test column flanges and webs at the location of all moment connections and brace connections. Test for a distance 3 inches around the location to be welded. The test procedure and acceptance criteria is defined by ASTM A898-07, "Standard Specification for Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes" Level I.

c. Base metal thicker than 1-1/2 inches, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities behind and within a distance of 3 inches of such welds after joint completion. Any material discontinuities shall be accepted or rejected on the basis of the defect rating in accordance with flaw severity, Class B criteria in Table 8.2 in AWS D1.1.

11. Where inspection reveals unacceptable defects:

a. The extent of inspection will be increased to provide confidence that the defects in a joint has been found and to assure that the problem is not systematic.

b. As a minimum, examine two additional joints in the group represented by the joint. If the non-destructive examination of the two additional joints reveals unacceptable defects, examine each joint in the group.

E. Take samples of all welding consumables and store in sealed containers.

F. Tests of High Strength Bolts, Nuts and Washers:

1. The Inspector will make all tests and inspections of high strength bolt connections as required by RCSC "Specifications for Structural Joints Using High Strength Bolts".

2. Observe all Direct Tension Indicators to see if proper tightness was achieved.

3. Confirm that the faying surfaces have been properly prepared before connections are assembled.

G. Testing of End-Welded Studs:

1. End-welded studs shall be random sampled and tested from stock furnished to each project. Tests shall meet the requirements in Table 7.1 of AWS D1.1.

2. Production control testing shall be in accordance with AWS D1.1 Chapter 7.

3. As a minimum, visually inspect 100% of the installed studs and test 15% of installed studs in accordance with AWS D1.1 paragraph 7.8.

H. Inspection Records

1. Make systematic record of all welds, including:

a. Location and type of weld.

b. Identification marks of welders.

c. List of defective welds.

d. Manner of correction of defects.

2. The Inspector will maintain a daily record of the work that has been inspected and its disposition. One copy of each of the report will be submitted to the Owner on a weekly basis. Test reports will be made on the form suggested in the AWS D1.1 "Structural Welding Code."

I. Mill Reports: Testing laboratory will review mill reports for conformance to referenced standard.

PART 3 - EXECUTION

3.1. CONDITION OF SURFACES

A. Prior to commencing with the erection of structural steel inspect the job site and verify that the structural steel may be erected in accordance with the Drawings and Specifications.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect in writing.
2. Do not proceed with construction in the region of the discrepancy until all such discrepancies have been resolved.

3.2. PREPARATION

A. Secure field measurements required for proper and adequate fabrication and installation of the work covered in this Section. Assume responsibility for exact measurements.

B. Furnish templates for exact locations of items to be embedded in concrete [and masonry,] and any setting instructions required for installation.

C. Contractor to employ an engineer or surveyor to check elevations of concrete bearing surfaces, anchor rods locations, and similar devices before erection proceeds. Report discrepancies to the Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with the Architect.

3.3. ERECTION

A. General:

1. Structural steel shall be erected in accordance with Chapter M of AISC Specifications and the Drawings and Specifications and with the AISC Code of Standard Practice.
2. Erection of architecturally exposed structural steel shall be in accordance with Section 10.5.1 and 10.5.2 of AISC Code of Standard Practice for Steel Buildings and Bridges.
3. Dimensions shown on drawings are based on an assumed design temperature of 70 degree F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.
4. Care shall be taken to protect work already installed from damages resulting from structural steel erection.
5. Steel erection may be allowed prior to supporting concrete reaching specified strengths if the contractor provides technical justification and the Architect concurs.

B. Temporary Shoring and Bracing:

1. Provide temporary bracing and shoring adequate to protect the structure against damage due to construction loads and other loads such as wind and seismic forces.
2. Provide temporary works as necessary to erect the structure.
3. Items installed before concrete is placed shall be properly braced to prevent distortion by pressure of concrete. Watch and maintain bracing during concrete operations.
4. Contractor is responsible for identifying need for temporary construction.

C. Field Assembly:

1. Set structural members to the lines and elevations indicated. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Before assembly clean bearing surfaces and other surfaces which will be in permanent contact after assembly.
3. Do not enlarge unfair holes in members by burning or by the use of drift pins. Ream holes that need to be enlarged to admit bolts. Where a hole is required to be enlarged by more than 3/32-inch ream to and use next larger bolt size.
4. Do not use gas cutting torches in the field for correcting fabricating errors in the structural framing unless accepted by the Architect. Finish gas cut sections equal to a sheared appearance when permitted.
5. The quality of field welds or bolting shall be the same as that performed in the shop.
6. Erection bolts for welded connection shall be tightened securely and left in place.
7. Erection Bolts: On architecturally exposed steel construction, remove erection bolts, fill holes with plug welds, and grind exposed surfaces smooth.

D. Installation of Bearing Pads:

As per manufacturer’s instructions.

E. Setting Base Plates:

1. Prepare surface of existing concrete as if for a concrete construction joint. Clean the bottom surface of base plates.
2. Grout shall be non-shrink grout mixed and applied in strict accordance with the manufacturer’s directions.
3. Leave no voids between the base plate and the concrete.
4. Tighten anchor rods after the supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base plate prior to installing grout.

F. Expansion Bolts:

1. Install in accordance with the manufacturer's recommendations.
2. Use washers on all bolts.
3. Use care to avoid cutting or damaging reinforcing bars.
4. When exposed to view in the final structure, bolts shall be of a length that will extend entirely through but not more than 1/4-inch beyond the nuts unless otherwise shown on the Drawings.

G. Shear Studs shall be attached in accordance with requirements of AWS D1.1 "Structural Welding Code".

3.4. BASE PLATE GROUTING

A. Base plate grout shall be mixed and applied in strict accord with manufacturer's directions.

B. Leave no voids between the base plates and the concrete.

3.5. TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint, and paint all surfaces exposed to the elements with the exception of those surfaces in direct contact with concrete or fireproofing.

B. Use same materials and standards as for shop painting.

3.6. FIELD QUALITY CONTROL

A. All field welding shall be inspected by a full time inspector.

B. Field quality control shall, as a minimum, conform to the requirements specified under Source Quality Control.

C. Expansion bolts to be proof tested after installation by loading 25 percent of them to 150 percent of the manufacturers recommended tensile design loads.

END OF SECTION

SECTION 05 12 13

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Architecturally exposed structural steel (AESS).

1.2 DEFINITIONS

A. AESS: Architecturally exposed structural steel.

B. Category AESS 2 (First beam and above): Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 2 and is designated as AESS 2 or Category AESS 2 in the Contract Documents.

C. Category AESS 3 (For columns up to first beam): Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 3 and is designated as AESS 3 or Category AESS 3 in the Contract Documents.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Tension-control, high-strength, bolt-nut-washer assemblies.
      b. Filler.
      c. Etching cleaner.
      d. Galvanized repair paint.
   2. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS.
      a. Identify AESS category for each steel member and connection, including transitions between AESS categories and between AESS and non-AESS.
      b. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
      c. Include embedment Drawings.

d. Indicate orientation of mill marks and HSS seams.
e. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
f. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation and location of bolt heads.
g. Indicate exposed surfaces and edges and surface preparation being used.
h. Indicate special tolerances and erection requirements.
i. Indicate weep holes for HSS.
j. Indicate surface preparation, primer, and coating requirements, including systems specified in other Sections.

3. Samples: Submit Samples to set quality standards for AESS.
   a. Steel plate, 3/8 by 8 by 8 inches (9.5 by 200 by 200 mm), with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches (100 by 150 by 9.5 mm), welded to plate with a continuous fillet weld and with weld ground smooth and blended.

B. Informational Submittals:
   1. Qualification Data: For fabricator.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172) and is experienced in fabricating AESS similar to that indicated on this Project.

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program, is designated an AISC-Certified Erector, Category CSE, and is experienced in erecting AESS similar to that indicated on this Project.

C. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.
   1. Build mockup of typical portion of AESS as shown on Drawings.
   2. Coordinate painting requirements with Section 09 91 00 - Painting for interior painting.
   3. Coordinate high-performance coatings requirements with Section 09 96 00 - High-Performance Coatings for exterior painting.
   4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Use special care in handling AESS to prevent twisting, warping, nicking, and other damage during fabrication, delivery, and erection. Store materials to permit easy access for inspection and identification. Keep AESS members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect AESS members and packaged materials from corrosion and deterioration.

1. Do not store AESS materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 FIELD CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with requirements of ANSI/AISC 303, Sections 1 through 9 and as modified in Section 10, "Architecturally Exposed Structural Steel."

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563/A563M, Grade DH, (ASTMA563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
   1. Finish: Plain.

2.3 FILLER

A. Polyester filler intended for use in repairing dents in automobile bodies.

2.4 PRIMER

A. Steel Primer:
   1. Comply with Section 09 91 00 - Painting for interior painting and Section 09 96 00 - High-Performance Coatings for exterior painting.

B. Galvanized-Steel Primer:
   1. Comply with Section 09 96 00 - High-Performance Coatings.

2.5 FABRICATION

A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.
   1. Use special care handling and fabricating AESS before and after shop painting to minimize damage to shop finish.

B. Category AESS 2 (First beam and above):
   1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.

2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE No. 3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch (9.5-mm) closure plates.
6. Limit butt and plug weld projections to 1/16 inch (1.6 mm).
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303 .
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M .
15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.

C. Category AESS 3 (For columns up to first beam):
1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE No. 3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch (9.5-mm) closure plates.
6. Limit butt and plug weld projections to 1/16 inch (1.6 mm).
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.

15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.
17. Cut out mill marks from mill material or hide these markings from view in the completed structure. Where neither method is possible, remove mill marks by grinding and filling surfaces as approved by Architect.
18. Grind butt and plug welds smooth or fill, removing weld splatter exposed to view.
19. Orient HSS seams as indicated or away from view.
20. Align and match abutting member cross sections.
21. At visible open joints of copes, miters, and cuts, maintain uniform clear gaps of 1/8 inch (3.2 mm). At closed joints, maintain uniform contact within 1/16 inch (1.6 mm).
22. Fabricate with exposed surfaces smooth, square, and of surface quality approved by Architect.

D. Erection marks, painted marks, and other marks are permitted on galvanized- steel surfaces of completed structure.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
   1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
   2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
   3. Galvanize AESS lintels attached to structural-steel frame and located in exterior walls.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
   1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments, showing dimensions, locations, angles, and elevations.

B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Take special care during erection to avoid marking or distorting the AESS and to minimize damage to shop painting. Set AESS accurately in locations and to elevations indicated and according to ANSI/AISC 303 and ANSI/AISC 360 .
   1. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Take care to avoid any blemishes, holes, or unsightly surfaces resulting from the use or removal of temporary elements.
   2. Grind tack welds smooth.
   3. Remove backing and runoff tabs, and grind welds smooth.
   4. Orient bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
   5. Conceal fabrication and erection markings from view in the completed structure.

B. In addition to ANSI/AISC 303, Section 10 requirements, comply with the following.
   1. Erection of Category AESS 2:
      a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
      b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
      c. Remove weld spatter, slivers, and similar surface discontinuities.
      d. Grind off butt and plug weld projections larger than 1/16 inch (1.6 mm).
      e. Continuous welds shall be of uniform size and profile.
      f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
      g. Splice members only where indicated on Drawings.
      h. No torch cutting or field fabrication is permitted.
   2. Erection of Category AESS 3:
      a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
      b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
      c. Remove weld spatter, slivers, and similar surface discontinuities.

d. Grind off butt and plug weld projections larger than 1/16 inch (1.6 mm).
e. Continuous welds shall be of uniform size and profile.
f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
g. Splice members only where indicated on Drawings.
h. No torch cutting or field fabrication is permitted.
i. Weld profiles, quality, and finish shall be as approved by Architect.
j. Make joint welds, including tack welds, appear continuous by filling intermittent welds.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
1. Joint Type: Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.5 REPAIR

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and touchup galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:
1. Cleaning and touchup painting are specified in Section 09 91 00 - Painting or Section 09 96 00 - High-Performance Coatings.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect AESS as specified in Section 05 12 00 - Structural Steel Framing. The testing agency is not responsible for enforcing requirements relating to aesthetic effect.

B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

END OF SECTION

SECTION 05 30 00

METAL DECKING

PART 1 - GENERAL

1.1. SUMMARY

A. Section Includes - Fabrication and installation of metal decking and metal decking accessories.

B. Related Sections
   1. 03 30 00 – Cast-In-Place Concrete.
   2. 05 12 00 – Structural Steel Framing.
   3. 05 21 00 – Steel Joists Framing.
   4. 05 50 00 – Metal Fabrications.
   5. 07 81 00 – Applied Fireproofing.

1.2. REFERENCES

A. American Iron and Steel Institute (AISI).
   1. AISI "Specification for the Design of Cold Formed Steel Structural Members."

B. American Society for Testing and Materials (ASTM).
   1. ASTM A 1008A.
   2. ASTM A 653.
   3. ASTM A 36 "Specification for Carbon Structural Steel".

C. American Welding Society (AWS).
   1. AWS D1.3 "Specifications for Welding Sheet Steel in Structures".

D. Underwriters Laboratories Fire Resistance Directory.

1.3. SUBMITTALS

A. General:
   1. Submit shop drawings for review and obtain acceptance prior to start of fabrication.
   2. Review of submittals is for general conformance with the design concept of the project and information shown on the contract documents only. The Contractor is responsible for conforming, correlating and coordinating dimensions in the field for tolerance, clearances, quantities, fabrication and installation processes means and methods of construction, coordination of this work with other trades and performing work in a safe and satisfactory manner.

B. Product Data:
   1. Submit manufacturer's literature for each style and combination of deck assembly provided including steel decking design calculations, section properties, load

carrying capacity, deflection data, and load test data substantiating calculated capacities.

2. Submit U.L. Fire Rating Report.
3. Submit certified copies of mill test reports for each heat of steel and for all fasteners, including nuts and washers prior to start of fabrication.
4. Mill test reports shall include ladle analysis and tensile elongation and bend tests. Perform mechanical and chemical tests for all material regardless of thickness or use.
5. Mill reports shall be traceable to individual pieces of steel used.

C. Shop Drawings:

1. Prepare decking plans showing deck profile, sheet layout, method of attachment, edge details, supplemental framing, openings and reinforcement, projections and accessories.
2. Show type and location of welds and other fasteners.
3. Show where shoring of deck is needed.

D. Submit certificates of compliance for:

1. Welding electrodes including electrode specification sheets.
2. Shear studs including manufacturers test reports.
3. Welder has passed qualification tests.

E. Welding Procedures:

1. Submit welding procedures for all welding.

1.4. QUALITY ASSURANCE

A. Owner's Testing Laboratory: Testing and inspection of metal decking will be performed by an independent laboratory engaged by the Owner ("Inspector").

B. All work shall be performed by qualified operators experienced in their field of work and as otherwise required by these specifications.

C. Qualifications of Welders:

1. All welding shall be performed by operators who are qualified for the types of welds used. Each operator shall have been qualified as prescribed by AWS. Welder qualification shall include passing the bend test.
2. Require welders to retake the qualification test in, as determined by the Architect, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify, he shall not perform any welding on the project.
3. Pay all costs associated with welder qualification.

1.5. DELIVERY, STORAGE AND HANDLING

A. Store materials to permit easy access for inspection and identification. Support material off the ground and protect from corrosion and deterioration. Materials showing evidence of damage will be rejected and shall be immediately removed from the site.

B. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Where deck is exposed to view in the completed structure use special care to prevent damage to decking.

D. Each bundle of decking shall be marked or tagged to indicate material grade, style and gage of deck.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Metal Decking
   1. ASTM A 653-09 designated as Structural Steel grade 50 or higher with G60 coating.
   2. All decking shall have a current ICC listing allowable vertical load values, diaphragm shear values and ratings for use in fire resistive assemblies.
   3. Decking shall be coated with the manufacturers painted finish where a galvanized finish is not provided.
   4. Decking Manufacturer: Canam or accepted equal.

B. Accessories:
   1. Cover plates, flashings and closures: Sheet steel ASTM A 653 Grade G60 or ASTM A 611 Grade C to match deck material, 16 gage minimum.

C. Welding Electrodes:
   1. Conform to AWS D1.3 and deck manufacturers recommendations. Base selection of electrodes on the actual properties of the metal connected.
   2. Electrodes will have a specified minimum tensile strength of at least 60 ksi.
   3. Use low hydrogen electrodes.

2.2. PRODUCTS

A. Touch-up Paint.
   1. Where painted decking is used touch-up paint shall be same as recommended by the decking manufacturer.
   2. Touch up paint for galvanized sheet metal shall be Steel Structures Painting Council (SSPC) Paint-20 Type 1, Inorganic.]

2.3. FABRICATION

A. Fabricate deck units in lengths to span three or more spans where possible.

B. Cantilevered units shall have the cantilever and at least the adjacent span in one length.

C. Fabricate such that end joints occur over supporting members.

D. Sheets parallel to and at the perimeter of the deck shall be full width sheets.

E. Each bundle of fabricated elements shall be marked or tagged so as to show material and grade.

F. TOLERANCES:

1. Panel length: Plus or minus ½ inch.
2. Thickness of deck units: Not less than 95 percent of the specified thickness.
3. Panel camber: ¼ inch in 10 foot length.

PART 3 - EXECUTION

3.1. CONDITION OF SURFACES

A. Prior to commencing with the erection of structural steel inspect the job site and verify that the work is sufficiently complete that this installation may properly commence.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect in writing.
2. Do not proceed with construction in the region of the discrepancy until all such discrepancies have been resolved.

3.2. PREPARATION

A. Secure field measurements required for proper and adequate fabrication and installation of the work covered in this Section. Assume responsibility for exact measurements.

3.3. ERECTION

A. General: Install deck units and accessories in accordance with Construction Documents and manufacturer's recommendations.

B. Placing Deck Units:

1. Position on supporting members and adjust to final position with ends bearing a minimum of 2 inches on supporting members.
2. Where feasible, install with ribs at right angles to support members.
3. Place units end-to-end before permanently fastening.
4. Align ribs over entire length of run.
5. Shore and brace decking as necessary for all construction loads.

C. Fastening of Deck Units:

1. Welding shall be in accordance with AWS D1.3.
   a. Contractor is responsible for selection of specific materials and procedures except as specifically noted in contract documents.
   b. When selecting materials and procedures, consideration shall be given to the need for materials and procedures in excess of code requirements.
   c. Weld variables shall be consistent with the recommendations of the electrode manufacturer.

d. Welding Procedure Specifications shall be readily available to all welders, inspectors, and supervisors.

2. No tack welds not incorporated into a weld will be allowed on the finished structure with the exception of backing plates that are not removed.
3. Sequence the Work as necessary to accommodate testing.
4. Secure decking to supporting members with [3/4]-inch diameter puddle welds. If studs are welded through the deck to the structural steel the stud welds can replace the fusion welds on a one per one basis.
5. Use weld washers when base metal thickness is less than 0.028 inch or where required in the Construction Documents. Weld washers shall have a minimum thickness of 16 gage and have a nominal 3/8 inch diameter hole.

D. Closures:
1. Install sheet steel closures and angle flashings to close openings between decks and walls, columns, and opening.
2. Closures shall be of sufficient strength to remain in place without significant distortion. Shore where necessary.

E. Punch holes in bottom flutes as required for installation of hanger wires.

F. Where the underside of decking is exposed in the final structure.
1. Tape or otherwise seal joints to prevent leakage of concrete.
2. Prevent damage to deck that would be observed.

G. Cutting Openings:
1. Where openings do not need reinforcements (exclusive of trim bars in concrete) do not cut deck until concrete has cured.
2. Unless both edges of openings perpendicular to deck span are supported by a beam, do not cut opening until concrete has cured.

3.4. PROTECTION

A. Contractor is responsible for determining of the adequacy of the decking (with or without concrete fill) to support construction loads and for identifying need for temporary construction. Shoring is the responsibility of the Contractor.

B. Do not suspend ducts, piping, ceilings, light fixtures or other items from metal roof decking.

C. Do not place pipes or conduit in concrete fill over deck except as specifically allowed.

D. Decking shall be protected from damage during construction operations. As a minimum this shall include the use of planked runways if buggies are used.

E. Concrete admixtures containing chloride salts shall not be used in concrete fill placed on metal decking.

3.5. TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint, and paint all surfaces exposed to the weather in the complete structure.

B. Use same materials and standards as for shop painting.

3.6. CLEAN-UP

A. Remove grease, oil, and other foreign material from all surfaces.

B. Leave deck in proper condition for bonding with concrete fill where concrete fill will be placed.

3.7. FIELD QUALITY CONTROL

A. Testing and inspection of metal deck installation will be performed by the independent testing agency. Provide the Inspector with the following.
   1. A complete set of accepted "Submittals"
   2. Representative sample pieces as requested by the testing agency
   3. Full and ample means and assistance for testing all material.
   4. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored or fabricated, and also in their erected position.

B. Scheduling of Tests and Inspections: The Contractor shall notify the Inspector in sufficient time prior to fabrication or erection work to allow testing and inspection without delaying the work.

C. Non-destructive Testing and Inspections
   1. As a minimum the inspector will make all tests and inspections as required by the International Building Code 2018. The Inspector will make all the tests and inspections indicated in the Construction Documents.
   2. The Inspector will make all verification tests and inspections as required by AWS D1.3.
   3. Inspector shall be present during all welding operations.
   4. Verify that welders are certified.
   5. Check materials, equipment and procedures. Verify meters on welding equipment are functioning and are accurate.
   6. Visually inspect all welds.

D. Inspection Records
   1. Make systematic record of all welds, including:
      a. Location and type of weld.
      b. Identification marks of welders.
      c. List of defective welds.
      d. Manner of correction of defects.
   3. The Inspector will maintain a daily record of the work that has been inspected and its disposition. One copy of each of the report will be submitted to the

Owner on a weekly basis. Test reports will be made on the form suggested in the AWS D1.3.

E. Mill Reports: Testing laboratory will review mill reports for conformance to referenced standard.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior non-load-bearing wall framing.

B. Soffit framing.

C. Interior load bearing wall and ceiling framing at kitchen.

1.2 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications for masonry shelf angles and connections.

B. Section 09 21 16.23 - Gypsum Board Shaftwall Assemblies for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

C. Section 09 22 16 - Non-Structural Metal Framing for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of cold-formed steel framing product and accessory.
   2. Shop Drawings:
      a. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
      b. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
      c. Indicate exterior sheathing screw fastener spacing to be utilized at interior zones and corner zones of building façade, as required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds.

B. Informational Submittals:
   1. Delegated-Design Submittal: Engineering calculations for cold-formed steel framing, signed and sealed by Metal Framing Engineer.
   2. Qualification Data: For testing agency.
   3. Welding certificates.
   4. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
      a. Steel sheet.

b. Expansion anchors.
c. Power-actuated anchors.
d. Mechanical fasteners.
e. Vertical deflection clips.
f. Miscellaneous structural clips and accessories.

5. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.
6. Field Quality Control:
   a. Photographic documentation of approved exterior wall framing mockup, in digital form. Include pan and close-up photos of the following:
      1) Attachment of bottom track to floor structure.
      2) Attachment of top track to overhead structure.
      3) Attachment of studs to bottom track and top track/clips.
      4) Attachment of vertical deflection clips to overhead structure.
      5) Attachment of studs to vertical deflection clips.
      6) Attachment of sheathing to studs.
   b. Pre-Inspection Notification: Submit written report that work has been reviewed for compliance by Contractor, Installer, and Metal Framing Engineer, and is ready for inspection by Testing Agency.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Mockups: Build mockups to verify quality standards for materials and execution, and to demonstrate compliance with structural performance criteria and delegated design submittals.
   1. Unless otherwise requested by Owner or Architect, build mockup of typical exterior non-load-bearing wall, one structural bay wide by one story high, at an outside corner.
   2. Include studs, top track, bottom track, sealer gasket, deflection clips and bridging.
   3. Cover approximately 25 percent of wall framing with specified sheathing. Include sheathing at outside corner.
   4. Mockup shall be reviewed by Metal Framing Engineer.
   5. Mockup will be inspected by testing and inspection agency.
   6. Provide photographic documentation of approved mockup.
   7. Subject to compliance with requirements, approved mockup may become part of the completed Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. CEMCO; California Expanded Metal Products Co.

B. ClarkDietrich Building Systems.

C. Marino\WARE.

D. SCAFCO Corporation.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 - Quality Requirements, to design cold-formed steel framing, including fasteners and connections to building structure.

B. Structural Performance: Provide cold-formed steel framing members, connectors, and fasteners capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated on Structural Drawings.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Framing Behind Brick or Stone Masonry Veneer: Horizontal deflection of L/600 of the wall height in feet.
      b. Framing Behind Dimension Stone Cladding: Horizontal deflection of L/600 of the wall height in feet.
      c. Framing Behind Metal Panels: Horizontal deflection of L/360 of the wall height in feet.
      d. Soffit Framing: Vertical deflection of 1/240 of the span for live loads and 1/240 for total loads of the span.
   3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 1/2-inch (13 mm).
   5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:
   1. Wall Studs: AISI S211.

2. Headers: AISI S212.
3. Lateral Design: AISI S213.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

E. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
2. Coating: G60 (Z180).

C. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
2. Coating: G60 (Z180).

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by design and performance requirements, but not less than 0.0538 inch (1.37 mm).
2. Flange Width: As required by design and performance requirements, but not less than 1-5/8 inches (41 mm).
3. Stud Depth: 6 inches (152.4 mm) unless otherwise indicated or required to comply with span and deflection design criteria.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by design and performance requirements, but not less than 0.0538 inch (1.37 mm).
2. Flange Width: As required by design and performance requirements, but not less than 1-1/4 inches (32 mm).

C. Slip-Type Head Joints for Vertical Deflection: Provide one of the following:
1. Proprietary Vertical Deflection Clips: Manufacturer's proprietary head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
a. Manufacturers:
1) ClarkDietrich Building Systems; “Fast Top Clip”, 0.0677 inch (1.72 mm), used in conjunction with minimum 0.033 inch (0.8 mm) deep leg track.

2) MarinoWARE; DEFLEX slide clips, used in conjunction with minimum 0.033 inch (0.8 mm) deep leg track.
3) SCAFCO Corporation, Deflection Clips ESC or DESC.
4) Steel Network, Inc. (The); VertiClip SL Series, or VertiTrack VTX Series (0.0677 inch (1.72 mm), used in conjunction with minimum 0.033 inch (0.8 mm) deep leg track).

2. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   a. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
      1) Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
      2) Flange Width: As required by design.
   b. Inner Track: Of web depth indicated, and as follows:
      1) Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
      2) Flange Width: As required by design.
3. Substitutions: None permitted.

2.5 INTERIOR LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As required by design and performance requirements, but not less than 0.0329 inch (0.84 mm).
   2. Flange Width: As required by design and performance requirements, but not less than 1-5/8 inches (41 mm).
   3. Stud Depth: 6 inches (152.4 mm) unless otherwise indicated or required to comply with span and deflection design criteria.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As required by design and performance requirements, but not less than 0.0538 inch (1.37 mm).
   2. Flange Width: As required by design and performance requirements, but not less than 1-1/4 inches (32 mm).

2.6 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
   2. Flange Width: 1-5/8-inches (41 mm), minimum.

2.7 INTERIOR CEILING FRAMING

A. Ceiling Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).

2. Flange Width: 1-5/8-inches (41 mm), minimum.

2.8 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
   1. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 3/4 inch (19 mm), minimum base-steel thickness of 0.0538 inch (1.37 mm), and depth required to fit insulation thickness or as indicated on Drawings.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers and knee braces.
   9. Hole reinforcing plates.
   10. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20.

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.11 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and fastener penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 07 21 00 - Thermal Insulation, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
   1. Bottom Tracks: Secure to concrete with expansion anchors or power-actuated anchors.
   2. Outer Track of Double Deflection Top Tracks:
      a. Secure to concrete with expansion anchors only; power-actuated anchors will not be permitted.
      b. Secure to structural steel with power-actuated anchors.

B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: As required by design, but not greater than 16 inches (406 mm) on center.
   2. Decrease spacing between studs (or increase minimum base-metal thickness) where required to ensure cold-formed metal framing system installation will withstand positive and negative wind pressures imposed by design wind speeds, as indicated in Shop Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. At Contractor’s option, provide one of the following:
      a. Connect proprietary vertical deflection track/clips to studs and anchor to building structure in accordance with manufacturer’s instructions.
      b. Install double deep-leg deflection tracks and anchor outer track to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
   1. At Contractor's option, provide one of the following:
      a. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
      b. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 SOFFIT INSTALLATION

A. Install perimeter soffit track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install soffit framing bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
   1. Install soffit framing over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).

C. Space soffit framing not more than 2 inches (51 mm) from abutting walls, and as follows:
   1. Soffit Framing Spacing: As required by design, but not greater than 16 inches (406 mm) on center.

D. Frame openings with built-up framing.

E. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each framing intersection as follows:
   1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and framing-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

F. Install miscellaneous framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner reserves the right to engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Submit written report that work has been reviewed for compliance by Contractor, Installer, and Metal Framing Engineer, and is ready for inspection by Testing Agency.

C. The following items will be subject to testing and inspecting:

1. Field and shop welds.
2. Attachment of bottom track to floor structure, including the following:
   a. Spacing of fasteners.
   b. Edge clearance.
   c. Embedment / penetration of fasteners.
3. Attachment of top track to overhead structure, including the following:
   a. Spacing of fasteners.
   b. Edge clearance.
   c. Embedment / penetration of fasteners.
4. Attachment of studs to bottom track and top track/clips.
5. Attachment of vertical deflection clips to overhead structure, including the following:
   a. Edge clearance.
   b. Embedment / penetration of fasteners.
6. Attachment of studs to vertical deflection clips.
7. Installation of bridging and bracing.

D. Testing agency will report test results promptly and in writing to Contractor, Architect, and Metal Framing Engineer.

E. Inspection Frequency:
   1. Owner and Architect will select approximately 20 random locations, roughly 12 to 15 feet wide by one story high, to be inspected by Testing Agency. Testing Agency will inspect the following at each location:
      a. Top and Bottom Track:
         1) Each lineal foot of bottom track to structure.
         2) Each lineal foot of outer track (of double deflection track) to structure.
      b. Studs:
         1) Attachment of each stud to bottom track.
         2) Attachment of each stud to inner track of double deflection track.
         3) Attachment of each vertical deflection clip to structure.
         4) Attachment of each stud to vertical deflection clip.
   2. If inspections reveal repeat deficiencies or a pattern of noncompliance with requirements, as determined by the Owner, Architect, and Testing Agency, work of this Section for the entire balance of the project will be inspected by the Testing Agency at the Contractor’s expense.

F. Remove and replace work where inspections indicate that it does not comply with specified requirements. Do not cover or conceal corrected work until it has been reinspected for compliance with requirements.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

(PART OF TRADE-BID SECTION 05 00 00 MISCELLANEOUS AND ORNAMENTAL IRON)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel framing and supports for overhead doors.

B. Steel framing and supports for countertops.

C. Steel framing and supports for Fire Fighting equipment.

D. Steel tube reinforcement for low partitions.

E. Steel framing and supports for mechanical and electrical equipment.

F. Steel framing and supports for applications where framing and supports are not specified in other Sections.

G. Elevator machine beams and hoist beams.

H. Steel shapes for supporting elevator door sills.

I. Shelf angles.

J. Metal ladders.

K. Personal Fall Arrest System

L. Elevator pit sump covers.

M. Miscellaneous steel trim including steel angle corner guards.
   1. Steel Plate canopy fascia and roof edge.
   2. Steel plate aparatus bay door trim

N. Metal bollards.

O. Loose bearing and leveling plates for applications where they are not specified in other Sections.

P. Fireman's slide pole systems.

Q. Self-supporting gear locker frames.

R. Drying racks.

S. Wire mesh strainer unit.

T. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 SUBMITTALS

A. Action Submittals:
1. Product Data: For the following:
   a. Nonslip aggregates and nonslip-aggregate surface finishes.
   b. Fasteners.
   c. Shop primers.
   d. Shrinkage-resisting grout.
   e. Manufactured metal ladders.
   f. Ladder safety devices
   g. Metal bollards.
2. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
   a. Steel framing and supports for overhead doors and grilles.
   b. Steel framing and supports for countertops.
   c. Steel tube reinforcement for low partitions.
   d. Steel framing and supports for mechanical and electrical equipment.
   e. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   f. Elevator machine beams, hoist beams, and divider beams.
   g. Steel shapes for supporting elevator door sills.
   h. Shelf angles.
   i. Metal ladders.
   j. Elevator pit sump covers.
   k. Miscellaneous steel trim including steel angle corner guards, steel edgings, and loading-dock edge angles.
   l. Metal bollards.
   m. Loose steel lintels.
   n. Fireman's slide pole systems.

o. Self-supporting gear locker frames.

3. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, within the State of the Project, responsible for their preparation.

B. Informational Submittals:
1. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
2. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.
3. Welding certificates.
4. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
5. Research Reports: For post-installed anchors.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 - Quality Requirements, using performance requirements and design criteria indicated.
1. Design Calculations: Submit design calculations for the following:
a. Framing and supports.
b. Ladders
c. Countertop support framing.
d. Partial height partitions.
e. Fireman's slide pole systems.
f. Self-supporting gear locker frames.

B. Structural Performance: Provide metal fabrications and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Loads: As indicated.
2. Dead Loads: As indicated on the Structural drawings.
3. Live Loads: As indicated on the Structural drawings
4. Wind Loads: Wind-load criteria, As indicated on the Structural Drawings, and as required by applicable building code or ASCE 7, including basic wind speed, importance factor, exposure category, and pressure coefficient.
5. Seismic Loads: As indicated on the Structural drawings.
6. Project Specific Loads: As indicated on the Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Structural Performance of Ladders: Ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

E. Supports for Countertops:
1. Dead load of counters.
2. Uniform Load: 50 pounds per linear foot of counter.
3. Concentrated Load Downward: 200 pounds at any point on the counter.
4. Limit deflection to L/360 between supports.

F. Support for Partial Height Partitions:
1. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
2. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Deflection of L/240.

G. Fireman's slide pole:
1. Concentrated load of 300 lbf (1.334467 kN) applied in any direction.
2. Deflection of L/240.

H. Self-supporting gear locker frames.
1. Dead load of lockers and gear.
2. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
3. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
4. Uniform and concentrated loads need not be assumed to act concurrently.
5. Deflection of L/240.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

D. Stainless Steel Sheet, Strip, and Plate: ASTM ASTM A240/A240M or ASTM A666/A666M, Type 304.

E. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.

F. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

G. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

H. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

I. Aluminum Plate and Sheet: ASTM B209/B209M, Alloy 6061-T6.

J. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

K. Brass Extruded Shapes: ASTM B249/B249M, Alloy UNS C36000 (free-cutting brass).

L. Brass Seamless Tube: ASTM B135 (ASTM B135M), Alloy UNS C26000 (cartridge brass, 70 percent copper).

M. Bronze Plate, Sheet, Strip, and Bars: ASTM B36/B36M, Alloy UNS C28000 (muntz metal, 60 percent copper).

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Provide stainless steel fasteners for fastening aluminum or stainless steel.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A ASTM A568/A568M, Property Class 4.6); with hex nuts, ASTM A563/A563M; and, where indicated, flat washers.

D. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 3, heavy-hex steel structural bolts; ASTM A563/A563M, Grade DH3, (ASTM A563/A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.

E. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1).

F. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563/A563M; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

G. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

H. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

I. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593, and nuts, ASTM F594 (ASTM F836M).

2.4 MISCELLANEOUS MATERIALS

A. Zinc-Rich Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
   1. Products:
      a. Carbozinc 621; Carboline Company.
      b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
      c. Series 90-97 - Tneme-Zinc; Tnemec Company, Inc.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Section 03 30 00 - Cast-in-Place Concrete for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Partial-Height Partition Supports: At Contractor’s Option provide one of the following:
   1. Fabricate supports for partial height partition supports from steel shapes of size required to limit the specified deflection with attached bearing plates, anchors, and braces.
   2. Manufactured minimum 14 gage steel tube and 3/8-inch thick steel base plate assembly, of height required to brace less than full-height, free-standing gypsum board partitions, with pre-punched holes for attachment or anchorage to concrete subfloor substrate.
      a. Acceptable Products:
         1) MidWall as manufactured by Steel Network MidWall

2) NoFlex Corporation, Huntington Beach, CA.
3) Pony Wall (PW) as manufactured by Clark Dietrick.

D. Prime miscellaneous framing and supports with zinc-rich primer, galvanize exterior components or where indicated on Drawings.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls or where otherwise indicated.

D. Prime shelf angles located in interior walls with zinc-rich primer.

2.8 METAL LADDERS

A. General:
1. Comply with ANSI A14.3 unless otherwise indicated.
2. For elevator pit ladders, comply with ASME ASME A17.1 /CSA B44.

B. Steel Ladders:
1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 1-inch- (25-mm-) diameter, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
a. Manufacturers:
1) Harsco Industrial IKG, a division of Harsco Corporation.
2) Ross Technology Corp.
3) W.S. Molnar Company.
7. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.

9. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
10. Galvanize exterior ladders and ladders in elevator pits, including brackets and fasteners.
11. Prime interior ladders, including brackets and fasteners, unless noted otherwise.

C. Aluminum Ladders:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Fixfast USA.
   b. Halliday Products.
   c. O'Keeffe's Inc.
   d. Precision Ladders, LLC.
   e. Royalite Manufacturing, Inc.
   f. Thompson Fabricating, LLC.
   g. Upnovr, Inc.
2. Source Limitations: Obtain aluminum ladders from single source from single manufacturer.
3. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
4. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches (64 mm) deep, 3/4 inch (19 mm) wide, and 1/8 inch (3.2 mm) thick.
5. Rungs: Extruded-aluminum tubes, not less than 3/4 inch (19 mm) deep and not less than 1/8 inch (3.2 mm) thick, with ribbed tread surfaces.
6. Fit rungs in centerline of siderails; fasten by welding or with stainless steel fasteners or brackets and aluminum rivets.
7. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
8. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted aluminum brackets.
9. Provide minimum 72-inch- (1830-mm-) high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

D. Personal Fall Arrest System:
1. Cable Preformation's: Left, Regular Lay.
2. Cable Strand: 1 by 7.
3. Connected ID Equipped: Yes.
4. Install Type: Permanent.
5. Lifeline Material: Galvanized Steel Cable.
6. Overall Width: 3-inches.
7. Single Point Anchor Rating: 3600 lbs.
8. Standards/Approvals: ANSI Z359.16, OSHA 1910.29 and 1926.1053, RR-W-410.
9. Weight Capacity: 620 lbs. (281 kg).
10. Basis of Design Product: 3M BBI-SALA Lad-Saf Cable Vertical System.
11. Provide two (2) Harness: Basis of Design Product: DBI-Sala ExoFit NEX Construction Style Positioning/Climbing Harness.

2.9 ELEVATOR PIT SUMP COVERS

A. Metal Bar-Grating: Form elevator sump pit cover to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
   1. Manufacturers:
      a. Alabama Metal Industries Corporation.
      b. All American Grating, Inc.
      c. Barnett/Bates Corp.
      d. IKG Industries; a Harsco Company.
      e. Ohio Gratings, Inc.
   2. Fabricate from welded steel grating with 1-1/4-by-3/16-inch (32-by-5-mm) bearing bars at 15/16 inch (24 mm) o.c. and crossbars at 4 inches (100 mm) o.c., NAAMM designation: W-15-4 (1-1/4 x 3/16) STEEL.
   3. Surface: Serrated.
   4. Finish: Galvanized.

2.10 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Prime miscellaneous steel trim with zinc-rich primer, galvanize exterior components or where indicated on Drawings.

2.11 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe.
   1. Cap bollards with 1/4-inch- (6.4-mm-) thick, steel plate with flat top.
   2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
   3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

B. On Parking Decks: Fabricate bollards with 3/8-inch- (9.5-mm-) thick, steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.
   1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Within Grade / Paving: Fabricate bollards to extend a minimum of 18-inches below grade / paving with four (4) 12-inch long pieces of #4 rebar welded to each side of pipe.

D. Fabricate internal sleeves for removable bollards from Schedule 80 steel pipe or 1/4-inch (6.4-mm) wall-thickness steel tubing with an OD approximately 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 3/4-inch (19-mm) steel machine bolt.

E. Galvanize and prime steel bollards.

2.12 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

2.13 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls or where otherwise indicated.

D. Prime loose steel lintels located in interior walls with zinc-rich primer.

2.14 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 FIREMAN'S SLIDE POLE SYSTEMS.

A. Manufacturers:
   1. McIntire Brass Works, Inc.

B. Basis of Design: McIntire Brass Works; Model 20 without Shutter, with floor trim kit and cage with pole support, Safety Kit.

C. Pole: Brass, 2 1/2 inch diameter, thickness as required for length.
   1. Length: As indicated on the Drawings.
   2. Reinforcing: Steel tube as required for length.
   3. Landing mat: Closed cell neoprene, 2 inch thickness, 32 inch diameter.

D. Floor trim kit:
   1. Polished cast bronze trim ring for the floor.
   2. Stainless steel filler sheet with nipples where you pass through the floor.
   3. Polished cast bronze trim ring for the ceiling.

E. Safety kit:
   1. Polished cast bronze trim ring for the floor and stainless steel filler sheet where you pass through the floor.
   2. A polished cast bronze trim ring for the ceiling.
   3. Chrome stanchions
   4. 14 ga. stainless steel mesh guards
   5. Chromed cast bronze self-closing gate.
   6. Chromed cast bronze handrail and lock-out.

2.16 DRYING RACKS

A. Fabricate as indicated on the Drawings.
   1. Schedule 40 threaded pipe galvanized pipe and fittings.

2.17 WIRE MESH STRAINER UNIT

A. Wire Mesh Strainer Unit at extractor pit:
   1. Fabricate as indicated on the Drawings.
      a. Lift out stainless-steel mesh and U channel frame as indicated.
      b. Anchored U channel frame.

2.18 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.19 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

B. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

C. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

D. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

E. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   1. Exterior Items: SSPC-SP 6 /NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3 , "Commercial Blast Cleaning."

3. Items Indicated to Receive Primers Specified in Section 09 96 00 - High-Performance Coatings: SSPC-SP 6 /NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

F. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

2.20 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions, operable partitions, overhead doors, and overhead grilles securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with expansion anchors.

3.3 INSTALLATION OF METAL BOLLARDS

A. On Parking Decks and Existing Construction: Anchor bollards to parking decks and existing construction with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.
   1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

B. Within Grade / Paving: Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Anchor internal sleeves for removable bollards in concrete by inserting in pipe sleeves preset into concrete. Fill annular space around internal sleeves solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward internal sleeve.

D. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.

E. Place removable bollards over internal sleeves and secure with 3/4-inch (19-mm) machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner furnishes padlocks.

F. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

G. Fill bollards solidly with concrete, mounding top surface to shed water.
   1. Do not fill removable bollards with concrete.

3.4 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 REPAIRS

A. Touchup Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
      a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 51 13

METAL PAN STAIRS

(PART OF TRADE-BID SECTION 05 00 00 MISCELLANEOUS AND ORNAMENTAL IRON)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preassembled steel stairs with concrete-filled treads.
   1. Interior Exit / Fire Stairs.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs and railings.
   1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
   2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

D. Schedule installation of railings so wall attachments are made only to completed walls.
   1. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For metal pan stairs and the following:
      a. Abrasive nosings.
      b. Shop primer products.
      c. Handrail wall brackets.
      d. Grout.
   2. Shop Drawings:
      a. Include plans, elevations, sections, details, and attachments to other work.
      b. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.

c. Include plan at each level.
d. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.
e. Indicate profile and dimensions of precast terrazzo treads.

3. Samples for Verification: For each type and finish of nosing.

B. Informational Submittals:
1. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.
2. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
3. Welding certificates.
4. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.
1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
a. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 - Quality Requirements, to design stairs and railings, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).

3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

C. Structural Performance of Railings: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
   a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   b. Infill load and other loads need not be assumed to act concurrently.
3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE 7/SEI 7.
1. Component Importance Factor: 1.5.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Tubing for Railings: ASTM A53/A53M or ASTM A513/A513M.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
2. Provide galvanized finish for exterior installations and where indicated.

D. Steel Pipe for Railings: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
2. Provide galvanized finish for exterior installations and where indicated.

E. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

F. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.
   1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

G. Galvanized-Steel Sheet: ASTM A653/A653M, G90 (Z275) coating, either commercial steel, Type B, or structural steel, Grade 33 (Grade 230), unless another grade is required by design loads.
   1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

H. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.
   1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

I. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
   1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941/F 1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5.
   1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563/A563M; and, where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563/A563M; and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594 (ASTM F 836M).

2.4 MISCELLANEOUS MATERIALS

A. Handrail Wall Brackets: Cast aluminum, center of rail 2-1/2 inches (63.5 mm) from face of wall.
   1. Manufacturers:
      a. Blum, Julius & Co., Inc.
      b. The Wagner Companies., R&B Wagner, Inc.

B. Welding Electrodes: Comply with AWS requirements.

C. Shop Primers: Provide primers that comply with Section 09 91 00 - Painting and 09 96 00 - High-Performance Coatings.

D. Universal Shop Primer: Complying with SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

E. Zinc-Rich Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
   1. Products:
      a. Carbozinc 621; Carboline Company.
      b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
      c. Series 90-97 - Tneme-Zinc; Tnemec Company, Inc.

F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish system indicated.

G. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

I. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior and exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

J. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs and railings in shop to greatest extent possible.
   1. Disassemble units only as necessary for shipping and handling limitations.
   2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32-inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of welded joint.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.
3. Fabricate joints that will be exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Architectural Class, unless more stringent requirements are indicated.

B. Stair Framing:
1. Fabricate stringers as indicated on Drawings.
   a. Stringer Size: As required to comply with "Performance Requirements" Article.
   b. Provide closures for exposed ends of channel and rectangular tube stringers.
   c. Finish: Shop primed.
2. Construct platforms of steel plate, channel, or rectangular tube headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
   a. Provide closures for exposed ends of channel and rectangular tube framing.
   b. Finish: Shop primed.
3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below.
   a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).
1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
2. Steel Sheet: Uncoated, cold-rolled steel sheet unless otherwise indicated.
3. Steel Sheet: Galvanized-steel sheet, where indicated.
4. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
5. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
6. Shape metal pans to include nosing integral with riser.
7. Attach abrasive nosings to risers.
8. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
9. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
    a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

2.7 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
   1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
   1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
      a. Clean bottom surface of plates.
      b. Set plates for structural members on wedges, shims, or setting nuts.
      c. Tighten anchor bolts after supported members have been positioned and plumbed.
      d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
      e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
         1) Neatly finish exposed surfaces; protect grout and allow to cure.
         2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
   2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
   3. Comply with requirements for welding in "Fabrication, General" Article.

F. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 - Cast-in-Place Concrete.
   1. Install abrasive nosings with anchors fully embedded in concrete.
   2. Center nosings on tread width.

G. Install precast concrete treads with adhesive supplied by manufacturer.

H. Install precast terrazzo treads according to manufacturer's written instructions.

3.3 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
   1. Space posts at spacing indicated or, if not indicated, as required by design loads.
   2. Plumb posts in each direction, within a tolerance of 1/16-inch in 3-feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4-inch in 12 feet (6 mm in 3.5 m).
   4. Secure posts and rail ends to building construction as follows:
      a. Anchor posts to steel by welding or bolting to steel supporting members.
      b. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

B. Install railing gates level, plumb, and secure for full opening without interference.
   1. Attach hardware using tamper-resistant or concealed means.
   2. Adjust hardware for smooth operation.

C. Attach handrails to wall with wall brackets.
   1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
   2. Secure wall brackets to building construction as follows:
      a. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
      b. For hollow masonry anchorage, use toggle bolts.
      c. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
      d. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated. Coordinate with stud installation to locate backing members.
      e. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
      f. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.4 REPAIR

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 - Painting and 09 96 00 - High-Performance Coatings.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 51 19

METAL GRATING STAIRS

(PART OF TRADE-BID SECTION 05 00 00 MISCELLANEOUS AND ORNAMENTAL IRON)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Industrial Class stairs with steel-grating treads.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs.
   1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
   2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For metal grating stairs and the following:
      a. Gratings.
      b. Shop primer products.
   2. Shop Drawings:
      a. Include plans, elevations, sections, details, and attachment to other work.
      b. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
      c. Include plan at each level.
   3. Delegated-Design Submittal: For stairs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Informational Submittals:
   1. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.
   2. Welding certificates.
   3. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.
   1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
   2. Protect steel members and packaged materials from corrosion and deterioration.
   3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
      a. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 - Quality Requirements, to design stairs, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
   2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
   3. Uniform and concentrated loads need not be assumed to act concurrently.
   4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
   5. Limit deflection of treads, platforms, and framing members to L/360.
   6. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
      a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE 7.
   1. Component Importance Factor: 1.5.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
   1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Bars for Grating Treads: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.
   1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 Insert value percent.

D. Steel Wire Rod for Grating Crossbars: ASTM A510/A510M.
   1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

E. Provide galvanized finish for exterior installations and where indicated.

F. Cast-Abrasive Nosings: Cast iron, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both.
   1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
   1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563/A563M; and, where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563/A563M; and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primers: Provide primers that comply with Section 09 96 00 - High-Performance Coatings.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs in shop to greatest extent possible.
   1. Disassemble units only as necessary for shipping and handling limitations.
   2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Weld exposed corners and seams continuously unless otherwise indicated.
   5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish # 3 - Partially dressed weld with spatter removed.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
   1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
   2. Locate joints where least conspicuous.
   3. Fabricate joints that are exposed to weather in a manner to exclude water.
   4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.

B. Stair Framing:
   1. Fabricate stringers of steel plates or channels.
      a. Stringer Size: As required to comply with "Performance Requirements" Article.
      b. Provide closures for exposed ends of channel stringers.
      c. Finish: Galvanized.
   2. Construct platforms and tread supports of steel plate or channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
      a. Provide closures for exposed ends of channel framing.
      b. Finish: Galvanized.
   3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.
   4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
   1. Fabricate treads and platforms from welded steel or pressure-locked steel grating with openings in gratings no more than 5/16 inch (8 mm) in least dimension.
      a. Surface: Serrated.
      b. Finish: Galvanized.
   2. Fabricate grating platforms with nosing matching that on grating treads.
      a. Secure grating to platform framing with bolts.

D. Risers: Perforated panels, Pattern as selected by the Architect.

E. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.
   1. Material and Finish: Steel plate to match finish of other steel items.
   2. Fabricate to dimensions and details indicated.

2.7 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
   1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
   2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. Shop applied High Performance Coating:

1. Preparation:
    a. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings. Clean using methods recommended in writing by coating manufacturer, but not less than the following:
        1) SSPC-SP 16 "Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals".
2. Finishing:
    a. Steel, Zinc-Coated (Galvanized and Galvannealed) (Sg) Moderate Environment:
        1) Paint System Sg-P5: Aliphatic Polyurethane Enamel over Epoxy primer, Semi-gloss Finish: See Section 09 96 00 - High Performance Coatings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
    1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
    1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
    1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.
        a. Clean bottom surface of baseplates.
        b. Set steel-stair baseplates on wedges, shims, or leveling nuts.
        c. After stairs have been positioned and aligned, tighten anchor bolts.
        d. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
        e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
            1) Neatly finish exposed surfaces; protect grout and allow to cure.

2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.
1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 REPAIR

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 96 00 "High-Performance Coatings."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 52 13

STEEL PIPE AND TUBE RAILINGS

(PART OF TRADE-BID SECTION 05 00 00 MISCELLANEOUS AND ORNAMENTAL IRON)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel pipe and tube railings.

B. Railing gates at the level of exit discharge.

1.2 RELATED REQUIREMENTS

A. Section 05 51 13 - Metal Pan Stairs for steel tube railings associated with metal pan stairs.

B. Section 06 10 53 - Miscellaneous Carpentry for wood blocking for anchoring railings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For the following:
      a. Manufacturer's product lines of mechanically connected railings.
      b. Railing brackets.
      c. Grout, anchoring cement, and paint products.
   2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   3. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Informational Submittals:
   1. Qualification Data: For testing agency.

2. Welding certificates.
3. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
4. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
5. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.
6. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 - Quality Requirements, to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces).

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.4 STEEL AND IRON

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

C. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
   1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A36/A36M.

E. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.5 FASTENERS

A. General: Provide the following:
   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5 for zinc coating.
   2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
   3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
   2. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Shop Primers: Provide primers that comply with Section 09 91 00 - Painting.

D. Universal Shop Primer: Complying with SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

E. Zinc-Rich Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
   1. Products:
      a. Carbozinc 621; Carboline Company.
      b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
      c. Series 90-97 - Tneme-Zinc; Tnemec Company, Inc.

F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

G. Intermediate Coats and Topcoats: Provide products that comply with Section 09 91 00 - Painting and 09 96 00 - High-Performance Coatings.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form Changes in Direction as Follows:
   1. By bending or by inserting prefabricated elbow fittings.

J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

P. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
   1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

R. Gates: Form gates from steel shapes or tube of same size and shape as top rails, with infill to match guards. Provide with cam-type, self-closing or spring hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize indicated steel railings, including hardware, after fabrication.
   2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
   3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
   4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
   1. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Railings Indicated to Receive Primers Specified in Section 09 96 00 - High-Performance Coatings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Other Railings: SSPC-SP 3, "Power Tool Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Shop prime uncoated railings with universal shop primers unless zinc-rich primer is indicated.

2. Do not apply primer to galvanized surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

C. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.

D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

E. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.

B. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.
   3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in 09 91 00 - Painting.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 05 73 00

DECORATIVE METAL RAILINGS

(PART OF TRADE-BID SECTION 05 00 00 MISCELLANEOUS AND ORNAMENTAL IRON)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel and Iron Decorative Railings.
   1. With Perforated Metal infill.

1.2 RELATED REQUIREMENTS

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Steel: 72 percent of minimum yield strength.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data: For the following:
      a. Manufacturer's product lines of railings assembled from standard components.
      b. Grout, anchoring cement, and paint products.
   2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
      a. Provide shop drawings sealed and signed by the same State of Location Licensed Structural (Professional) Engineer that prepared calculations.
   3. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
   4. Samples for Verification: For each type of exposed finish required.
      a. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
      b. Fittings and brackets.
      c. Welded connections.
      d. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.

B. Informational Submittals:
   1. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Qualification Data: For qualified:
      a. Manufacturer/fabricator
      b. Professional engineer
   3. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
   4. Welding certificates.
   5. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
   6. Preconstruction test reports.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Manufacturer Qualifications: Provide manufactured steel stairs by a firm producing the types of stair and railing systems required for not less than ten (10) consecutive years, with not less than five (5) similar projects that have been in successful use for not less than five (5) years.

C. Installer Qualifications:
   1. Minimum five (5) consecutive years experience in the successful installation of steel stair and railing systems of the type indicated for this project.
   2. The Installer is to be acceptable to the Manufacturer of the stair system and the Architect. The Manufacturer is to provide written assurance to the Architect of the installer acceptability upon request.

D. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups as shown on Drawings.
   2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Basis of Design: Custom fabrications.
   1. Provide assemblies as indicated on the Drawings.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
   1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
   2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
   3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
   4. Provide extruded-aluminum brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

2.3 STEEL AND IRON

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

C. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

F. MTL2: Perforated Metal: Cold-rolled steel sheet, ASTM A 1008/A 1008M, or hot-rolled steel sheet, ASTM A 1011/A 1011M, commercial steel Type B, 1/4 inch thick, 'ROUND PERFORATED STEEL METAL, PS/HRPO 11GA 3/SRD 1/2Stg, POWDER COATED TO MATCH PNT1.

2.4 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:
   1. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.

2. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
3. Dissimilar Metals: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.
1. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Post-Installed Anchors:
1. Type:
a. Torque-controlled expansion anchors
b. Chemical anchors.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

E. Intermediate Coats and Topcoats: Provide products that comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded or nonwelded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:
   1. As detailed.
   2. By bending or by inserting prefabricated elbow fittings.
   3. By flush bends or by inserting prefabricated flush-elbow fittings.

4. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
5. By bending to smallest radius that will not result in distortion of railing member.

K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

Q. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

R. Perforated-Metal Infill Panels: Same metal as railings in which they are installed.
1. Edge panels with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch (1.1 mm) thick.
2. Orient perforated metal with pattern parallel to top rail.

S. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

T. Gates: Form gates from steel shapes or tube of same size and shape as top rails, with infill to match guards. Provide with cam-type, self-closing or spring hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:
1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
6. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
1. Railings Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with primers specified in Division 09 painting Sections and High Performance Coatings Section unless indicated.

G. Powder-Coat Finish: Prepare, treat, and coat nongalvanized ferrous metal to comply with resin manufacturer's written instructions and as follows:
   1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Treat prepared metal with iron-phosphate pretreatment, rinse, and seal surfaces.
   3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm).
   4. Color: As indicated by manufacturer's designations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.

E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.

B. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
   1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.

3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
6. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 CLEANING AND TOUCHUP

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting and High Performance Coatings Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 05 75 03

DECORATIVE METAL BASE / TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal base / trim.

1.2 COORDINATION

A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product, including finishing materials.
   2. Shop Drawings: Show fabrication and installation details for decorative formed metal.
      a. Include plans, elevations, component details, and attachment details.
      b. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 SHEET METAL

A. General: Fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Aluminum Sheet: Flat sheet complying with ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H32.

2.2 MISCELLANEOUS MATERIALS

A. Sealants, Interior: Nonsag, paintable sealant complying with Section 07 92 00 - Joint Sealants and as recommended in writing by decorative formed metal manufacturer.

B. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.
   1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

C. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
   1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless exposed fasteners are unavoidable d.

D. Backing Materials: Provided or recommended by decorative formed metal manufacturer.

2.3 FABRICATION, GENERAL

A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- (12-mm-) wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch (1 mm) and support with concealed stiffeners.

D. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.

2.4 METAL BASE / TRIM

A. Form metal base from metal of type and thickness indicated below:
   1. Material: Extruded aluminum.
   2. Height: 4 inches, unless otherwise indicated.
   3. Inside and Outside Corners:
      a. Preformed corners welded, groung smooth.
   4. Finish: Color anodized.
   5. Basis of Design:
      a. MTL2: FRYREGLET; Custom, new code
      b. MTL3: FRYREGLET; 4"H FLUSH BASE - 1/2", DRMBFL-50400, COLOR BUFFED BRITE BLACK
      c. MTL4: FRYREGLET; 4"H MILLWORK REVEAL BASE - 3/4", MWRB75400. COLOR BUFFED BRITE BLACK
      d. MTL5: FRYREGLET; 4"H MILLWORK FLUSH BASE. Model : Custom, new code tag MTL2. COLOR BUFFED BRITE BLACK

2.5 METAL REVEAL TRIM

A. Form metal reveal trim from metal of type and thickness indicated below:
   1. Material: Extruded aluminum.
   2. Height: As standard with products.
   3. Inside and Outside Corners:
      a. Preformed corners welded, groung smooth.
   4. Finish: Color anodized.
   5. Basis of Design:
      a. MTL6: FRYREGLET; ANODIZED ALUMINUM STEPPED OUTSIDE CORNER, MUDDED-IN, 1/2"X1/2". DRMW-50-50. COLOR : BUFFED BRITE BLACK
      b. MTL7: FRYREGLET; ANODIZED ALUMINUM REVEAL MOLDING, MUDDED-IN, 1/4"X1/2". DRM-50-25. COLOR : BUFFED BRITE BLACK.
      c. MTL8: FRYREGLET; ANODIZED ALUMINUM MILLWORK 1/4" POST TERMINATION, 3/4". MWPT2575. COLOR : BUFFED BRITE BLACK. (MTL5 is used for base see above.)
      d. MTLX: FRYREGLET; ANODIZED ALUMINUM REVEAL MOLDING, MUDDED-IN, 1/4"X1/2". DRM-50-25. COLOR : BUFFED BRITE BLACK.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class II, 0.010 mm or thicker.
   1. Color:

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.
   1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

3.3 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the requirements for materials, fabrications and installation of rough carpentry and associated items including, but not necessarily limited to, the following:
   1. Blocking, backing, stripping, furring, sub-bases and nailers.
   2. Rough hardware.
   3. Wood framing.
   4. Insulation stops.
   5. Overhead supports for Ceiling.
   6. Fire retardance.
   7. Preservative treatment.
   8. Installation of concrete anchors for wood or steel.

B. Related Work Described Elsewhere:
   1. Section 06 18 00 – Glued-Laminated Construction.

1.2 QUALITY ASSURANCE

A. Pre-Construction Conference:
   1. Prior to sheathing shear walls or diaphragms, a pre-construction conference will be held. The following individuals will be present:
      a. Architect.
      b. Structural Engineer.
      c. General Contractor.
      d. Foreman supervising installation of shear walls, diaphragms and tie-downs.
      e. Representative of Testing Laboratory.
   2. The agenda will include:
      a. Fasteners and tie-downs to be used.
      b. Installation criteria.
      c. Inspection requirements.

B. In the event of conflict between pertinent codes and regulations, these Specifications and Drawings ask the Architect for clarification.

1.3 REFERENCES

A. Standards:
   1. National Design Specification.

2. International Building Code.
3. American Society for Testing and Materials.
4. American Wood Protection Association:
   a. AWPA T1-10, "Use Category System: Processing and Treatment Standard.
   b. AWPA U1-10, "Use Category System: User Specification for Treated Wood.

1.4 SUBMITTALS

A. Prior to commencing Work, submit a sample of the nails and/or staples to be used.

B. When submitting staples or nails used in nailing guns submit a copy of the applicable ICC report.

C. Wood Treatment Data: For informational purposes, submit two copies of the chemical treatment manufacturers' instructions for proper use of each type of treated material. Indicate by means of copy of letter of transmittal, that copy of each instruction has been distributed to the installer of the material.

D. Dip Treatment: For each type specified, include certification by treatment plant, identifying the chemical solutions used, submersion period and conformance with specified standards.

E. Pressure Preservative Treatment: For each type specified, include certification by the treating plant, identifying the chemicals and process used, net amount of salts retained and conformance with applicable standards. For water borne preservatives, include statement that moisture content of treated materials was reduced to a maximum of 15 percent prior to shipment to project site.

F. Fire Retardant Treatment: Include certification by the treating plant that the treatment materials complies with the governing ordinances and that treatment will not "bleed" through the surface finish materials scheduled to be used.

G. Review of submittals is of a general nature only, and responsibility for conformance with intent of Drawings and Specifications shall remain with the Contractor. Review does not imply or state that the contract documents have been interpreted correctly.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store all materials flat on dunnage or pallets to prevent warping or distortion.

B. Cover materials to protect against damage and the weather. Ensure that materials are stored in a manner which also provides proper ventilation and drainage.

C. Separate all framing lumber by grade and store different grades separately.

D. Damaged or otherwise non-complying materials shall not be used in the project. Keep all damaged materials clearly identified, and store separately to prevent inadvertent use.

E. Use extreme care in the off-loading and handling of lumber to prevent damage, splitting, and breaking of materials.

F. Use all means necessary to protect the installed work and materials of all other trades.

G. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

H. Deliver and store packaged products in original containers or bundles with seals unbroken and labels intact until time of use.

PART 2 - PRODUCTS

2.1 LUMBER

A. General:
1. All lumber shall be s4s unless noted otherwise.
2. Sizes noted are nominal unless shown as net.
3. All lumber shall be free of heart center (FOHC).
4. All lumber shall have a moisture content not exceeding 16 percent for 2x and smaller lumber nor 19 percent for thicker lumber at the time of installation.

B. Protection Against Decay:
1. Wood exposed to earth or weather must be preservative-treated using water-borne preservatives in accordance with AWPA U1 (Commodity Specifications A or F). Specific AWPA Use Categories by application are specified below.
a. Where wood joists or the bottom of a wood structural floor without joists are closer than 18 inches to the exposed ground, or wood girders are closer than 12 inches to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation (but neither condition in contact with the ground), the floor framing, including posts, girders, joists, and subfloor, shall be comprised of preservative-treated wood conforming to AWPA Use Category: UC3B.
b. Wood framing members, including wood sheathing, that rest on exterior foundation walls and are less than 8 inches from exposed earth shall be comprised of preservative-treated wood conforming to AWPA Use Category: UC4B.
c. Wood framing members and furring strips attached directly to the interior of exterior masonry or concrete walls below grade shall be comprised of preservative-treated wood conforming to AWPA Use Category: UC3B.
d. Sleepers and sills on a concrete or masonry wall or slab that is in direct contact with earth (wood not in contact with earth), shall be of preservative-treated wood conforming to AWPA Use Category: UC3B.
e. The ends of above grade wood girders entering exterior masonry or concrete walls shall be provided with a ½-inch air space on the tops, sides, and ends, unless preservative-treated wood is used conforming to AWPA Use Category: UC3B.
f. Clearance between wood siding and earth on the exterior of a building shall not be less than 6 inches, except where siding, sheathing, and wall framing are of preservative-treated wood, conforming to AWPA Use Category: UC4B.

g. Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be constructed of preservative-treated wood conforming to AWPA Use Category: UC4B.

h. The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not fully protected from moisture by a roof, eave, or similar covering shall be manufactured from preservative-treated wood conforming to AWPA Use Category: UC4B.

i. Wooden posts or columns supporting permanent structures that are embedded in concrete that is in direct contact with the earth, embedded in concrete that is exposed to the weather, or in direct contact with the earth shall be preservative-treated wood conforming to AWPA Use Category: UC4C.

j. Wood structural members that support moisture-permeable floors or roofs that are exposed to weather, such as concrete or masonry slabs, shall be preservative-treated wood conforming to AWPA Use Category: UC4C, unless separated from such floors or roofs by an impervious moisture barrier.

k. Other wood not noted above in an exterior application, and not in contact with ground or water shall be preservative-treated wood conforming to AWPA Use Category: UC3B.

l. Other wood members not noted above in contact with ground or fresh water shall be preservative- treated conforming to AWPA Use Category: UC4B.

m. Wood members exposed to salt water shall be preservative-treated conforming to AWPA Use Category: UC5A (North of New Jersey and San Francisco); UC5B (South of New Jersey to Georgia and South of San Francisco); UC5C (South of Georgia, Gulf Coast).

n. Wood framing in geographical areas where hazard of termite damage is known to be very heavy shall be preservative-treated conforming to the AWPA Use Category noted above for the appropriate exposure.

C. Fire-Retardant-Treated (FRT) Lumber:

1. All lumber specified in the drawings as FRT must be preservative-treated using water-borne preservatives in accordance with AWPA U1 (Commodity Specifications A or F). Specific AWPA Use Categories by application are specified below:

a. FRT lumber located at the interior of the building and shielded from the weather shall be treated conforming to AWPA Use Category: UCFA.

b. FRT lumber located at the exterior of a building and exposed to the weather shall be treated conforming to AWPA Use Category: UCFB.

D. Grades:

1. All lumber shall be Spruce Pine Fir No. 2 or better unless noted otherwise on the drawings.

2. All pressure preservative treated (PT) and fire-retardant-treated (FRT) lumber shall be unincised Southern Pine No. 2 or better unless noted otherwise on the drawings.

E. Grade Marks:

1. Lumber and plywood grade marks shall not be exposed in exposed-to-view lumber.
2. Each piece of lumber used for structural framing shall be graded and stamped with the grading and trade mark of the specified lumber grading organization, except that a certificate of grade from such a grading organization may be accepted in lieu of grade and trademarks when approved by the Architect.
3. All preservative-treated lumber must bear an end tag demonstrating conformance to the specified AWPA standards.

2.2 PLYWOOD

A. Plywood shall be manufactured in accordance with American Plywood Association standards with each sheet grade marked.

B. All plywood shall have a minimum of 5 ply.

C. All plywood sheathing exposed to view shall be touch sanded and shall have a C-plugged face or better.

D. Floor plywood shall be APA Rated Sturd-I-Floor 24oc Exposure 1 and shall be 3/4-inch thick and have a Panel Identification Index of 48/24.

E. Plywood on walls shall be APA Rated Sheathing C-D Exposure I and shall be 1/2-inch thick.

F. Roof plywood shall be APA Rated Sheathing CD-X Exposure I and shall be 3/4-inch thick and have a Panel Identification Index of 48/24.

2.3 TONGUE AND GROOVE WOOD DECKING

A. Maximum moisture content – 15% for 2-inch nominal decking, 19% for 3- and 4-inch decking. Moisture content shall be determined by such methods as will assure these limitations.

B. Wood decking to be Douglas Fir.

C. Minimum required Bending stress = 2500 psi

D. Minimum required Modulus of Elasticity = 1800000 psi

2.4 CONNECTING HARDWARE

A. Use hot dip galvanized hardware where exposed to the exterior.

B. Nails:

1. All nails shall be standard steel common wire nails with a full head meeting FS FF-N-101.
2. Nails for exterior work shall be galvanized.

C. Staples and Non Standard Nails:

1. Nails that do not conform to the above requirements or staples will be allowed on a case-by-case basis and shall have an ICC report.

2. The use of powder driven fasteners shall be discontinued if inspection discloses over or under driving.

D. Screws and Bolts:
1. Machine Bolts, anchor bolts, and nuts shall be as per ASTM A307, Grade A.
2. Lag Bolts shall be FS FF-B-561.
3. Wood screws shall meet the requirements of ANSI/ASME Standard B18.6.1

E. Joist Hangers and Framing Connectors shall be as manufactured by Simpson Strong-Tie Co., Inc. Nails to be used with joist hangers and framing connectors shall be largest size recommended by the manufacturer. Use maximum number of nails provided for.

F. Washers shall be square plate or malleable iron washers.

G. Powder Driven Fasteners: Each use and fastener type subject to prior approval of Architect.

H. Expansion Anchors: Kwik-Bolt III as manufactured by Hilti Inc.

2.5 WOOD PRESERVATIVE

A. Preservative Treatment shall conform to AWPA U1 and AWPA T1, and the specified use categories, using waterborne preservatives.

B. Chromated Copper Arsenate (CCA) shall not be used as a preservative.

2.6 PRESERVATIVE TREATMENT FIELD TOUCH-UP PRESERVATIVE

A. Use a preservative compatible with the original preservative, and appropriate for the Use Category, in accordance with AWPA M4.

2.7 HARDWARE USED OUTBOARD OF WATERPROOFING BARRIER AND/OR IN CONTACT WITH PRESERVATIVE-TREATED LUMBER

A. All hardware and steel connectors used outboard of the waterproofing barrier and/or in contact with preservative-treated lumber shall be hot-dip galvanized, or otherwise noted by the manufacturer as approved for exterior use and for contact with contact with all lumber preservatives, except as follows:

B. Type 316 stainless steel shall be used for hangers and hardware within 5 miles of the coast.

C. Care shall be taken not to mix galvanized steel with stainless steel in exterior connections.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that rough carpentry may be performed in strict accordance with the original design an all pertinent codes and regulations.

B. Discrepancies:
1. In the event of discrepancy, immediately notify the Architect.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 WORKMANSHIP

A. All rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the Drawings and with all pertinent codes and regulations.

B. Selection of Lumber Pieces:
1. Carefully select all members; select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.
2. Cut out and discard all defects which will render a piece unable to serve its intended function; lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

C. Do not shim sills, joists, short studs, trimmers, headers, lintels, or other framing components.

3.3 TREATED LUMBER

A. Use treated lumber that is appropriate for the Use Category, as specified in Part 2.

B. Use appropriate hardware for the preservatives and exposure, as specified in Part 2.

C. Field-cut ends, notches, and drilled holes of preservative-treated wood shall be treated in the field with compatible preservatives in accordance with AWPA M4.

3.4 GENERAL FRAMING

A. General:
1. In addition to all framing operations normal to the fabrication and erection indicated on the Drawings, install all backing, blocking, nailers, grounds and other similar items required for the work specified in other sections.
2. Set all horizontal or sloped members with crown up.
3. Do not notch, bore, or cut members for pipes, ducts, conduits, or other reasons except as shown on the Drawings or as specifically approved in advance by the Architect.

4. For all framing members to receive a finished wall or ceiling, align the finish subsurface to vary not more than 1/8-inch from the plane of surfaces of adjacent framing and furring members.
5. Apply preservatives to all timbers (existing and new) as noted on the contract documents or where exposure to long term moisture is anticipated (e.g. where joists are supported by perimeter walls, bathroom framing, kitchen framing (framing to mean floor ceiling and/or partition supports).

B. Bearings:
1. Make all bearing full unless otherwise indicated on the Drawings.
2. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support; where framing members slope, cut or notch the ends as required to give a uniform bearing surface.

C. Temporary Shoring: Provide all temporary works, shoring and bracing necessary to construct the structure.

3.5 BLOCKING AND BRIDGING

A. Blocking:
1. Install all blocking required to support all items of finish and to cut off all concealed draft opening, both vertical and horizontal, between ceiling and floor areas.
2. Install all fire-blocks as required by code.

B. Bridging:
1. Install solid blocking between joists as noted on plan.
2. Install solid blocking between joists wherever floor plywood is continuous and the plywood is to be blocked.
3. Where existing bridging must be removed, install new bridging.

3.6 STUD WALLS AND PARTITIONS

A. Make all studs single length, unspliced, and platform framed.

B. Unless otherwise indicated on the Drawings, frame all corners and intersections with three or more studs and all required bearing for wall finish.

C. In bearing walls install a stud below each joint or rafter that is not supported directly by a beam.

D. As a minimum install a 4x or 2-2x's under the end of each 4x or glue laminated beam shown on the Structural drawings.

E. All top plates shall be lapped a minimum of 4 feet, 0 inches with a minimum of 16d Nails at 6 inches o.c.

3.7 INSTALLATION OF PLYWOOD SHEATHING

A. Placement:

1. Place all plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise specifically shown on the Drawings.
2. Center joints accurately over supports; unless otherwise specifically shown on the Drawings, stagger the end joints of plywood panels to achieve a minimum of continuity of joints. In addition, where support spacing is 24 inches of less plywood shall, as a minimum, be continuous over two spans.
3. Place all roof plywood with best face down.
4. All floor plywood shall be glued to the floor framing in addition to the specified fasteners.
5. Place solid blocking under all plywood edges. Blocking shall be same thickness as required studs or joists.
6. On shear wall schedule, when indicated plywood nail spacing is less than 3 inches place nails in two or more rows spaced 1/2-inch apart with the nail spacing in each row not less than 6 inches o.c.

B. Protect all plywood from moisture by use of waterproof coverings until the plywood has in turn been covered with the next succeeding component or finish.

3.8 FASTENERS

A. Nails and Staples:
1. Use only common wire nails or spikes of the sizes and quantities as indicated on the Drawings.
2. Do all nailing without splitting wood, preboring as required to a diameter smaller than that of the nails. Replace all split members.
3. Nailing guns:
a. When nailing plywood with a nailing gun the nail head shall not crush the plywood, nor shall the nail be under driven.
b. Any fastener overdrive shall be considered of no value and shall be replaced with an additional fastener. If the additional nails result in a spacing closer than 1-1/2 inches, if more than 6 fasteners in a row are overdriven, or more than 12 fasteners per piece of plywood are overdriven, the entire piece of plywood shall be removed and replaced.
c. If plywood is on both sides of wall only the first side may be nailed with a nailing gun.
d. Reference to nails shall also infer staples if used.
4. For wood-to-wood joints, the spacing center to center of nails shall be not less than the required penetration. Edge or end distances shall be not less than one half of the required penetration. All spacing and edge and end distances shall be such as to avoid splitting of the wood.

B. Bolts:
1. Drill holes 1/16-inch larger in diameter than the bolts.

C. Screws:

1. For lag-screws and wood-screws, prebore holes same diameter as root of thread; enlarge holes to shank diameter for length of shank.
2. Screw, do not drive, any lag and wood screws.
3. Use washers under head of lag-screws where they bear on wood.

3.9 JOIST HANGERS

A. Joist hangers and framing connectors shall be installed in accordance with the manufacturer's recommendations.

3.10 CLEAN UP

A. Remove all wood, including form lumber, scrap lumber, shavings and sawdust, in contact with the ground. Leave no wood buried in any fill or backfill.

3.11 FIELD QUALITY CONTROL

A. General:
   1. Notify Architect and Testing Laboratory at least 48 hours prior to start of Work requiring inspection.
   2. As a minimum, all testing and inspection shall be per this specification and the International Building Code 2018 edition.

B. The following are subject to special inspection:
   1. Anchor bolts, prior to concreting.
   2. Tie-downs.
   3. Plywood fastening, when part of diaphragm or shear walls, which will include nail/screw size, spacing, and whether fasteners are flush with sheathing.
   4. Expansion anchors.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood blocking, cants, and nailers.

B. Wood furring and grounds.

C. Plywood backing panels.

D. Plywood interior sheathing.

E. In wall blocking for wall mounting equipment and accessories.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
      a. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
      b. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
      c. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
      d. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Informational Submittals:

1. Evaluation Reports: For the following, from ICC-ES:
   a. Preservative-treated wood.
   b. Fire-retardant-treated wood.
   c. Metal framing anchors.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal (38-mm actual) thickness or less; no limit for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 mm) beyond the centerline of the burners at any time during the test.
   1. Treatment shall not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
   3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
   1. Hem-fir (north); NLGA.
   2. Mixed southern pine or southern pine; SPIB.
   3. Spruce-pine-fir; NLGA.
   4. Hem-fir; WCLIB or WWPA.
   5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
   6. Western woods; WCLIB or WWPA.
   7. Northern species; NLGA.
   8. Eastern softwoods; NeLMA.

C. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:
   1. Mixed southern pine or southern pine, No. 3 grade; SPIB.
   2. Hem-fir or hem-fir (north), Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.
   3. Spruce-pine-fir (south) or spruce-pine-fir, Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.6 PLYWOOD INTERIOR SHEATHING.

A. Exposed plywood interior sheathing for paint finish: DOC PS 1, B-C Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch (12.5-mm) nominal thickness.
   1. MDO: Plywood with a medium-density overlay on the face.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667/F1667M.

C. Screws for Fastening to Metal Framing: ASTM C954, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

C. Do not splice structural members between supports unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16-inches (406 mm) o.c.

E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3.2 BLOCKING AND NAILER OR METAL STRAPPING INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96-inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96-inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.

D. At Contractor’s option, provide metal backing plates or fire treated wood blocking to support loads imposed at wall-mounted and wall-hung items that require backing plates, include, without limitation, the following:
   1. Louvered panel with plastic bins.
   2. Toilet accessories.
   3. Metal lockers.
   4. Fire protection specialties.
   5. Markerboards.
   6. Tackboards.
   7. Millwork.
   8. Wood trim.
   9. Medical equipment.
   10. Metal cabinets.
   11. Computer equipment wall mounting brackets.
   12. Within walls of utility and storage rooms.
   13. Medical equipment rails.

14. Wall protection.

E. Fire-treated wood blocking is required at the following locations:
1. Audio / Visual equipment.
2. Wall-mounted door stops.
3. Wall-mounted grab bars.
4. Upper wall casework units.
5. Wall-mounted handrails.
6. Wall-mounted ladders.

F. Where indicated or where wood blocking is not allowed by code, utilize galvanized sheet metal backing plates. Plating shall be long enough to span across a minimum of 3 studs, unless otherwise indicated, and may be one of the following:
1. Galvanized steel plate 0.053-inch (1.34-mm) thick minimum by4-inches (102-mm) wide.
2. 3-5/8 inches (92.1 mm) un-punched wide flange steel stud of 0.053 inch (1.34-mm) thick. Notch studs so that backing plate will be flush with exterior face of stud.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
1. Fire block furred spaces of walls, at each floor level and at ceiling, with wood blocking or noncombustible materials accurately fitted to close furred spaces.

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

3.4 PANEL PRODUCT INSTALLATION

A. Wood Structural Panels: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
1. Comply with "Code Plus" provisions in above-referenced guide.

3.5 PLYWOOD BACKING PANELS

A. Provide fire retardant-treated 3/4-inch (19-mm) thick plywood panels to each wall scheduled to receive electrical, telephone, communications, data, or similar equipment.
1. Do not install panels within 2 feet (610 mm) of the floor nor within 2 feet (610 mm) of a door frame.

B. Refer to Section 09 91 00 - Painting for field painting. Do not paint over at least one fire-retardant-treated label per panel.

END OF SECTION

SECTION 06 16 43

GYPSUM SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gypsum wall sheathing.

B. Sheathing joint and penetration treatment.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier and gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and gypsum sheathing.
   2. Refer to Section 05 40 00 - Cold-Formed Metal Framing for additional information.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   2. Shop Drawings: Comply with provisions of Section 05 40 00 - Cold-Formed Metal Framing.
      a. Shop Drawings that are required by that Section, indicate exterior sheathing screw fastener spacing to be utilized at interior zones and corner zones of building façade, as required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds.

B. Informational Submittals:
   1. Qualification Data: For Installer.
   2. Field quality-control reports, if required.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for materials and execution.
   1. Provide mock-up in accordance with provisions of Section 01 43 39 - Mockup Requirements.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Testing Agency Qualifications (If Required):
1. For testing agency provide inspections that are acceptable to Owner that periodically performs inspections to verify that material are installed correctly.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL (FRD) or from the listings of another qualified testing agency.

2.2 GYPSUM SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.
1. Manufacturers:
a. CertainTeed Corporation; GlasRoc.
b. Georgia-Pacific Building Products; Dens-Glass Exterior Sheathing.
c. National Gypsum Company; Gold Bond eXP.
d. United States Gypsum Co.; Securock.
2. Type and Thickness: Regular, 1/2 inch (13 mm) thick and Type X, 5/8 inch where required for fire resistance.
3. Permeance: Not less than 15 perms per ASTM E96/E96M.
4. Size: 48 by 96 inches (1219 by 2438 mm).
5. Mold Growth: 10, per ASTM D3273.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, provide one of the following:

a. Bugle-head screws complying with ASTM C954.
b. Wafer-head screws complying with ASTM C1513.

2. Minimum Fastener Head Diameter: Not less than 0.42 inch (10.7 mm), unless larger diameter is required by sheathing manufacturer.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sheathing Sealant: Refer to Section 07 27 26 - Fluid-Applied Membrane Air Barriers. Sealant must be approved by Air-Barrier manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
1. ASTM C1280, unless closer spacing is required in order for sheathing to resist pressures imposed by design wind speeds.

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
1. Fasten gypsum sheathing to cold-formed metal framing with bugle-head or wafer-head screws, with minimum head diameter of 0.42 inch (10.7 mm) , unless larger diameter is required by sheathing manufacturer.
2. Install panels with a 3/8 inch (9.5 mm) gap where non-load-bearing construction abuts structural elements.
3. Install panels with a 1/4 inch (6.4 mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
      a. Decrease spacing between fasteners where required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds, as indicated in Shop Drawings submitted under Section 05 40 00 - Cold-Formed Metal Framing.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
      a. Decrease spacing between fasteners where required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds, as indicated in Shop Drawings submitted under Section 05 40 00 - Cold-Formed Metal Framing.

3.3 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to "Air-Barrier" manufacturer's written recommendations.
   1. Apply sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling, unless directed otherwise by "Air-Barrier" manufacturer's written instructions. Seal other penetrations and openings.
      a. Utilize primers and tapes as recommended by sealant manufacturer at corners and joints at adjacent substrates.
   2. Taping of joints will not be accepted as an alternative or substitute for application of joint sealant.
   3. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip, so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
   4. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
   5. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
   6. Seal top of through-wall flashings to sheathing with an additional 6 inch- (150 mm-) wide, transition strip.
   7. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

8. Repair punctures, voids, and deficient lapped seams in strips and transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner reserves the right to engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. The following items will be subject to testing and inspecting:
   1. Attachment of sheathing to studs and other supplemental support framing.
   2. Type and size of fasteners.
   3. Spacing of fasteners.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 06 20 23

INTERIOR FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Composite Shelves.

B. Reclaimed Wood Planks/Paneling.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
   1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.

B. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

A. Mockups:
   1. Solid reclaimed wood paneling.
      a. Mockup, minimum size 24"x36" size panel showing overall construction, planks abutment (tight, flush joint), finished edges, and final selected stain.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
   1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
   2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Composite Shelves:
   1. Engineered polymer Trim, primed.
   2. Flame Spread Index ASTM E84 Class A Rating.
   3. Thickness: 5/4 inches.
   4. Edge: Square edge.
   5. Corners: Eased.
   6. Dimensions: As indicated on the Drawings.
   7. Finish: Field applied.

C. Softwood Plywood: DOC PS 1.

D. WD1: Rustic solid wood planks - reclaimed Douglas Fir), quartered cut, 7" wide x 1/2" and 3/4" thick, tongue-and-groove plank, sharp edge.
   1. Manufacturers:
      a. Terramai
      b. Pioneer Millworks
      c. WD Walls/Flooring/Walls
   2. Basis of Design: Terramai,

E. Moisture Content: Dry lumber to the moisture content recommended by the AWI Section 100-S-3. Not to exceed 8-10% moisture content upon manufacturing

2.2 DECORATIVE WOOD WALL TREATMENT

A. Rustic solid wood planks WD1: Direct applying/installing the solid planks to the wall (plywood substrate), mechanically fastened (no glue).

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
   1. Provide stainless-steel fasteners.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
   1. Adhesives shall have a VOC content of 30 g/L or less.

C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D 3498, that is recommended for indicated use by adhesive manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.

D. Shop finishing materials:
   1. Stain: Match Architect's sample.
   2. Sherwin Williams Ultra Matte Finish, Conversion Varnish, ultra flat or low sheen.
   3. Sherwood, 0.5 VOC Conversion Varnish. Low Sheen Finish.

2.4 FABRICATION

A. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5 mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8- inch (3-mm) radius

2.5 FINISHING

A. Shop finishing materials: Apply according to Manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.
   1. Conditioning of reclaimed wood: Condition reclaimed wood in accordance with TerraMai Flooring and Paneling Acclimation Guidelines and recommendations of the National Wood Flooring Association (NWFA).

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
   1. Use concealed shims where necessary for alignment.
   2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
   4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
   5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 SHELVING INSTALLATION

A. Install shelves to supports as indicated on the Drawings.

3.5 DECORATIVE WOOD WALL TREATMENT

A. Rustic solid wood planks WD1: Direct applying/installing the prefinished solid planks to the wall (plywood substrate instead of gyp), mechanically fastened (no glue).

3.6 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.
   1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 41 13

WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood-veneer-faced and rustic solid wood plank architectural cabinets.

B. Wood furring, blocking, shims, and hanging strips for installing architectural cabinets that are not concealed within other construction.

C. Shop finishing of architectural cabinets.

D. Coordination and preparation as required to accommodate countertops.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Action Submittals:
   1. Coordination: Submit related shop drawings, specified in another Section simultaneously for approval.
      a. Countertops shops, showing all dimensions and indicating how countertops are to be mounted to cabinets.
   2. Product Data: For each type of product.
   3. Shop Drawings: For architectural cabinets.
      a. Include plans, elevations, sections, and attachment details.
      b. Show large-scale details.
      c. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
      d. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.
      e. Apply AWI Quality Certification Program label to Shop Drawings.
   4. Samples: For each exposed product and for each color and finish specified, in manufacturer's standard size.
   5. Samples for Verification: For the following:

a. Lumber for Transparent Finish: Not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.
b. Lumber and Panel Products with Shop-Applied Opaque Finish: 5 inches (125 mm) wide by 12 inches (300 mm) long for lumber and 8 by 10 inches (200 by 250 mm) for panels, for each finish system and color.
   1) Finish entire exposed surface.
c. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

B. Informational Submittals:
1. Qualification Data: For manufacturer and Installer.
2. Product Certificates: For the following:
   a. Composite wood and agrifiber products.
   b. Thermoset decorative panels.
   c. Glass.
   d. Adhesives.
3. Field quality-control reports.

C. Closeout Submittals:
1. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Installer Qualifications: Manufacturer of products.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups of typical architectural cabinets as shown on Drawings.
2. Build mockup of solid reclaimed wood cabinet
   a. Mockup, minimum size 24"x36" size panel showing overall construction, planks abutment (tight, flush joint), finished edges, carved pull and final selected stain.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 CABINETS, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of architectural cabinets indicated for construction, finishes, installation, and other requirements.
   1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
      a. This project has been registered with AWI as AWI Quality Certification Program Number 25.1031.
   2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.2 WOOD CABINETS FOR TRANSPARENT FINISH

A. Architectural Woodwork Standards Grade: Premium.

B. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. Reclaimed Wood for Exposed Surfaces: As indicated in Interior Finish Legend on Drawings.
   1. WD1: Rustic solid wood planks - reclaimed Douglas Fir), quartered cut, 7" wide x 1/2" and 3/4" thick, tongue-and-groove plank, sharp edge. See Section 06 2023 - Interior Finish Carpentry.

2. Matching of panels: Random match.
3. Matching within Panel Face: Balance match.
4. Matching within Room: Provide cabinets in each room or other space with doors, drawer fronts, and other surfaces of compatable color, grain and charecter.
5. Base cabinets with the WD1 face will have "pre-finished plywood, 3/4" thick with raw edge, with applied specialty edge banding (solid wood banding is an option)" bones.

F. Semiexposed Surfaces:
1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
a. Edges of Shelves: Solid hardwood, unless otherwise indicated.
2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, stained to match species indicated for exposed surfaces, unless otherwise indicated.
3. Drawer Bottoms: Hardwood plywood.

G. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

I. CABINETS FRONTS (DOORS AND DRAWERS): 1/2" thick solid wood planks, mechanically fastened (no glue)

J. TALL DOORS / STORAGES AREA: 1/2" thick planks over 3/4" plywood; recommended "off set" pivot hinges. Magnet latch at top .

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.

B. Wood Moisture Content: 5 to 10 percent.

C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

D. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
1. Softwood Plywood: DOC PS 1, exterior.
2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
   1. Manufacturers:
      a. Accuride International.
      b. Blum, Julius & Co., Inc.
      c. CompX International, Inc.
      d. Doug Mockett & Company
      e. GRASS GmbH.
      f. Häfele GmbH & Co.
      g. Hettich America L.P.
      h. Knape & Vogt Manufacturing Company.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
   1. Provide hinges as follows (based on maximum 24-inch wide doors):
      a. 2 Hinges: For doors up to 35 inches high.
      b. 3 Hinges: For doors 36 to 62 inches high.
      c. 4 Hinges: For doors 63 to 78 inches high.
      d. 5 Hinges: For doors 79 to 94 inches high.

C. Pulls: Custom formed recessed cincealed wood pulls as detailed on the Drawings.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Mortised Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: 5-mm hole steel, nickel-plated.
   1. Acceptable Manufacturers:
      a. Hafele; 282.11.707
      b. Knape & Vogt; 332.

G. Shelf Brackets and Standards, for closet and utility shelving:
   1. Vertical slotted shelf standards, BHMA A156.9, B04102
   2. Shelf brackets for slotted standards, BHMA A156.9, B04112.

H. Drawer Slides: BHMA A156.9.
   1. Grade 1: Side mounted and extending under bottom edge of drawer.
      a. Type: Full extension.
      b. Material: Zinc-plated steel with polymer rollers.
   2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel, ball-bearing slides.
   3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
   4. For drawers more than 3 inches (75 mm) high, but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
   5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
   6. For computer keyboard shelves, provide Grade 1.

7. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200.

I. Door Locks: BHMA A156.11, E07121, provide where indicated.

J. Elbow Latch: BHMA A156.9, B03023, for inactive leaf at pairs of doors.

K. Door and Drawer Silencers: Provide 3/8 inch to 1/2 inch diameter self-adhesive neoprene disks.
1. Color: Clear.

L. Grommets for Cable Passage: 1-1/4-inch (32-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Color: Brown.

M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Satin Stainless Steel: BHMA 630.

N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease edges and corners to 1/16-inch (1.5-mm) radius unless otherwise indicated.

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.7 SHOP FINISHING

A. General: Finish architectural cabinets at manufacturer's shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. General: Drawings indicate items that are required to be shop finished. Finish these items at manufacturer's shop as specified in this Section. See 09 91 00 - Painting for field finishing of architectural cabinets.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural cabinets, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

D. Transparent Finish:
   1. Catilized penetration oil finish:
      a. Basis of design: Rubio's Monocoat.
         1) Color: Selected by the Architect from Manufacturer's full range.
      b. Precoat: As recommended by the Manufacturer.
   2. Architectural Woodwork Standards Grade: Premium.
   3. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
   4. Sheen: Low sheen.

PART 3 EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with cabinet surface.
   1. For shop-finished items, use filler matching finish of items being installed.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm)using concealed shims.
   1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Maintain veneer sequence matching of cabinets with transparent finish.
4. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

E. Shop Finishes: Touch up finishing after installation of architectural cabinets. Fill nail holes with matching filler.
1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.3 FIELD QUALITY CONTROL

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 41 16

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plastic-laminate-clad architectural cabinets.

B. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

C. Coordination and preparation as required to accommodate countertops.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Action Submittals:
   1. Coordination: Submit related shop drawings, specified in another Section simultaneously for approval.
      a. Countertops shops, showing all dimensions and indicating how countertops are to be mounted to cabinets.
   2. Product Data: For each type of product.
   3. Shop Drawings:
      a. Include plans, elevations, sections, and attachment details.
      b. Show large-scale details.
      c. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
      d. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
      e. Apply AWI Quality Certification Program label to Shop Drawings.
         1) AWI Quality Certification Project Number: 25.1031
   4. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.
   5. Samples for Verification: For the following:
      a. Plastic Laminates: 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish required.

1) Provide one sample applied to core material with specified edge material applied to one edge.

b. Thermoset Decorative Panels: 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish.
1) Provide edge banding on one edge.

c. Corner Pieces:
1) Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
2) Miter joints for standing trim.

d. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

B. Informational Submittals:
1. Qualification Data: For manufacturer and Installer.
2. Product Certificates: For each type of product.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Installer Qualifications: Manufacturer of products.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups of typical architectural cabinets as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
   1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Premium.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
   1. Manufacturers:
      a. Abet Laminati Inc.
      b. Formica Corporation.
      c. Lamin-Art, Inc.
      d. Pionite; a Panolam Industries International, Inc. brand.
      e. Wilsonart.
   2. Basis of Design:
      a. PLAM2: FORMICA CHERYY WALNUT 6995-26, OILED WOOD FINISH.
      b. PLAM1: FORMICA, SURF COLORCORE2, 923-58.

F. Laminate Cladding for Exposed Surfaces:
   1. Horizontal Surfaces: Grade HGS.
   2. Postformed Surfaces: Grade HGP.
   3. Vertical Surfaces: Grade VGS.
   4. Exposed Edging for Door and Drawer Fronts: 3 mm color coordinated ABS, adhesive applied.
      a. Doellken-Woodtape ABS Edgebanding as manufactured by Surteco USA Inc.
   5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels Provide continuous match for wood grain laminates on doors and drawers of same cabinet.

G. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
   a. Edges of Plastic-Laminate Shelves: Polyester tape, 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
   b. Edges of Thermoset Decorative Panel Shelves: ABS or polyester edge banding.
   c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
2. Drawer Sides and Backs: Thermoset decorative panels with ABS or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

H. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Color: Refer to Interior Finish Legend on Drawings.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than percent.
2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
   a. Agrifiber particleboard is not acceptable.
3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Accuride International.
      b. Blum, Julius & Co., Inc.
      c. CompX International, Inc.
      d. GRASS GmbH.
      e. Häfele GmbH & Co.
      f. Hettich America L.P.
      g. Knape & Vogt Manufacturing Company.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
   1. Provide hinges as follows (based on maximum 24-inch wide doors):
      a. 2 Hinges: For doors up to 35 inches high.
      b. 3 Hinges: For doors 36 to 62 inches high.
      c. 4 Hinges: For doors 63 to 78 inches high.
      d. 5 Hinges: For doors 79 to 94 inches high.

C. Pulls: Mockett, DP128 Series - Round Top Drawer Pull, 6-11/16" , SSS finish (satin stainless steel)

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Mortised Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Floating Shelf Bracket: Heavy duty for maximum shelf depth of 14-inches.
   1. Tube thickness: 1 3/4 inches minimum.

G. Shelf Rests: 5-mm hole steel, nickel-plated.

H. Shelf Brackets and Standards, for closet and utility shelving:
   1. Vertical slotted shelf standards, BHMA A156.9, B04102
   2. Shelf brackets for slotted standards, BHMA A156.9, B04112.

I. Drawer Slides: BHMA A156.9.
   1. Grade 1: Side mounted and extending under bottom edge of drawer.
      a. Type: Full extension.
      b. Material: Zinc-plated steel with polymer rollers.
   2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
   3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
   4. For drawers more than 3 inches (75 mm) high, but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
   5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
   6. For computer keyboard shelves, provide Grade 1.

7. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200.

J. Door and Drawer Silencers: Provide 3/8 inch to 1/2 inch diameter self-adhesive neoprene disks.
1. Color: Clear.

K. Wire Manager: J-shape wire manager; 2 feet; factory installed with double-sided tape or screwed.
1. Acceptable Product: WM2A by Doug Mockett and Co., Inc.
a. Color: Black or White .

L. Grommets for Cable Passage: 1-1/4-inch (32-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Color: Black.

M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Satin Stainless Steel: BHMA 630.

N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Adhesive for Bonding Plastic Laminate: Contact cement.
1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.
1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
1. Inspection entity shall prepare and submit report of inspection.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 06 42 16

PLASTIC LAMINATE PANELING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Custom flush plastic laminate paneling.

B. Wood furring, blocking, shims, and hanging strips for installing plastic laminate paneling unless concealed within other construction before paneling installation.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product, including panel products, adhesives, fire-retardant-treated materials, and finishing materials and processes.
      a. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
   2. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
      a. Show details full size.
      b. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
      c. Apply AWI Quality Certification Program label to Shop Drawings.
   3. Samples for Verification: As follows:
      a. Plastic Laminates: For each type, color, pattern, and surface finish required, 8 by 10 inches (200 by 250 mm) in size.
      b. Fabrication Sample: For each type of panel required, provide one sample applied to core material with specified edge material applied to one edge.

B. Informational Submittals:
   1. Qualification Data: For Fabricator.
      a. Product Certificates: For each type of product.
   2. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
   3. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.
   4. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of typical paneling as shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 degrees Fahrenheit (32.22 degrees Celsius) and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.

C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 PRODUCTS

2.1 PANELING, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards (AWS)" for grades of plastic laminate paneling (plastic laminate wall surfacing) indicated for construction, finishes, installation, and other requirements.
   1. Provide labels and certificates from AWI certification program indicating that paneling, complies with requirements of grades specified.
      a. This project has been registered with AWI as AWI Quality Certification Program Number 25.1031.
   2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.2 PLASTIC LAMINATE PANELING

A. Grade: Premium.

B. Certified Wood: Wood and composite wood components of flush wood paneling shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

C. Panel Core Construction: Medium-density fiberboard.
   1. Thickness: As indicated on the Drawings.

D. Exposed Panel Edges: Inset plastic laminate matching faces.

E. Panel Reveals: Matte black plastic laminate.

F. Fire-Retardant-Treated Paneling: Panels shall consist of plastic laminate and fire-retardant particleboard or fire-retardant, medium-density fiberboard. Panels shall have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E 84 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. Assemble panels by gluing and concealed fastening.

2.3 MATERIALS

A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

B. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS.
   1. Manufacturers:
      a. Abet Laminati Inc.
      b. Formica Corporation.
      c. Lamin-Art, Inc.
      d. Nevamar; a Panolam Industries International, Inc. brand.

e. Pionite; a Panolam Industries International, Inc. brand.
f. Wilsonart.

2. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   a. Color: Refer to Interior Finish Legend on Drawings.

C. Wood Moisture Content: 5 to 10 percent.

D. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
   1. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   2. Medium-Density Fiberboard: ANSI A208.2, Grade 140-MR30, made with binder containing no urea formaldehyde.

E. Adhesives: Do not use adhesives that contain urea formaldehyde.

F. Adhesives: Use adhesives that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
   3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (320.04 cm) beyond the centerline of the burners at any time during the test.
   1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

C. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
1. Products: Subject to compliance with requirements, avilable products include th the following:
a. Panel Source International, Inc., McKillican America, Inc.; Pyroblock Platinum.
b. SierraPine; Medite FR.

2.5 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.

C. Panel "Z" Clips: Mill finish aluminum panel clips designed as two sections to wedge together for securely locking panels in place.
1. Offset from wall: 1/4-inch.
2. Panel drop (lift-off): 5/8-inch.
3. Acceptable manufactures:
a. Monarch Metal Fabrications.
b. Mustang Metals.
c. New York Metals.
d. Orange Aluminum.

D. VOC Limits for Installation Adhesives: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Contact Adhesive: 80 g/L.
4. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch (1.59 mm) or less in thickness to any surface): 250 g/L.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
   1. Lay out one elevation at a time if approved by Architect.
   2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.
   3. Provide lighting of similar type and level as that of final installation for viewing layout unless otherwise approved by Architect.
   4. Rearrange paneling as directed by Architect until layout is approved.
   5. Do not trim end units and other nonmodular-size units to less than modular size until after Architect's approval of layout. Indicate trimming by masking edges of units with nonmarking material.
   6. Obtain Architect's approval of layout before start of assembly. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.

C. Complete fabrication, including assembly and finishing, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 EXECUTION

3.1 PREPARATION

A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.

B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install paneling to comply with same grade as paneling to be installed.

B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm). Install with no more than 1/16 inch (1.59 mm) in 96-inch (0.06 inch (1.6 mm) in 2400-mm) vertical cup or bow and 1/8 inch in 96-inch (0.12 inch (3 mm) in 94.49 inch (2400 mm)) horizontal variation from a true plane.
   1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch (0.79 mm).
   2. Verify panels are install in proper /sequence order to conform to specified veneer matching.

C. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed.
   1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 FIELD QUALITY CONTROL

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective paneling, where possible, to eliminate defects; where not possible to repair, replace paneling. Adjust for uniform appearance.

B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 61 15

QUARTZ AGGLOMERATE COUNTERTOP FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quartz agglomerate countertops.

B. Quartz agglomerate backsplashes.

C. Quartz agglomerate end splashes.

D. Quartz agglomerate apron fronts.

1.2 SUBMITTALS

A. Action Submittals:
   1. Coordination: Submit related shop drawings, specified in another Section simultaneously for approval.
      a. Cabinet shops, showing all dimensions and indicating how countertops are to be mounted to cabinets.
   2. Product Data: For countertop materials.
   3. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
      a. Show locations and details of joints.
      b. Show direction of directional pattern, if any.
   4. Samples for Verification: For the following products:
      a. Countertop material, 6 inches (150 mm) square.

B. Informational Submittals:
   1. Qualification Data: For fabricator.

C. Closeout Submittals:
   1. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.5 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
   1. Manufacturers:
      a. Caesarstone.
      b. Cambria.
      c. Cosentino USA.
      d. Corian, E. I. du Pont de Nemours and Company.
      e. Wilsonart LLC.
      f. LX Hausys.
   2. Basis of Design:
      a. SS1: LX HAUSYS VIATERA - SUGAR WHITE, 3CM (JUMBO SLAB FOR KITCHEN ISLAND)
      b. SS2: LX HAUSYS VIATERA - SONORO BRUSHED, 2CM AND 3CM

B. Composite Wood Products: Products shall be made without urea formaldehyde.

C. Plywood: Exterior softwood plywood complying with DOC PS 1, Marine, Grade B-C.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Grade: Premium.

B. Configuration:
   1. Thickness: As indicated on Drawings.
   2. Front: Straight, slightly eased at top.
   3. Backsplash: Straight, slightly eased at corner
   4. End Splash: Matching backsplash.

C. Fabricate tops with shop-applied edges[and backsplashes] unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   1. Fabricate with loose backsplashes for field assembly.

D. Joints: Fabricate countertops in sections for joining in field.

1. Joint Locations: Not within 18 inches (450 mm) of a sink or cooktop and not where a countertop section less than 36 inches (900 mm) long would result, unless unavoidable.
2. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.

E. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixturesusing template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
   a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by quartz agglomerate manufacturer.
1. Adhesives shall have a VOC content of 70 g/L or less.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 - Joint Sealants for color matched sealant.

2.4 ACCESSORIES

A. Grommets for Cable Passage through Countertops: Doug Mockett and Company as follows:
1. EDP3 Flip-Top Series 2-1/2 inch Grommet.
2. RG Rectangular Grommet.
3. Color: As selected by Architect from manufacturer’s full range of colors.

B. Concealed Countertop Support Brackets Standard Mount or In-Wall Mount, minimum 400 lb. load limit.
1. Basis of Design: Rakks Corporation; EH-Counter Supports.
   a. Size: As required by application.
2. Provide manufacturer’s standard factory-applied primer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
   1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
   2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
   1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 07 92 00 - Joint Sealants.

END OF SECTION

SECTION 06 61 16

SOLID SURFACING WINDOW SILLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Solid-surface-material window sills.

1.2 SUBMITTALS

A. Action Submittals:
   1. Coordination: Submit related shop drawings, specified in another Section simultaneously for approval.
   2. Product Data: For window sill materials.
   3. Shop Drawings: For window sills. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
      a. Show locations and details of joints.
      b. Show direction of directional pattern, if any.
   4. Samples for Verification: For the following products:
      a. Window sill material, 6 inches (150 mm) square.

B. Informational Submittals:
   1. Qualification Data: For fabricator.

C. Closeout Submittals:
   1. Maintenance Data: For solid surface material to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
   1. Build mockup of typical window sill as shown on Drawings or as directed by Architect.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of window sills by field measurements after base cabinets are installed but before window sill fabrication is complete.

PART 2 PRODUCTS

2.1 SOLID SURFACE MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
   1. Manufacturers:
      a. Affinity Surfaces; a brand of Domain Industries, Inc.
      b. Avonite Surfaces.
      c. Corian, E. I. du Pont de Nemours and Company.
      d. Formica Corporation.
      e. LG Chemical, Ltd.
      f. Meganite Inc.
      g. Samsung Chemical USA, Inc.
      h. Swan Corporation (The).
      i. Transolid Div of Trumbull Industries.
      j. Wilsonart LLC.
   2. Basis of Design: CORIAN SOLID SURFACE, Designer White.

B. Composite Wood Products: Products shall be made without urea formaldehyde.

C. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 SOLID-SURFACE-MATERIAL FABRICATIONS

A. Window Sills: 1/2-inch- (12.7-mm-) thick, solid surface material with beveled edges. Refer to Drawings for sizes.

B. Fabrication: Fabricate items in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.
   2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sealant for Window Sills: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material window sills and conditions under which window sills will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of window sills.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install window sills level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten subsills to cabinets by screwing through subtops into wall below. Shim as needed to align subtops in a level plane.

C. Secure window sills to subsills with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match sills, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Apply sealant to gaps at walls; comply with Section 07 92 00 - Joint Sealants.

END OF SECTION

SECTION 06 67 00

FIBERGLASS GRATING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass grating.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: Describe the properties of items to be used in the Work.
   2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
      a. Provide templates for anchors and bolts specified for installation under other Sections.
      b. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in successfully producing work similar to that indicated for this Project, with a record of successful in-service performance, and with sufficient production capacity to produce required units without causing delay in the Work.
   1. Experience: Minimum of 5 years.

B. Installer Qualifications: An installer trained in the use of the materials and equipment to be employed in the Work.
   1. Experience: Minimum of 1 years.

C. Regulatory Requirements: Comply with all applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

D. Single Source Responsibility: Obtain work from a single manufacturer.

E. Pre-Installation Meetings: Contractor to conduct meetings at site with installer prior to start of Work. Familiarize installer with conditions at site and related Work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver materials in manufacturer's original packaging with label indicating pertinent information identifying the item. Store materials in accordance with manufacturer's instructions in a protected dry location off ground. Do not open packaging nor remove labels until time of installation.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating gratings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
   2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION

A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design Requirements: Design, engineer, fabricate, and install work in compliance with specified standards, performance requirements, material selections, and requirements of this and related sections.

B. Structural Performance:
   1. Grating: Capable of withstanding a uniform load of 100 lbs per sq. ft. live load and a concentrated load of 300 lbf on a area of 4 sq. inches located in the center of the grating. Supports designed to carry dead load and live load.
   2. Deflection:
      a. Uniform Load: Deflection not to exceed the lesser of 3/8" or L/120.
      b. Concentrated Load: Deflection not to exceed L/120.
   3. Factor of Safety: 2.5 maximum allowable loading.

C. Surface Burning Characteristics: ASTM E 84. Tested by an independent testing agency.
   1. Flame Spread: 25 or less.

2.2 MANUFACTURERS

A. Manufacturers:
1. Creative Pultrusions, Inc.
2. Enduro Systems Inc.; Composite Products Division.
3. Fibergrate Composite Structures Inc.
4. Fisher & Ludlow.
5. IKG Industries; a Harsco Company.
6. Seasafe, Inc.
7. Strongwell.

2.3 FIBERGLASS GRATING

A. Pultruded Glass-Fiber-Reinforced Gratings: Bar gratings assembled from components made by simultaneously pulling glass fibers and extruding thermosetting plastic resin through a heated die under pressure to produce a product without voids and with a high glass-fiber content.
1. Flame-Spread Index: 25 or less when tested according to ASTM E 84.
2. U.S.D.A. Acceptance: Accepted for food processing applications.

B. Fiberglass Grating:
1. Material: Isopthalic Polyester resin molded grating.
2. Bearing Bars: 1-1/2 inch deep by 1-1/2 inch spacing, unless otherwise indicated.
3. Slip Resistant Surface: Manufacturer’s standard black grit.
4. Finish: Light Grey.
5. Miscellaneous: Provide pultruded fiberglass or stainless-steel support angles and removable grating clips that are not mounted on top of grating.

2.4 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

2.5 GRATING FRAMES AND SUPPORTS

A. Frames and Supports for Glass-Fiber-Reinforced Plastic Gratings: Fabricate from glass-fiber-reinforced plastic shapes of sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
   1. Unless otherwise indicated, use shapes made from same resin as gratings.
   2. Equip units indicated to be cast into concrete or built into masonry with integral anchors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine and correct conditions of area to receive the Work prior to installation. Comply with the following requirements.

3.2 PREPARATION

A. Coordinate and Furnish: Anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of items having integral anchors embedded in concrete construction. Coordinate delivery of such items to the project site.

3.3 INSTALLATION

A. General: Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard stainless-steel anchor clips and hold-down devices for bolted connections.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

E. Fit exposed connections accurately together to form hairline joints.

F. Place units on supporting members and adjust into final positing. Secure to bearing member with anchoring devices.

G. Coat all cut or sanded surfaces with manufacturer recommended resin.

3.4 CLEANING

A. At the end of each workday, remove unused materials, debris and containers from the site.

3.5 PROTECTION

A. Protect the Work so it will not deteriorate or be damaged. Remove protection at time of Substantial Completion.

END OF SECTION

SECTION 07 00 00

WATERPROOFING DAMPPROOFING AND CAULKING (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
2. The following shall appear on the upper left hand of the envelope:
   a. Name of Sub-Bidder: Print Name of Sub-bidder
   b. Project: Insert project name
   c. Sub-Bid for Section: xxxx - Trade
3. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
4. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
1. 01-GENERAL Series.
2. 04-STRUCTURAL Series.
3. 05-ARCHITECTURAL Series.
4. 10-PLUMBING Series.
5. 11-MECHANICAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. All Waterproofing, Dampproofing and Caulking Work of Section 01 43 39, MOCK-UP REQUIREMENTS.
2. All Work of Section 07 13 26 SELF ADHERING SHEET WATERPROOFING
3. All Work of Section 07 27 26 FLUID APPLIED MEMBRANE AIR BARRIERS
4. All Work of Section 07 92 00 JOINT SEALANTS

END OF SECTION

SECTION 07 00 01

ROOFING AND FLASHING (TRADE BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
2. The following shall appear on the upper left hand of the envelope:
   a. Name of Sub-Bidder: Print Name of Sub-bidder
   b. Project: Insert project name
   c. Sub-Bid for Section: xxxx - Trade
3. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
4. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
   1. 01-GENERAL Series.
   2. 04-STRUCTURAL Series.
   3. 05-ARCHITECTURAL Series.
   4. 10-PLUMBING Series.
   5. 11-MECHANICAL Series.
   6. 12-ELECTRICAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. All Roofing and Flashing Work of Section 01 43 39, MOCK-UP REQUIREMENTS.
   2. All Work of Section 07 54 23 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING.
   3. All Work of Section 07 62 00 SHEET METAL FLASHING AND TRIM
   4. All Work of Section 07 71 00 ROOF SPECIALTIES
   5. All Work of Section 07 71 29 MANUFACTURED ROOF EXPANSION JOINTS

END OF SECTION

SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING

(PART OF TRADE-BID SECTION 07 00 00 - WATERPROOFING, DAMPPROOFING, AND CAULKING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Type A: HDPE sheet waterproofing system for horizontal (blindside) under-slab applications.

B. Type B: Rubberized-asphalt sheet waterproofing system for vertical below grade foundation walls.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
   2. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

B. Informational Submittals:
   1. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
   2. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.
   3. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

C. Closeout Submittals:

1. Executed copy of Special Manufacturer's Warranty.
2. Executed copy of Special Installer's Warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver materials in manufacturer's original packaging with label indicating pertinent information identifying the item. Store materials in accordance with manufacturer's instructions in a protected dry location off ground. Do not open packaging nor remove labels until time of installation.

B. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

C. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

D. Remove and replace liquid materials that cannot be applied within their stated shelf life.

E. Store rolls according to manufacturer's written instructions.

F. Protect stored materials from direct sunlight.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.
   1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch (1.6 mm) in width.
   2. Warranty Period: Ten years after date of Substantial Completion.

B. Special Installer's Warranty: Written waterproofing Installer's warranty, signed by Installer, covering Work of this Section, for warranty period of two years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain waterproofing materials and molded-sheet drainage panels through one source from a single manufacturer.
   1. Obtain bituminous sheet waterproofing and HDPE sheet waterproofing, and all related accessory materials for each system, through one source from a single manufacturer, to ensure compatibility of systems and continuity of manufacturer's waterproofing warranty.

2.2 PERFORMANCE REQUIREMENTS

A. Waterproofing System: Provide waterproofing products that prevent the passage of water, are compatible with adjacent waterproofing systems with which they interface, and which have been produced and are installed to establish and maintain continuous watertight seals.

2.3 TYPE A - HDPE SHEET WATERPROOFING

A. HDPE Sheet for Horizontal Applications: Composite sheet membrane comprising 0.046 in (1.2 mm) of high density polyethylene film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and permanent bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete.

B. Physical Properties: As follows, measured per standard test methods referenced:
   1. Resistance to Hydrostatic Head: 231 ft (70 m); ASTM D 5385 modified.
   2. Tensile Strength, Film: 4000 psi (27.6 MPa) minimum; ASTM D 412.
   3. Elongation: 300%; ASTM D 412, modified.
   4. Low-Temperature Flexibility: Pass at minus -10 deg F (minus 23 deg C); ASTM D 1970.
   5. Peel Adhesion to Concrete: 5 lbf/in. (880 N/m); ASTM D 903, modified.
   6. Puncture Resistance: 221 lb. (990 N); ASTM E 154.
   7. Vapor Permeance: 0.01 perms (0.6 ng/Pa x s x sq. m); ASTM E 96, Water Method.

C. Basis of Design Product: HDPE Sheet Waterproofing:
   1. "Preprufe 300R Plus," as manufactured by GCP Applied Technologies Inc. (formerly Grace Construction Products).

D. Auxiliary Materials: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with HDPE sheet waterproofing.
   1. Adhesive Tape: Adhesive tapes recommended by waterproofing manufacturer.
      a. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches (114 mm) wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
   2. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (225-mm) centers.

2.4 TYPE B - RUBBERIZED-ASPHALT SHEET WATERPROOFING

A. Rubberized-Asphalt Sheet: 60-mil-(1.5-mm-) thick, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil-(0.10-mm-) thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
   1. Physical Properties: As follows, measured per standard test methods referenced:
      a. Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
      b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
      c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
      d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
      e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
      f. Hydrostatic-Head Resistance: 150 feet (45 m) minimum; ASTM D 5385.
      g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
      h. Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m); ASTM E 96, Water Method.

B. Basis of Design Product: Rubberized-Asphalt Sheet Waterproofing:
   1. "Bituthene," as manufactured by GCP Applied Technologies Inc. (formerly Grace Construction Products).

C. Auxiliary Materials: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with rubberized-asphalt sheet waterproofing.
   1. General: Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
   2. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.
   3. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.
   4. Sheet Strips: Self-adhering, rubberized-asphalt composite sheet strips of same material and thickness as sheet waterproofing.
   5. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.
   6. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.
   7. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
      a. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches (114 mm) wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
   8. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (225-mm) centers.

9. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation sandwiched between 2 sheets of plastic film, nominal thickness 1/4 inch(6 mm), with compressive strength of 15 psi (103 kPa) per ASTM D 1621 and maximum water absorption by volume of 0.4 percent per ASTM C 272.

2.5 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

B. HDPE Sheet Waterproofing: Verify that compacted subgrade is dry, smooth, and sound; and has been inspected and approved by Owner’s Testing Laboratory.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
   1. Install membrane strips centered over vertical inside corners. Install 3/4-inch(19-mm) fillets of liquid membrane on horizontal inside corners and as follows:
      a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 TYPE A – HDPE SHEET APPLICATION

A. Install HDPE sheets according to waterproofing manufacturer's written instructions.

B. Place and secure drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.

C. Vertical Applications: Install sheet membrane with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch- (75-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.
   1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.

D. Horizontal Applications: Install sheet membrane with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch- (75-mm-) minimum lap widths and end laps. Overlap and seal seams. Overlap, stagger, and seal end laps with detail tape to ensure watertight installation.

E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

F. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

G. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet membrane and firmly secure with detail tape.

I. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 TYPE B – RUBBERIZED-ASPHALT SHEET APPLICATION

A. Install self-adhering sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch-(64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, rubberized-asphalt sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths to provide a minimum of 2 thicknesses of sheet membrane over areas to receive waterproofing.

E. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic or sealant.

G. Install sheet waterproofing and auxiliary materials to completely seal waterproofing to adjacent HDPE waterproofing, and under-slab sheet vapor retarder.
1. Perform perimeter tie-ins and transitions in strict accordance with manufacturer’s details, instructions, and recommendations to ensure specified waterproofing warranty will be issued.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheets extending 6 inches (150 mm) beyond repaired areas in all directions.

I. Immediately install drainage panels and protection course with butted joints over waterproofing membrane.

3.5 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
1. For vertical applications, install board insulation as a protection course after installing drainage panels.

3.6 FIELD QUALITY CONTROL

A. Inspection: Arrange for manufacturer's representative to perform two field inspections, as follows:
1. Perform inspection at commencement of installation, to ensure work is being performed in accordance with manufacturer’s instructions.
2. Inspect completed installation and provide written report that installation complies with manufacturer's written instructions.

B. Remove and replace applications of sheet waterproofing where inspection indicates that it does not comply with specified requirements.

C. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.7 PROTECTION AND CLEANING

A. Do not permit foot traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect sheet waterproofing from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded polystyrene foam-plastic board.

B. Fiberglass and Rock Mineral-wool blanket.

C. Mineral-wool board.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.

B. Informational Submittals:
   1. Product Test Reports: For each product, for tests performed by a qualified testing agency.
   2. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded Polystyrene Board, Type IV Designation; **Type A-2**: ASTM C578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.
   1. Products:

a. DiversiFoam Products; Certifoam 25 SL.
b. Dow Chemical Company (The); Cavitymate Tongue and Groove.
c. Owens Corning; Foamular 250 Tongue and Groove Edge.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

B. Extruded Polystyrene Board, Type VII Designation; **Type A-4**: ASTM C578, Type VII, 60-psi (414-kPa) minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.

1. Products:
a. Dow Chemical Company (The); PlazaMate.
b. Owens Corning; Foamular 604.

2.2 GLASS OR MINERAL WOOL BLANKET

A. Fiberglass Blanket (Batt), Unfaced Designation; **Type C**: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

1. Products:
a. CertainTeed Corporation; Sustainable Insulation.
b. Johns Manville.
c. Knauf Insulation; EcoBatt with ECOSE Technology.
d. Owens Corning; Pink Next Gen Unfaced Insulation.

2.3 MINERAL-WOOL BOARD

A. Mineral-Wool Board, Types IA and IB, Unfaced Designation; **Type E**: ASTM C612, Types IA and IB; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics. Nominal density of 4 lb/cu. ft. (64 kg/cu. m).

1. Products:
a. Rockwool International; CavityRock MD or CavityRock DD.
b. Thermafiber, Inc.; an Owens Corning company; RainBarrier 45 or RainBarrier HD.

B. Mineral-Wool Board, Type II, Unfaced Designation; **Type F**: ASTM C612, Type II; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics. Nominal density of 6 lb/cu. ft. (96 kg/cu. m).

1. Products:
a. Industrial Insulation Group, LLC (IIG-LLC); MinWool-1200 Industrial Board.
b. Rockwool International; CurtainRock 80.
c. Thermafiber, Inc.; an Owens Corning company; FireSpan 40 or FireSpan 90.

2. Application: Use where insulation is completely concealed, including in chases, plenums, and above-ceiling spaces, by not less than 5/8-inch thick gypsum board.

2.4 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
   1. Manufacturers:
      a. AGM Industries, Inc.
      b. Gemco.
   2. Plate: Perforated, galvanized carbon-steel sheet, 0.030-inch (0.762 mm) thick by 2 inches (50 mm) square.
   3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
   1. Manufacturers:
      a. Gemco.
   2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.
   3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
   1. Manufacturers:
      a. AGM Industries, Inc.
      b. Gemco.
   2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
      a. Crawl spaces.
      b. Ceiling plenums.
      c. Attic spaces.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 2 inches (50 mm) between face of insulation and substrate to which anchor is attached.
   1. Manufacturers:
      a. Gemco.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
   1. Manufacturers:
      a. AGM Industries, Inc.
      b. Gemco.

F. Hexagonal Wire Mesh Support for Insulation: Woven-Wire Lath, complying with ASTM C1032, fabricated into 1-1/2-inch (38-mm) hexagonal-shaped mesh with minimum 0.0510-inch- (1.3-mm-) diameter, galvanized steel wire.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Rock Mineral Wool Board: Types IA, Unfaced, ASTM C612, Types IA and IB; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics. Nominal density of 4.4 lb/cu. ft. (70 kg/cu. m).
   2. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
   1. Adhesives shall have a VOC content of 70 g/L or less.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

E. Rock Mineral Wool Board or Glass-Fiber Insulation or Low-Expansion Detailing Foam Insulation: Fill gaps and voids between heads, jambs, and sills and their rough openings, at the following openings in exterior walls:
   1. Doors.
   2. Windows.
   3. Entrances and storefront.
   4. Curtain wall.
   5. Louvers.
   6. Through-wall penetrations.

3.3 INSTALLATION OF SLAB INSULATION

A. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
   2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
   3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
   4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

A. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches (100 mm) from each corner of board insulation, at center of board, and as recommended by manufacturer.
   1. Fit courses of insulation between masonry wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
   2. Press units firmly against inside substrates.

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Glass-Fiber or Mineral Wool Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.7 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction according to curtain-wall manufacturer's written instructions.
   1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
   2. Install insulation to fit snugly without bowing.

3.8 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closed-cell spray polyurethane foam.

B. Thermal and Ignition barriers.

1.2 SUBMITTALS

A. Action Submittals:
1. Product Data: For each type of product.

B. Informational Submittals:
1. Qualification Data: For Installer.
2. Product Test Reports: For each product, for tests performed by a qualified testing agency.
3. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 1.5 lb/cu. ft. (24 kg/cu. m) and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Corporation.
   b. CertainTeed Corporation.
   c. Henry Company.
   d. Huntsman Building Solutions.
   e. Johns Manville; a Berkshire Hathaway company.
2. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 THERMAL BARRIER COATING FOR SPRAY POLYURETHANE FOAM

A. Ignition Barrier and 15-Minute Thermal Barrier for Spray Polyurethane Foam Insulation. A water-based, low VOC, intumescent latex paint.
1. Tested to NFPA 286 test standards and has been approved for use on spray foam insulation.
2. Thickness: As required to provide an ignition barrier over spray applied polyurethane foam of thickness and density as applied.
a. Apply to spray foam insulation where completely separated from occupied space by gypsum board, or an equivalent thermal barrier.
3. Thickness: As required to provide a 15-minute thermal barrier over spray applied polyurethane foam of thickness and density as applied.
a. Apply to spray foam insulation to separate it from occupied spaces in locations where gypsum board is not installed between the foam plastic insulation and the Building interior.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Ignition barrier coating: Apply ignition barrier coating to spray polyurethane foam covered by minimum 1/2-inch thick gypsum board, or other equivalent 15-minute thermal barrier.

1. Apply coating according to Manufacturer's instructions in thickness tested.

E. Thermal Barrier Coating: Apply thermal barrier coating to spray polyurethane foam unless covered by minimum 1/2-inch thick gypsum board, or other equivalent 15-minute thermal barrier.
   1. Apply coating according to Manufacturer's instructions in thickness tested.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 07 27 20

AIR BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Self-adhering sheet air barriers.
   1. **AB-01** Vapor-Retarding Self-adhering, Sheet Air Barriers.

1.2 RELATED REQUIREMENTS

A. Related Section Requirements:
   1. Division 01 Section "Allowances" for testing and inspecting allowances.
   2. Division 06 Section "Sheathing" for wall sheathing.
   3. Division 07 low-slope roofing Sections for roof air barriers.
   4. Division 07 Section "Thermal Insulation" for foam-plastic board insulation.
   5. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.
   6. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.3 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall. The intent of this combined section is to allow the contractor some flexibility in the location of the fluid-applied membrane air barrier and self-adhering, vapor-retarding, modified bituminous sheet air barriers used.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to air barrier manufacturers, for testing indicated below, samples of materials that will contact or affect air barriers and air barrier sealants.
   1. Submit not fewer than eight pieces of each kind of material, including substrates, shims, backings, sealants and miscellaneous materials.
   2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   3. For materials failing tests, obtain air barriert manufacturer's written instructions for corrective measures including use of specially formulated primers.
   4. Testing will not be required if air barrier manufacturers submit data that are based on previous testing, not older than 24 months, of products for adhesion to, and compatibility with, substrates and other materials matching those submitted.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
   2. Shop Drawings: For air-barrier assemblies.
      a. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
      b. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
      c. Include details of interfaces with other materials that form part of air barrier coating; including but not limited to the following:
         1) Foundation and walls, including penetrations, ties and anchors.
         2) Walls, windows, curtain walls, storefronts, louvers or doors.
         3) Different wall assemblies, and fixed openings within those assemblies.
         4) Wall and roof connections and penetrations.
         5) Floors over unconditioned space.
         6) Walls, floor and roof across construction, control and expansion joints.
         7) Walls, floors and roof to utility, pipe and duct penetrations.
         8) Seismic and expansion joints.
         9) All other leakage pathways in the building envelope.
         10) Include details of mockups.

B. Informational Submittals
   1. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
   2. Qualification Data: For Applicator. Provide letter from membrane manufacturer indicating applicator is trained and approved by manufacturer.
   3. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.
   4. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance and that is trained and authorized by membrane manufacturer and that is an ABAA-licensed contractor, employs certified and registered installers, and complies with ABAA's Quality Assurance Program.

B. Mockups: Build mockups to set quality standards for materials and execution.
   1. Build integrated mockups of exterior wall assembly, 150 sq. ft. (14 sq. m).

2. Incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
    a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
    b. Include junction with roofing membrane tie-in building corner condition,.
    c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site.
1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions and membrane curing period, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
1. Qualitative Air-Leakage Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Quantitative Air-Leakage Testing: Mockups will be tested for air leakage according to ASTM E 783.
3. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D 4541.
4. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.10 WARRANTY

A. Material Warranty: Provide the manufacturer’s 5 year air barrier material warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air Barrier Assembly Air Leakage: Not to exceed 0.04 cfm x sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa); ASTM E 2357.
   1. Assembly shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air and vapor seal materials at such locations, changes in substrate and perimeter conditions.
      a. Assembly shall be capable of withstanding combined positive and negative design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure.
      b. Assembly shall not displace adjacent materials under full load.
      c. Assembly shall be joined in an airtight and flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations and creep, and anticipated seismic movement.

C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly, consistent with the building construction as designed.

2.2 MANUFACTURERS

A. Source Limitations: Obtain all air barriers from a single source from single manufacturer.

1. Obtain accessory materials from the same manufacturer, or from manufacturers approved in writing by the Air Barrier manufacturer.

2.3 SELF-ADHERING SHEET AIR BARRIERS

A. **AB-01** Vapor-Retarding Sheet (Non-Permeable Air Barrier): 18-mil- thick, self-adhering sheet with release liner on adhesive side and formulated for application without primer and with primer that complies with VOC limits of authorities having jurisdiction and project VOC requirements.
   1. Basis of Design: GCP Applied Technologies Inc.; Perm-A-Barrier NPS Wall Membranes.
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. Perm-A-Barrier NPS Wall Membranes (GCP Applied Technologies).
      b. Blueskin SA (Henry Company).
   3. Physical and Performance Properties:
      a. Membrane Air Permeance: Not to exceed 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
      b. Tensile Strength: 400 psi minimum; ASTM D 412.
      c. Ultimate Elongation: 200 percent minimum; ASTM D 412, Die C, modified.
      d. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
      e. Crack Cycling: 1/8-inch movement; ASTM C1305, Pass.
      f. Puncture Resistance: 40 lbf minimum; ASTM E 154.
      g. Water Absorption: 0.1 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
      h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.
      i. Adhesion to Substrate: Minimum 5 lbf/sq. in. when tested according to ASTM D 903.
      j. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
      k. UV Resistance: Can be exposed to sunlight for one year

2.4 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction and project VOC requirements.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

C. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, crosslaminated polyethylene film with release liner backing.

D. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

E. Modified Bituminous Transition Strip for long exposure: Vapor-retarding, 25-mil- thick, smooth-surfaced, self-adhering; consisting of rubberized asphalt laminated to aluminum surfaced, cross-laminated HDPE with release liner backing.

F. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
   1. Products: Subject to compliance with requirements, provide the following:
      a. 123 Silicone Seal (Dow).
      b. US11000 UltraSpan (Momentive).
      c. Sil-Span (Pecora).
      d. Spectrem Simple Seal (Tremco).

G. Termination Mastic: Cold fluid-applied elastomeric liquid; trowel grade.

H. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.

I. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

J. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

K. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch (0.5 mm) thick, and Series 300 stainless-steel fasteners.

L. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

M. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

N. Joint Sealant: Single- or multi-component, moisture curing, low-modulus, high-movement polyether joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated, and complying with the following:
   1. Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates:
      a. Type and Grade: M (multicomponent) and NS (nonsag).
      b. Class: 100/50.
      c. Uses Related to Exposure: NT (nontraffic).
      d. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   2. Basis of Design Products: Provide one of the following:
      a. Sonneborn, Division of ChemRex Inc.; Sonolastic 150 Polyether Sealant.
      b. STS Coatings, Inc., GreatSeal PE-150 Polyether Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
   3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   4. Verify that masonry joints are flush and completely filled with mortar.
   5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).

G. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

H. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 AIR BARRIER MEMBRANE INSTALLATION (SHEET MEMBRANES)

A. Install modified bituminous sheets according to air barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous air barrier sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of termination mastic on horizontal inside corners.

C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier sheets. Accurately align sheets and maintain a uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure airtight installation.
1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
2. Roll sheets firmly to enhance adhesion to substrate.

F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

G. CMU: Install air barrier sheet horizontally against the CMU beginning at base of wall. Align top edge of air barrier sheet immediately below protruding masonry ties or joint reinforcement or ties and firmly adhere in place.
1. Overlap horizontally adjacent sheets a minimum of 2 inches (50 mm) and roll seams.
2. Apply overlapping sheets with bottom edge slit to fit around masonry reinforcing or ties. Roll firmly into place.
3. Seal around masonry reinforcing or ties and penetrations with termination mastic.
4. Continue the membrane into all openings in the wall, such as doors, windows, and terminate at points to maintain an airtight barrier that will not be visible from interior.

H. Seal top of through-wall flashings to air barrier with termination bar and sealant.
1. Seal exposed edges of sheets at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

I. Install air barrier sheets and auxiliary materials to form a seal with adjacent construction and to maintain a continuous air barrier.
1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

J. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings using accessory materials as indicated and according to manufacturer's tested assembly.

K. Wall Openings: Prime concealed perimeter and extend transition strips at perimeter of opening to interior as indicated.

L. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

M. At end or each working day, seal top edge of membrane to substrate with termination mastic.

N. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

O. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.

P. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

Q. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. See Section 01 45 36 “Performance Testing for Exterior Wall Systems” for field quality control testing.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air-barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed where applicable.

7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Air barrier has been firmly adhered to substrate.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

D. Air barriers will be considered defective if they do not pass inspections.
   1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
   2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. When covering membrane, use covering approved by the membrane manufacturer. Remove and replace air barrier exposed for more than 90 days, or exposure period stated in Manufacturer’s instructions if less than 90 days.
   2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIERS

(PART OF TRADE-BID SECTION 07 00 00 - WATERPROOFING, DAMPPROOFING, AND CAULKING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High-build air barriers, vapor retarding.

B. High-build air barriers, vapor permeable.

1.2 DEFINITIONS

A. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

B. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

C. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Schedule conference, two weeks prior to start of air barrier installation. Attendees shall include Contractor, certified installer, and air barrier manufacturer’s representative. Optional attendees Owner’s representative and Architect.
   2. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.
      a. High-build air barriers, vapor retarding.
      b. High-build air barriers, vapor permeable.
   2. Shop Drawings: For air-barrier assemblies.
      a. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.

b. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
c. Include details of interfaces with other materials that form part of air barrier coating; including but not limited to the following:
   1) Foundation and walls, including penetrations, ties and anchors.
   2) Walls, windows, curtain walls, storefronts, louvers or doors.
   3) Different wall assemblies, and fixed openings within those assemblies.
   4) Wall and roof connections and penetrations.
   5) Floors over unconditioned space.
   6) Walls, floor and roof across construction, control and expansion joints.
   7) Walls, floors and roof to utility, pipe and duct penetrations.
   8) All other leakage pathways in the building envelope.

B. Informational Submittals:
   1. Qualification Data: For Installer.
   2. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
   3. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
   4. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
   1. Provide mock-up in accordance with provisions of Section 01 43 39 - Mockup Requirements.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from damage, weather, excessive temperatures, freezing or extreme heat, and construction operations. Remove damaged material from site and dispose of in accordance with applicable regulations.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Protect stored materials from direct sunlight.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.8 WARRANTY

A. System Warranty: Manufacturer's shall warrant system including the primary air barrier and installed accessories, sealants and sheet materials to be free from defects in material and workmanship and agreeing to replace defective materials and components.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain primary air-barrier materials and air-barrier accessories from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance:
   1. Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration.
   2. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested in accordance with ASTM E2357.
   1. Assembly shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air and vapor seal materials at such locations, changes in substrate and perimeter conditions.
      a. Assembly shall be capable of withstanding combined positive and negative design wind, fan and stack pressures on the envelope without damage or displacement and shall transfer the load to the structure.

b. Assembly shall not displace adjacent materials under full load.
c. Assembly shall be joined in an airtight and flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations and creep, and anticipated seismic movement.

C. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75 Pa) pressure difference; ASTM E2178.

D. Ultimate Elongation: Minimum 500 percent; ASTM D412, Die C.

E. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested in accordance with ASTM D4541.

F. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

G. UV Resistance: Can be exposed to sunlight for 30 days in accordance with manufacturer's written instructions.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

A. High-Build, Vapor-Retarding Air Barrier, Synthetic Polymer Type: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils (0.9 mm) or thicker over smooth, void-free substrates.
1. Carlisle Coatings & Waterproofing Inc.; Barritech NP.
2. GCP Applied Technologies; Perm-A-Barrier Liquid.
3. Henry Company; Air-Bloc 32MR.
4. Hohmann & Barnard; Enviro-Barrier.
5. Meadows, W. R., Inc.; Air-Shield LSR.
6. Sto Corp.; StoGuard VaporSeal.

B. Vapor Permeance: Maximum 0.1 perm (5.8 ng/Pa x s x sq. m); ASTM E96/E96M, Procedure A, Desiccant Method.

2.4 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. High-Build, Vapor-Permeable Air Barrier, Synthetic Polymer Type: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils (0.9 mm) or thicker over smooth, void-free substrates.
1. DuPont Tyvek Fluid Applied Flashing and Joint Compound System.
2. GCP Applied Technologies; Perm-A-Barrier Liquid
3. Henry Company; Air-Bloc 17MR.
4. Sto Corp.; Gold Coat.

B. Vapor Permeance: Minimum 5 perms (290 ng/Pa x s x sq. m); ASTM E96/E96M, Procedure A, Desiccant Method.

2.5 ACCESSORY MATERIALS

A. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer (If required by air barrier Manufacturer): Liquid waterborne or solvent-borne primer recommended for substrate by air-barrier material manufacturer.

C. Stainless Steel Sheet (If required by air barrier Manufacturer): ASTM A240/A240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless steel fasteners.

D. Joint Reinforcing Strip (If required by air barrier Manufacturer): Air-barrier manufacturer's standard joint reinforcing material(s) or sealants.

E. Substrate-Patching Material: Substrate fillers for preparation of cracks and overdriven fasteners, as recommended by air barrier manufacturer.

F. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

G. Sprayed Polyurethane Foam Sealant (If approved by air barrier Manufacturer): One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft (24- to 32-kg/cu. m) density; flame-spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

H. Elastomeric Flashing Sheet: ASTM D2000, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with aluminum termination bars and stainless-steel fasteners.

I. Joint Sealant: Single or multi-component, moisture curing, low-modulus, high-movement polyether / silicone joint sealant compatible with joint substrates and other materials, recommended by air barrier manufacturer for application indicated.
   1. Comply with ASTM C920 and other requirements for each liquid-applied chemically curing sealant, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method in accordance with ASTM D4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints, expansion joints, discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement in accordance with manufacturer's written instructions and details.

3.3 INSTALLATION OF ACCESSORIES

A. Install accessory materials in accordance with air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
3. Unless the manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on the same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
   1. Transition Strip: Roll firmly to enhance adhesion.
   2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.4 INSTALLATION OF PRIMARY AIR-BARRIER MATERIAL

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier in accordance with air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
   1. Unless the manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
   2. Limit priming to areas that will be covered by air-barrier material on the same day. Reprime areas exposed for more than 24 hours.
   3. Where multiple prime coats are needed to achieve the required bond, allow adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
   1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in one or more equal coats.
   2. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in one or more equal coats.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Air-barrier dry film thickness.
   3. Continuous structural support of air-barrier system has been provided.
   4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
   5. Site conditions for application temperature and dryness of substrates have been maintained.
   6. Maximum exposure time of materials to UV deterioration has not been exceeded.
   7. Surfaces have been primed, if applicable.
   8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
   9. Termination mastic has been applied on cut edges.
   10. Strips and transition strips have been firmly adhered to the substrate.
   11. Compatible materials have been used.
   12. Transitions at changes in direction and structural support at gaps have been provided.
   13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
   14. All penetrations have been sealed.

C. Tests: As determined by testing agency from among the following tests:
   1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage in accordance with ASTM E1186, chamber pressurization or depressurization with smoke tracers.

2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate in accordance with ASTM E783 or ASTM E2357.
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate in accordance with ASTM D4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction, that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

SECTION 07 42 10

THERMALLY BROKEN WALL CLADDING SUPPORT STRUCTURE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Thermally broken, exterior wall cladding support/attachment system to meet ASHRAE 90.1 wall assembly U value and continuous insulation requirements:
   1. Fiberglass Z-Girt System.

B. RELATED REQUIREMENTS

C. Related Section Requirements:
   1. Division 7 Section "Thermal Insulation" for insulation installed on behind exterior wall claddings.
   2. Division 7 Section "Metal Wall Panels" for metal wall panels.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, exterior wall cladding support/attachment system Installer, exterior wall support system manufacturer's representative, exterior wall cladding support system Installer, and installers whose work interfaces with or affects exterior wall cladding support system, including installers of wall cladding system.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to exterior wall cladding support/attachment system installation, including manufacturer's written instructions.
   4. Examine conditions for compliance with requirements, including alignment between exterior wall cladding support/attachment system and attachment to structural members.
   5. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   6. Review temporary protection requirements for exterior wall cladding support/attachment system assembly during and after installation.
   7. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall cladding support system and accessory.

2. Shop Drawings:
   a. Submit shop drawings showing details of construction, and relationship of cladding/wall panels with adjacent construction including fastening and/or anchorage connection details, thermal break size and thickness.
   b. Accessories: Include details of the corners, openings and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

B. Informational Submittals:
1. Delegated-Design Submittal: Engineering calculations for wall cladding support system signed and sealed by cladding support system Engineer.
2. Qualification Data: For Installer.
3. Product Test Reports: For each product, tests performed by a qualified testing agency.
4. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify quality standards for materials and execution, and to demonstrate compliance with envelope / structural performance criteria and delegated design submittals.
1. Provide mock-up in accordance with provisions of Section 01 43 39.
2. Erect mockup of typical exterior wall cladding system demonstrating how system will achieve continuous insulation requirements. One bay wide by one story high, at an outside corner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver components of wall cladding support system so as not to be damaged.

B. Comply with manufacturer's recommendations for storage and handling. Protect from weather damage.

1.6 COORDINATION

A. Coordinate wall cladding support system installation with cladding work, and other adjoining work to provide a thermally broken wall cladding system.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of wall cladding support systems that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design wall cladding support system, including fasteners and connections to building structure.

B. Thermal Design: Wall assembly or interface detail shall meet the ASHRAE 90.1 requirements for continuous insulation.
   1. Wall assembly shall not have structural connections (beams, support framing, sub girts, clips) which create thermal bridging.
   2. Wall assembly effective thickness of insulation required to achieve a minimum effective thermal R-value of 5; U value of 0.2.
   3. Provide efficiency of no less than 93 to 98 percent or, with a maximum temperature differential of 18 degrees F from interior wall surface to interior wall cavity and node locations with a 70 degrees F exterior to interior wall temperature delta.
   4. Effective R / U value calculation or modeling shall be performed in accordance with ASHRAE guidelines.
   5. Provide thermal modeling report include the impact of the support/attachment system on the effective R / U value of the wall assembly.

C. Structural Performance: Provide exterior wall/cladding support and wall panel assemblies capable of withstanding the effects of the following loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 THERMALLY BROKEN WALL CLADDING SUPPORT SYSTEMS

A. Fiberglass Z-Girt System:
   1. Basis of Design Product: Z-Girt as manufactured by Armatherm.
   2. Structural Thermal Break Material: Girt with the following attributes:
      a. Compressive Strength: ASTM D638 40,000 psi.
      b. Compressive Modulus: ASTM D695 673,400 psi.

c. Shear Strength: ASTM D732 16,000 psi.
d. Thermal Conductivity: ASTM C518 1.05 BTU in/hr sf degree F.
e. Coefficient of Thermal Expansion: ASTM E831 2.2 x 10e-6 in/in/degree F.
f. Surface Burning Characteristics: ASTM E84.
1) Flame Spread: 25 (class A).
2) Smoke Developed: 50 (class A).

3. Spacing: Refer to manufacturer's recommendations and comply with project specific calculations.
4. Connectors and Fasteners: Minimum ultimate pull-out capacity from shall be 450 pounds.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of wall cladding system.

B. Fasteners: Self-tapping screws designed to withstand design loads.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.
1. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by cladding material manufacturer.
a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF THERMALLY BROKEN WALL CLADDING SUPPORT SYSTEMS

A. Installation of Fiberglass Z-Girt System / Insulation:
1. Install fiberglass z-girt system in accordance with manufacturer's written recommendations.
2. Erect insulation (specified in Section 07 21 00 "Thermal Insulation") vertically and hold in place with Z-furring members spaced 16 inches (610 mm) o.c. horizontal or vertical. Horizontal members shall be installed in a manner to facilitate cavity drainage.
a. Seal fastens that penetrate air or water-resistive barriers and flashings that will be concealed by wall clading when installed.

b. Install corrosion resistant stick pins or other mechanical insulation retention devices 16 inches maximum on center along centerline of insulation boards and in accordance with insulation manufacturer's written recommendations.
   1) Use 3 minimum stick pins or retention devices for each 4 feet long batt or board.
   2) Ensure insulation pieces are in contact with no linear gaps between spacers.

3. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to wall cladding manufacturer's written recommendations.

3.3 TOLERANCES

A. Shim and align thermally broken wall cladding support systems within installed tolerances of 1/4 inch in 20 feet, non-cumulative, level, plumb, and on location lines as indicated.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align wall cladding system units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

END OF SECTION

SECTION 07 42 13

ALUMINUM METAL PLATE WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum metal plate wall panel system.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate panel assemblies with rain drainage, flashing, trim, stud back-up, soffits, and other adjoining work.

B. Preinstallation Meeting: Convene one week before starting work of this Section.
   1. Convene under general provisions of Section 01 7000.
   2. Review installation requirements including manufacturer's written instructions.
   3. Examine support conditions for compliance with requirements, including alignment and attachment to structural members.
   4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affects this Work.

1.3 SUBMITTALS

A. See Section 3000 – Administrative Requirements, for submittal procedures.

B. Product Data: Submit for each type of product indicated, include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal plate wall panel and accessory.

C. Shop Drawings: Submit fabrication and installation layouts of metal plate wall panels; including details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
   1. Provide distinction between factory-assembled, shop-assembled, and field-assembled work.

D. Coordination Drawings: Submit exterior elevations, drawn to scale, that have the following items shown and coordinated with each other, using input from installers of these items as follows:
   1. Metal plate wall panels and attachments.
   2. Girts.
   3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
   4. Penetrations of wall by pipes and utilities.

E. Delegated-Design Submittal: For Aluminum Plate Metal Wall Panel system to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, liscensed to practive within the State of Massachusetts, responsible for their preparation.

F. Samples: Submit for each type of exposed finish required, and prepared on samples of size as follows:
   1. Aluminum Metal Plate Wall Panels: Minimum 2 inch by 3 inch.

G. Test and Inspection Reports: Submit test and inspection reports on each type of wall panel system provided for project based on evaluation of comprehensive tests performed by qualified testing agency.

H. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.

I. Maintenance Data: Submit maintenance data for metal plate wall panels.

J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with at least five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this Section and approved by manufacturer.

C. Source Limitations: Obtain each type of metal plate wall panel from single source and from single manufacturer.

D. Basis of Design: Specifications are based on wall panel types by specified basis of design manufacturer. Wall panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in design, composition, and profile are minor, and do not detract substantially from the indicated design intent.
   1. Comply with requirements specified in Section 01 4000 and Section {\ch\#2}.

1.5 MOCK-UP

A. Comply with general mock-up requirements specified in Section 01 43 39.

B. Mock-up: Provide mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and to establish quality standards for fabrication and installation.
   1. Construct mock-up of typical wall panel assembly as shown on Drawings, including corner, soffit, supports, attachments, and accessories.
   2. Mockups may remain as part of Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
2. Deliver panels, components, and other manufactured items without damage or deformation.

B. Storage:
1. Store materials in clean, dry, interior area in accordance with manufacturer's instructions.
2. Store panels vertically with top of panel down, storage of panels horizontally is not permitted.
3. Store panels covered with suitable weather tight and ventilated covering.
4. Store panels to ensure dryness, with positive slope for drainage of moisture.
5. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

C. Handling:
1. Protect panels during transportation, handling, and installation from weather, excessive temperatures and construction operations.
2. Handle panels in strict compliance with manufacturer's instructions and recommendations, and in a manner to prevent bending, warping, twisting, and surface damage.
3. Remove strippable protective covering from aluminum panel prior to installation.

1.7 SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this work to be performed according to manufacturer's installation instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before panel fabrication and indicate measurements on shop drawings.

1.8 WARRANTY

A. Wall System Warranty: Provide wall panel manufacturer warranty, agreeing to correct defects in manufacturing of materials within a one year period after date of Substantial Completion.
1. Failures include, but are not limited to, the following:
   a. Structural failures, including rupturing, cracking, or puncturing.
   b. Deterioration: Beyond normal weathering of wall system metals and other materials.
   c. Warranty Period: 5 years from date of Substantial Completion.

B. Panel Finish Warranty: Provide panel finish manufacturer warranty, agreeing to repair finish of metal plate wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Finish Warranty Period: 20 years from date of Substantial Completion.
2. Warranty Coverage: In accordance with AAMA 2605 for PVDF resin on aluminum finish requirements.

a. Fading, Loss of Color Retention: Loss of 5 Delta E units (Hunter) or less in accordance with ASTM D2244.
b. Chalking, Chalky White Powder on Panel Surface: Chalking at No. 8 or less for colors or No. 6 for white in accordance with ASTM D4214.
c. Loss of Adhesion: Loss of 10 percent due to cracking, checking or peeling, or failure to adhere to bare metal.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Phenolic wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, liscensed to practice in the State of Massachusetts, using performance requirements and design criteria indicated.

C. Structural Performance: Provide solid phenolic cladding material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/175 of the span.

D. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressure:Design Pressure: As indicated within related Roofing Section.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 MANUFACTURER

A. Basis of Design Manufacturer:
1. MTL1: Americlad® AC-3200 BV system.

B. Other Acceptable Manufacturers:
1. Dri-Design: www.dri-design.com.

2. MBCI: www.mbci.com.
3. Metal Sales Manufacturing Corporation: www.metalsales.us.com.
4. Petersen Aluminum Corporation: www.pac-clad.com.

2.3 METAL PANEL WALL ASSEMBLIES

A. General: Comply with performance requirements without failure due to defective manufacturing, fabrication, installation, or other construction defects.

B. Design, fabricate, and erect a dry joint, pressure equalized rainscreen aluminum wall panel system without use of sealants, gaskets, or butyl tape, tested as installed in compliance with AAMA 508.
   1. Pressure Equalization Cycling: Pass cycled pressure loading from 5 psf to 25 psf for 100 three-second cycles at 0.08 seconds or less; ASTM E1233.
   2. Structural: Provide systems tested in accordance with ASTM E330 and certified to be without permanent deformation or failure of structural members.

2.4 MATERIALS

A. Aluminum Plate: Alloy and temper as recommended by manufacturer for application and in compliance with manufacturers design requirements.
   1. Aluminum Material: Tension-leveled, flouropolymer PVDF painted finish, 3003-H14. manganese alloy.
   2. Thickness: 0.125 inch.
   3. Weight: Less than 2 lbs per sf.

B. Panel Depth: 1 1/4 inch, nominal.

C. Panel Size: As indicated on Drawings.

D. Panel Joints: As indicated on Drawings.

2.5 FABRICATION

A. Fabricate and finish wall panels within manufacturer’s facilities and fulfill indicated performance requirements demonstrated by laboratory testing.
   1. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide aluminum wall panels with welded inside corners at backside, typically at corner locations where metal plate is bent to form reveals.

C. Provide post-finishing of panels, paint aluminum wall panels only after completion of panel fabrication.

2.6 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: [PPG: Cafe Noir].

2.7 ACCESSORIES

A. Metal Plate Wall Panel Accessories: Provide components required for a complete metal plate wall panel assembly including trim, copings, fascia, mullions, sills, corner units, flashings, and similar items. Match material and finish of panels unless otherwise indicated.

B. Provide integral drainage system and manufactures standard extrusions at termination of dissimilar materials.

C. Flashing and Trim: Match material, finish, and color of adjacent wall panels.

D. Panel Fasteners: Designed to withstand design loads, with minimum 7/16 inch diameter head and neoprene washer.
   1. Aluminum Wall Panel Material: Stainless steel fasteners.

E. Sealants: As recommended by metal panel manufacturer for openings within wall panels and perimeter conditions.
   1. Specified in Section 07 92 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, and Work areas and conditions with Installer present for compliance with requirements for installation tolerances, wall panel supports, and other conditions affecting performance of this Work.

B. Examine wall framing to verify that girts, angles, channels, studs, and other structural wall panel support members and anchorage have been installed within alignment tolerances required by wall panel manufacturer.

C. Verify that weather barrier has been installed over sheathing or substrate to prevent air infiltration or water penetration.

D. Examine rough-in for components and systems penetrating wall panels to coordinate actual penetration locations relative to wall panel joint locations prior to installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Framing: Install sub girt, base angles, sills, furring, and other wall panel support members and provide anchorage in accordance with ASTM C754 for gypsum panel type substrates and panel manufacturer’s installation instructions.

3.3 INSTALLATION

A. Install wall panels in accordance with manufacturer's installation instructions, including pressure equalized rainscreen installation method and installation guidelines.

1. Wall panels consist of single sheets of metal formed with interlocking gutter and drainage system integral to the panel with single horizontal attachment for dry-joint rainscreen assembly.
2. Use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of wall panel system is not permitted.
3. Attach wall panels using progressive interlocking method, engaging bottom of panel in top of previous panel working bottom up, and left to right.
4. Install wall panels with single top attachment in pre-punched holes to allow individual panels to move due to thermal expansion.
5. Do not compromise internal gutter.

B. Install wall panels for orientation, sizes, and locations as indicated on Drawings.

C. Install wall panels with proper anchorage and other components for this Work securely in place.

D. Install wall panels with provisions for thermal and structural movement.

E. Install shims to plumb substrates as necessary for installation of wall panels.

F. Install weather tight seals at perimeter of wall panel openings.
1. Test for proper adhesion on small unexposed area of solid surfacing prior to use.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA.

H. Install weather tight escutcheons for pipe and conduit penetrating exterior walls.

I. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by wall panel manufacturer.

J. Install attachment system to support wall panels and with provisions to provide a complete weather tight wall system, including sub girts, extrusions, flashings and trim.
1. Include attachment to supports and trims at locations using dissimilar materials.
2. Do not apply sealants to joints, unless noted otherwise on Drawings.
3. Install starter extrusion at base course and at cut panel locations.

K. Install accessories with positive anchorage to building and weather tight mounting and provisions for thermal expansion, and coordinate installation with flashings and other components.
1. Install components required for a complete wall panel assembly including trim, copings, flashings and other accessory items.

3.4 TOLERANCES

A. Shim and align wall panel units with installed tolerances of 1/4 inch in 20 feet, non-cumulative, on level, plumb, and location lines as indicated.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

C. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

D. Prepare test and inspection reports.

3.6 CLEANING

A. Upon completion of wall panel installation, clean finished surfaces as recommended by panel manufacturer.

B. Upon completion of wall panel installation, clear weep holes and drainage channels of obstructions and dirt.

3.7 PROTECTION

A. Protect installed products from damage during subsequent construction.

B. Replace wall panels damaged or deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

(PART OF TRADE-BID SECTION 07 00 01 - ROOFING AND FLASHING)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Adhered thermoplastic polyolefin (TPO) roofing system.

B. Substrate board.

C. Air/Vapor barrier.

D. Roof insulation.

E. Cover board.

F. Roof pavers.

G. Walkways.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: For each type of product.
a. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.
2. Shop Drawings: Include roof plans, sections, details, and attachments to other work, details must be project specific, not manufacturer’s standard package details. Details shall be at scale of not less than 1-1/2 inches per 12 inches (1:10) and include the following:
a. Layout and thickness of insulation.
b. Base flashings and membrane termination details.
c. Flashing details at penetrations.
d. Tapered insulation layout, thickness, and slopes.
e. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.

f. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
g. Tie-in with adjoining air barrier.

3. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

B. Informational Submittals:
1. Qualification Data: For Installer, manufacturer, and testing agency.
2. Manufacturer Certificates:
a. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1) Submit evidence of compliance with performance requirements.
b. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
3. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
4. Evaluation Reports: For components of roofing system, from ICC-ES.
5. Field Test Reports:
6. Field quality-control reports.
7. Sample Warranties: For manufacturer's special warranties.

C. Closeout Submittals:
1. Maintenance Data: For roofing system to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board, and other components of roofing system.
   2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
   1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4470, UL 580, or UL 1897 with a safety factor of two:
   1. Zone 1 (Roof Area Field): As indicated on Drawings.
   2. Zone 2 (Roof Area Perimeter): As indicated on Drawings.
   3. Zone 3 (Roof Area Corners): As indicated on Drawings.

D. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

E. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

F. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

G. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class C; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

A. TPO Sheet: ASTM D 6878/D 6878M, internally fabric- or scrim-reinforced, TPO sheet.
   1. Manufacturers:
      a. Carlisle SynTec Incorporated.
      b. Elevate.
      c. GAF Materials Corporation.
      d. Johns Manville.
   2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
   3. Thickness: 80 mils (2.0 mm), nominal.
   4. Exposed Face Color: White, unless otherwisi indicated.

B. Thermal Envelope: Design, fabricate and install insulated membrane roofing system with continuous insulation to provide a thermal envelope.
   1. Provide thickness of insulation required to achieve a minimum effective thermal R-value indicated on the Drawings.
   2. Average R-Value calculations are not acceptable.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
   1. Adhesives and sealants shall comply with the following limits for VOC content or authorities having jurisdiction, whichever is more restrictive:
      a. Plastic Foam Adhesives: 50 g/L.
      b. Gypsum Board and Panel Adhesives: 50 g/L.
      c. Multipurpose Construction Adhesives: 70 g/L.
      d. Fiberglass Adhesives: 80 g/L.
      e. Contact Adhesives: 80 g/L.
      f. PVC Welding Compounds: 510 g/L.
      g. Other Adhesives: 250 g/L.
      h. Single-Ply Roof Membrane Sealants: 450 g/L.
      i. Nonmembrane Roof Sealants: 300 g/L.

j. Sealant Primers for Nonporous Substrates: 250 g/L.
k. Sealant Primers for Porous Substrates: 775 g/L.

2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Bonding Adhesive: Manufacturer's standard, water based.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

A. Substrate Board:
1. ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch (12.5 mm) thick.
a. Products:
1) Georgia-Pacific Corporation; Dens Deck.
2. ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch (12.5 mm) thick.
a. Products:
1) USG Corporation; Securock Gypsum-Fiber Roof Board.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 AIR/VAPOR BARRIER

A. Self-Adhering-Sheet Vapor Retarder: ASTM D 1970/D 1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil (1.0-mm) total thickness; maximum permeance rating of 0.1 perm (6 ng/Pa x s x sq. m); cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.

2.6 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer, approved for use in FM Approvals' RoofNav-listed roof assemblies. Where total insulation thickness exceeds 2-inches, insulation must be applied in 2-layers minimum with joints staggered at each layer.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   1. Manufacturers:
      a. Atlas Roofing Corporation.
      b. Firestone Building Products.
      c. Hunter Panels.
      d. Johns Manville; a Berkshire Hathaway company.
   2. Compressive Strength: 20 psi (138 kPa).
   3. Size: 48 by 96 inches (1219 by 2438 mm).
   4. Thickness:
      a. Base Layer: 1 1/2 inches (38 mm) minimum.
      b. Upper Layer: As required, to achieve scheduled R-Value.

C. Tapered Insulation: Provide factory-tapered insulation boards.
   1. Material: Match roof insulation.
   2. Minimum Thickness: 1/4 inch (6.35 mm).
   3. Slope:
      a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
      b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.7 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate boards, roof insulation, and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Modified asphaltic, asbestos-free, cold-applied adhesive.
   2. Adhesives and sealants shall comply with the following limits for VOC content:
      a. Plastic Foam Adhesives: 50 g/L.
      b. Gypsum Board and Panel Adhesives: 50 g/L.
      c. Multipurpose Construction Adhesives: 70 g/L.
      d. Fiberglass Adhesives: 80 g/L.
      e. Contact Adhesives: 80 g/L.
      f. PVC Welding Compounds: 510 g/L.
      g. Other Adhesives: 250 g/L.
      h. Single-Ply Roof Membrane Sealants: 450 g/L.

i. Nonmembrane Roof Sealants: 300 g/L.
j. Sealant Primers for Nonporous Substrates: 250 g/L.
k. Sealant Primers for Porous Substrates: 775 g/L.

3. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Cover Board:
1. Shall meet the requirements of the roof insurance policy to include hail damage. The use of plywood is prohibited.
2. ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch (13 mm) thick, factory primed.
a. Products:
1) Georgia-Pacific Corporation; Dens Deck Prime.

E. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric; water permeable and resistant to UV degradation; type and weight as recommended by roofing system manufacturer for application.

2.8 ROOF PAVERS

A. Manufacturers:
1. Bison.
2. TecTile.
3. Unilock.
4. Size: 24 by 24 inches (600 by 600 mm). Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch (1.6 mm) in length, height, and thickness.
5. Support System:
a. Basis of Design: Bison ScrewJack pedestals.
b. Paver Supports: Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 to 3/16 inch (3 to 5 mm).
c. Paver Support Protection Pads: Manufacturer’s standard pre-formed roof protection pad cut to extend a minimum 2-inches past the edge of the Paver Support.
6. Concrete paver and pedestal systems: Heavyweight, hydraulically pressed, concrete units, square edged, manufactured for use as roof- or plaza-deck pavers; with absorption not greater than 5 percent per ASTM C 140; with no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.
a. Compressive Strength: 7500 psi (52 MPa) minimum when tested according to ASTM C 140.
b. Color: As indicated by manufacturer's designations.
7. Wood Paver and pedestal systems: Wood Tiles, commercial-grade, constructed from sustainably harvested hardwoods
a. Species: As selected by the Architect from Manufacturer's standard species, Ipe and Cumarus.
b. Wood Tile Fastening Kit.

2.9 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.
   1. Size: Approximately 36 by 60 inches (914 by 1524 mm).
   2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 - Steel Decking.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under 07 27 26 - Fluid-Applied Membrane Air Barriers.

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (610 mm) in adjacent rows.
   1. At steel roof decks, install substrate board at right angle to flutes of deck.
      a. Locate end joints over crests of steel roof deck.
   2. Tightly butt substrate boards together.
   3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   4. Fasten substrate board to top flanges of steel and wood decks to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions. Ensure screws are not long enough to reach the bottom flute.

3.5 AIR/VAPOR BARRIER INSTALLATION

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches (90 and 150 mm), respectively.
   1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
   2. Seal laps by rolling.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Wood and Metal Decking:
   1. Install base layer of insulation with end joints staggered not less than 12 inches (305 mm) in adjacent rows and with long joints continuous at right angle to flutes of decking.
      a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
      b. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
      c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
         1) Trim insulation so that water flow is unrestricted.
      d. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
      e. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

f. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks and to metal decks. Ensure screws are long enough to provide 3/4 inch penetration through the top flute, of metal decks but not long enough to reach the bottom flute.
   1) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation in both directions.
   a. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
   b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
   d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
      1) Trim insulation so that water flow is unrestricted.
   e. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   f. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
   g. Adhere each layer of insulation to substrate to resist specified uplift pressure at corners, perimeter, and field of roof.

3.7 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.
   1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   2. At internal roof drains, conform to slope of drain sump.
   3. Trim cover board so that water flow is unrestricted.
   4. Cut and fit cover board tight to nailers, projections, and penetrations.
   5. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 ADHERED ROOFING INSTALLATION

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps 36 inches minimum.

D. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

E. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing through solid wood blocking.

F. Apply roof membrane with side laps shingled with slope of roof deck.

G. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

3.9 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.10 WALKWAY INSTALLATION

A. Flexible Walkways:
   1. Install flexible walkways at the following locations:
      a. Locations indicated on Drawings.
      b. As required by roof membrane manufacturer's warranty requirements.
   2. Provide 6-inch (76-mm) clearance between adjoining pads.
   3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.11 ROOF PAVER INSTALLATION

A. Install pavers in locations indicated according to manufacturer's written instructions.

B. Install roof membrane manufacturer’s roof protection pad under each pedestal support, ensuring that it extends a minimum 2-inches past the pedestal base in all directions.

1. Accurately install adjustable-height paver pedestals and accessories in locations and to elevations required. Adjust for final level and slope with shims.

C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.
1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.

D. Install pavers to not vary more than 1/16 inch (1.6 mm) in elevation between adjacent pavers or more than 1/16 inch (1.6 mm) from surface plane elevation of individual paver.

E. Maintain tolerances of paving installation within 1/4 inch in 10 feet (1:48) of surface plane in any direction.

F. Maintain appropriate spacing (1/4-inch minimum) between paver and single ply membrane at vertical base flashings so that the paver does not abrade the roofing membrane.

3.12 SOLAR PANELS

A. See Division 26 Sections for roof mounted photovoltaic panels and other roof mounted related equipment.
1. Install per FM Global Property Loss Prevention Data Sheet 1-15, Roof Mounted Solar Photovoltaic Panels and in accordance with the FM Global Approval Standard 4478.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.14 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

(PART OF TRADE-BID SECTION 07 00 01 - ROOFING AND FLASHING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured through-wall flashing with counterflashing.

B. Manufactured reglets with counterflashing.

C. Formed roof-drainage sheet metal fabrications.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
   3. Review requirements for insurance and certificates if applicable.
   4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
   2. Shop Drawings: For sheet metal flashing and trim.

a. Include plans, elevations, sections, and attachment details.
b. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
c. Include identification of material, thickness, weight, and finish for each item and location in Project.
d. Include details for forming, including profiles, shapes, seams, and dimensions.
e. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
f. Include details of termination points and assemblies.
g. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
h. Include details of roof-penetration flashing.
i. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
j. Include details of special conditions.
k. Include details of connections to adjoining work.
l. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

3. Samples for Verification: For each type of exposed finish.
   a. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   b. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
   c. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

B. Informational Submittals:
1. Qualification Data: For fabricator.
2. Product Test Reports: For each product, for tests performed by a qualified testing agency.
3. Sample Warranty: For special warranty.

C. Closeout Submittals:
1. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressure:
   1. Design Pressure: As indicated within related Roofing Section.

D. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

E. Recycled Content of Zinc-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 15 percent.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. Color: As selected by Architect from manufacturer's full range.
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
   1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).
   3. Products:
      a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Metal-Fab Manufacturing, LLC; MetShield.
      e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
1. Fabricated Hanger Style: Fig 1-35G according to SMACNA's "Architectural Sheet Metal Manual."
2. Manufactured Hanger Style: Fig 1-34A according to SMACNA's "Architectural Sheet Metal Manual."
3. Fabricate from the following materials:
a. Aluminum: 0.040 inch (1.02 mm) thick.

B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
1. Aluminum: 0.040 inch (1.02 mm) thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim and built-in overflows. Fabricate from the following materials:
1. Aluminum: 0.040 inch (1.02 mm) thick.

D. Splash Pans: Fabricate to dimensions and shape indicated on Drawings and from the following materials:
1. Aluminum: 0.040 inch (1.02 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm) thick.

B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

C. Flashing Receivers: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

E. Roof-Drain Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.
   6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
   1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
   2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 - Joint Sealants.

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
   2. Provide elbows at base of downspout to direct water away from building.
   3. Connect downspouts to underground drainage system.

C. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.

D. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
   2. Loosely lock front edge of scupper with conductor head.
   3. Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below scupper or gutter discharge.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 65 11

SILICONE SHEET TRANSITION ASSEMBLY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Silicone sheet transition assembly and premoulded corner pieces.

1.2 DEFINITIONS

A. Silicone Sheet: A clear translucent transitional component that provides continuity of the air barrier.

B. Transition Assembly: The collection of materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air and water movement through the wall at window and door openings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Schedule conference, two weeks prior to start of air barrier installation. Attendees shall include Contractor, certified installer of silicone sheet transition assembly, and air barrier manufacturer’s representative. Optional attendees Owner’s representative and Architect.
   2. Review silicone sheet transition assembly requirements and installation, special details, mockups and bond testing, air-barrier coordination, and work scheduling that covers silicone sheet transition assembly.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
   2. Shop Drawings: For silicone sheet transition assemblies.
      a. Show locations and extent of silicone sheet transition assembly. Include details for substrate joints, inside and outside corners, terminations, and tie-ins with adjoining construction.
      b. Include details of interfaces with other materials that form part of silicone sheet transition assembly or manufactures 2D and 3D installation drawings for job specific details.

B. Informational Submittals:

1. Qualification Data: For Installer. Include list of installers and supervisors employed by the Installer, who work on Project.
2. Product Certificates: From silicone sheet transition assembly manufacturer, certifying compatibility of silicone sheet transition assembly and accessory materials with Project materials that connect to or that come in contact with the air barrier.
3. Product Test Reports: For each silicone sheet transition assembly, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and accepted by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.
1. Build integrated mockups of exterior wall assembly as shown on Drawings, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, application of air barriers, and silicone sheet transition assembly.
2. If Architect determines mockups do not comply with requirements, reconstruct mockups and install silicone sheet transition assembly until mockups are approved.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect stored materials from direct sunlight. Refer to silicone sheet transition assembly manufacturer's product data for storage conditions.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply silicone sheet transition assembly within the range of ambient and substrate temperatures recommended by silicone sheet transition assembly manufacturer.
1. Protect substrates from environmental conditions that affect silicone sheet transition assembly performance.
2. Do not apply silicone sheet transition assembly to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Dow Corning Corporation; Silicone Transition System (STS).
2. GE, Momentive Performance Materials; UltraSpan US2200.
3. Pecora Corporation; XL-Span AVB Silicone.
4. Tremco Incorporated; Proglaze Engineered Transition Assembly (ETA).

B. Source Limitations: Obtain primary silicone sheet transition assembly materials and accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Silicone sheet transition assembly perimeter seal to windows, doors, curtain wall and storefront systems evaluated in accordance with the following properties:
1. ASTM E 283 Test Method for Determining Rate of Airflow Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
2. ASTM E 330 Test Method for Structural Performance of Exterior Windows, Curtain Wall and Doors by Uniform Static Air Pressure Differential
3. ASTM E 331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air pressure Difference
4. ASTM E 547 Test Method for Water penetration of Exterior Windows, Curtain walls and Doors by Cyclic Static Air Pressure Difference

2.3 MATERIALS

A. Silicone Sheet Transition Assembly: Highly-flexible flashing and transition sheet with pre-molded corner accessory pieces for bonding to air barrier substrates and to adjacent curtain wall, storefront, and window frames and other transition substrates using silicone sealant.
1. Silicone Rubber Sheet: Extruded, 40 durometer, translucent silicone, with a lock-in rubber dart.
2. Silicone Rubber Corners: Pre-molded, 40 durometer, translucent silicone, with a lock in rubber dart.
3. Extruded Aluminum Attachment: Alodine finished, with pre-engineered race for receiving silicone lock-in rubber dart. Extrusion is supplied in 5 foot lengths with predrilled holes.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by silicone sheet transition assembly manufacturer to produce a complete silicone sheet transition assembly and compatible with primary air-barrier material.

B. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 50 (medium modulus) or Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 92 00 - Joint Sealants.
   1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

C. Primers: The silicone sheet transition assembly manufacturer may determine that a primer is necessary for good sealant adhesion on some substrates. Use only those primers recommended by the manufacturer for use with the specified sealant on the specific substrate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for silicone sheet transition assembly application.

3.3 SILICONE SHEET TRANSITION ASSEMBLY INSTALLATION

A. General: Install silicone sheet transition assembly, and accessory materials according to manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
   1. Form tie-in to window, storefront, and curtain wall frames, door frames, louver frames, roofing system perimeters, and at interface of other adjacent materials utilizing compatible accessory materials forming part of air barrier assembly.
   2. Promptly adhere laps and bonds to substrates.

3.4 FIELD QUALITY CONTROL

A. Silicone Sheet Transition Assembly Field Testing:
   1. Testing and inspection by a qualified representative of 20 percent of Silicone Sheet Transition Assemblies shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.

3.5 CLEANING AND PROTECTION

A. Protect silicone sheet transition assembly from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect silicone sheet transition assembly from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

END OF SECTION

SECTION 07 71 00

ROOF SPECIALTIES

(PART OF TRADE-BID SECTION 07 00 01 - ROOFING AND FLASHING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preformed copings and fascias.

B. Preformed roof-edge flashings.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
      a. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
      b. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
      c. Details of termination points and assemblies, including fixed points.
      d. Details of special conditions.
   3. Samples for Verification: For copings, roof-edge flashings, roof-edge drainage systems, and reglets and counterflashings made from 12-inch (300-mm) lengths of full-size components including fasteners, cover joints, accessories, and attachments.

B. Informational Submittals:
   1. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.
      a. Submit evidence that manufactured copings and roof edge flashings proposed for this Project have passed SPRI tests RE-2 and RE-3.
   2. Warranty: Sample of special warranty.

C. Closeout Submittals:
   1. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical roof edge, including fascia, approximately 10 feet (3.0 m) long, including supporting construction, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.5 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. SPRI Wind Design Standard: Manufacture and install copings and roof-edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:
   1. Design Pressure: As indicated within related Roofing Section.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

A. Architectural Products Company.

B. ATAS International, Inc.

C. Cheney Flashing Company.

D. Hickman Company, W. P.

E. Johns Manville.

F. Metal-Fab Manufacturing, LLC.

G. MM Systems Corporation.

H. Petersen Aluminum Corporation.

I. Sheet Metal Supply Ltd.

2.3 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
   1. Surface: Smooth, flat finish.
   2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
      b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.4 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

2.5 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).
   3. Products:
      a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Metal-Fab Manufacturing, LLC; MetShield.
      e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
   2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
   4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.7 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; corner units, end cap units, fascia where indicated and concealed splice plates with same finish as coping caps.
   1. Basis of Design Manufacturer: Sheet Metal Supply Ltd.
   2. Coping-Cap and Fascia Material: Formed aluminum, thickness as required to meet performance requirements with a minimum thickness of 0.050 inch (1.27 mm).
      a. Finish: Three-coat fluoropolymer.
      b. Color: Match Architect's sample.
      c. Corners: Factory mitered and mechanically clinched and sealed watertight.
      d. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
      e. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches (300 mm) wide, with integral cleats.
      f. Face Leg Cleats: Concealed, continuous aluminum sheet, 0.63 inch thickness.

2.8 ROOF-EDGE FLASHINGS

A. Roof-Edge Flashing: Manufactured, roof-edge consisting of snap-on metal cover in section lengths not exceeding 12 feet (3.6 m) and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
   1. Basis of Design Manufacturer: Sheet Metal Supply Ltd.
   2. Fascia Cover: Fabricated from the following exposed metal:
      a. Formed Aluminum: Thickness as required to meet performance requirements with a minimum thickness of 0.050 inch (1.27 mm).
   3. Corners: Factory mitered and mechanically clinched and sealed watertight.
   4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

B. Aluminum Finish: Three-coat fluoropolymer.
   1. Color: Match Architect's sample.

2.9 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FABRICATION

A. Cutting and Forming Radiussed Copings / Roof Edges:
   1. Cut curved shapes using templates to produce uniform smooth and consistent edges. Optional method of cutting may be a computer guided plasma arc (water jet) cutter.
   2. Form and bend fabrications with curved surfaces in jigs or formed using CNC rolling machines which produce smooth consistent surfaces which show no surface irregularities or other imperfections. Fabricate units to produce uniform sightlines which are level, plumb and in the same plane as adjacent units.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

3.4 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
   1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
   2. Provide uniform, neat seams with minimum exposure of solder and sealant.
   3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
   4. Torch cutting of roof specialties is not permitted.
   5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum and stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.
   3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
   1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise shown on Drawings.
   2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.5 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings to meet performance requirements.
   1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch (760-mm) centers.
   2. Interlock face leg drip edge into continuous cleat anchored to substrate at 24-inch (600-mm) centers. Anchor back leg of coping with screw fasteners and elastomeric washers at 24-inch (600-mm) centers.

C. Coping Seam locations:
   1. Locate seams as indicated.
   2. Fabricate corners as one unit with seams a minimum of two-feet from corner in each direction. Divide space between corner units evenly into lengths of 12 foot maximum.

3.6 ROOF-EDGE FLASHING INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

C. Roof-Edge Seam locations:
   1. Locate seams as indicated.
   2. Fabricate corners as one unit with seams a minimum of two-feet from corner in each direction. Divide space between corner units evenly into lengths of 12 foot maximum.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 71 29

MANUFACTURED ROOF EXPANSION JOINTS

(PART OF TRADE-BID SECTION 07 00 01 - ROOFING AND FLASHING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bellows-type roof expansion joints.

B. Aluminum roof expansion joints.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Shop Drawings: For roof expansion joints.
      a. Include plans, elevations, sections, and attachment details.
      b. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
      c. Provide isometric drawings of intersections, terminations, and changes in joint direction or planes, depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.
   3. Samples: For each exposed product and for each color specified, 6 inches (150 mm) in size.

B. Informational Submittals:
   1. Qualification Data: For Installer.
   2. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.
   3. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer of roofing membrane.

1.5 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than five Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Roof expansion joints shall withstand exposure to weather, remain watertight, and resist the movements indicated without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Fire-Test-Response Characteristics: Provide fire-barrier assemblies with fire-test-response characteristics as determined by testing identical products, per test method indicated, by UL or another testing agency acceptable to authorities having jurisdiction. Assemblies shall be capable of anticipated movement while maintaining fire rating. Fire-barrier products shall bear classification marking of qualified testing agency.

2.2 MANUFACTURERS

A. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.

B. Balco, Inc.

C. C/S Group.

D. InPro Corporation (IPC).

E. Johns Manville; a Berkshire Hathaway company.

F. MM Systems Corporation.

G. Watson Bowman Acme Corp.

H. Source Limitations: Obtain roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.

2.3 BELLOWS-TYPE ROOF EXPANSION JOINTS

A. Flanged Bellows Roof Expansion Joint: Manufactured, continuous, waterproof, joint-cover assembly, consisting of exposed membrane bellows, laminated to flexible, closed-cell support foam, and secured along each edge to a 3- to 4-inch- (76- to 100-mm-) wide metal flange for nailing to substrate. Provide each size and type indicated, factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation. Fabricate each assembly specifically for installation configuration indicated on Drawings.
   1. Joint Movement Capability: Plus and minus 25 percent of joint size.
   2. Bellows: EPDM or Neoprene flexible membrane, nominal 60 mils (1.5 mm) thick.
      a. Color: Black or match roof color as close as possible.
   3. Flanges: Galvanized steel, 0.022 inch (0.56 mm) thick.
      a. Form: Flat to fit cants or angle formed to fit curbs as indicated on Drawings.
   4. Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary bellows assembly.
      a. Thermal Insulation: Fill space above secondary seal with manufacturer's standard, factory-installed fiber insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
   5. Fire Barrier: Manufacturer's standard fire-resistive joint system with ratings determined per ASTM E 1966 or UL 2079 to resist spread of fire and to accommodate building thermal[and seismic] movements without impairing its ability to resist the passage of fire and hot gases.
      a. Fire-Resistance Rating: Not less than fire-resistance rating of the roof assembly.
   6. Basis of Design Product:
      a. Type EJ EXT R 01: BRJ-200 at roof to roof as manufactured by Construction Specialties.
      b. Type EJ EXT R 02: BRJW-200 at roof to wall as manufactured by Construction Specialties.

2.4 ALUMINUM ROOF EXPANSION JOINTS

A. Aluminum Roof Expansion Joint: Manufactured, continuous, waterproof, joint-cover assembly; consisting of a formed or extruded metal cover secured to extruded aluminum frames, with water-resistant gasketing between cover and frames, and with provision for securing assembly to substrate and sealing assembly to roofing membrane or flashing. Provide each size and type indicated, factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation. Fabricate each assembly specifically for installation configuration indicated on Drawings.
   1. Joint Movement Capability: Plus and minus 25 percent of joint size.

2. Frame Members: Extruded aluminum configured for curbs or sloped cants as indicated on Drawings; with exposed finish matching cover.
3. Cover: Formed or extruded aluminum; thickness as recommended by manufacturer.
   a. Aluminum Finish: Mill.
   b. Aluminum Finish Color: Light bronze.
4. Centering Devices: Centering bars or snap-on spring clips attached to the cover.
5. Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the cover.
   a. Thermal Insulation: Fill space above secondary seal with mineral-fiber blanket insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
6. Fire Barrier: Manufacturer's standard fire-resistive joint system with ratings determined per ASTM E 1966 or UL 2079 to resist spread of fire and accommodate building thermal and seismic movements without impairing its ability to resist the passage of fire and hot gases.
   a. Fire-Resistance Rating: Not less than fire-resistance rating of the roof assembly.
7. Basis of Design Product:
   a. Type EJ EXT R 01: RJT-200 at roof to roof as manufactured by Construction Specialties.
   b. Type EJ EXT R 02: RJTW-200 at roof to wall as manufactured by Construction Specialties.
   c. Type EJ EXT R 03: RJTW-200 w/ RFX-2F (2-hour rated) at roof to wall as manufactured by Construction Specialties.

2.5 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 653/A 653M, hot-dip zinc-coating designation G90 (Z275).

B. Aluminum: ASTM B 209 (ASTM B 209M) for sheet and plate, ASTM B 221 (ASTM B 221M) for extrusions; alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.
2. Mill Finish: As manufactured.
3. Class II, Clear Anodic Finish: Architectural Class II, clear coating 0.010 mm or thicker, complying with AAMA 611.
4. Class I, Clear Anodic Finish: Architectural Class I, clear coating 0.018 mm or thicker, complying with AAMA 611.
5. Class I, Color Anodic Finish: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker, complying with AAMA 611.
6. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Two-Coat Fluoropolymer: System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

b. Three-Coat Fluoropolymer: System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent PVDF resin by weight.

C. EPDM Membrane: ASTM D 4637, Type standard with manufacturer for application.

D. Neoprene Membrane: Neoprene sheet recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil; and as standard with roof-expansion-joint manufacturer for application.

E. Silicone Extrusions: ASTM D 2000, UV stabilized, and that does not propagate flame.

F. Adhesives: As recommended by roof-expansion-joint manufacturer.
1. Adhesives shall have a VOC content of 70 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.

H. Mineral-Fiber Blanket: ASTM C 665.

I. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine roof-joint openings, inside surfaces of parapets, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.
1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
2. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.

3. Provide for linear thermal expansion of roof expansion joint materials.
4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
5. Provide uniform, neat seams.
6. Install roof expansion joints to fit substrates and to result in watertight performance.
7. Torch cutting of roof expansion joints is not permitted.
8. Do not use graphite pencils to mark aluminum surfaces.

B. Directional Changes and Other Expansion-Control Joint Systems: Coordinate installation of roof expansion joints with other expansion-control joint systems to result in watertight performance. Install units at directional changes and at transitions between roof expansion joints and exterior expansion-control joint systems specified in Section 07 95 00 "Expansion Control" to provide continuous, uninterrupted, and watertight joints.

C. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.
1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.

D. Fire Barrier: Install fire barrier where indicated to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.

E. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

3.3 PROTECTION

A. Protect roof expansion joints from foot traffic, displacement, or other damage.

B. Remove and replace roof expansion joints and components that become damaged by moisture or otherwise.

END OF SECTION

SECTION 07 81 16

APPLIED FIRE PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sprayed fire-resistive materials.

1.2 DEFINITIONS

A. SFRM: Sprayed fire-resistive materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Shop Drawings: Framing plans or schedules, or both, indicating the following:
      a. Extent of fire protection for each construction and fire-resistance rating.
      b. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
      c. Minimum fire protection thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
      d. Treatment of fire protection after application.
   3. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

B. Informational Submittals:
   1. Qualification Data: For Installer and testing agency.
   2. Product Certificates: For each type of fire protection.
   3. Evaluation Reports: For fire protection, from ICC-ES.
   4. Preconstruction Test Reports: For fire protection.
   5. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fire protection manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects, to set quality standards for materials and execution, and for preconstruction testing.
   1. Build mockup of each type of fire protection and different substrate and each required finish as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fire protection when ambient or substrate temperature is 44 deg F (7 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fire protection, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fire protection for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   1. Flat Paints and Coatings: 50 g/L.
   2. Nonflat Paints and Coatings: 150 g/L.
   3. Primers, Sealers, and Undercoaters: 200 g/L.

E. Low-Emitting Materials: For field applications, coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Asbestos: Provide products containing no detectable asbestos.

2.2 CONCEALED (LOW DENSITY) SFRM (FOR 0-75 FEET ABOVE GRADE)

A. Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
   1. Portland Cement Based Products:
      a. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; AD Southwest Fireproofing Type 5MD.
      b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z106/G.
      c. Isolatek International; Cafco Blaze-Shield II.
      d. Southwest Fireproofing Products Co.; Type 7GP.
   2. Bond Strength: Minimum 150-lbf/sq. ft. (7.18-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
   3. Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.
   4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
   5. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 10 or less.
      b. Smoke-Developed Index: 10 or less.
   6. Compressive Strength: Minimum 10 lbf/sq. in. (68.9 kPa) according to ASTM E 761.
   7. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
   8. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
   9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
   10. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
   11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.

2.3 CONCEALED / EXPOSED (LOW DENSITY) SFRM (FOR 75-420 FEET ABOVE GRADE)

A. Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
   1. Portland Cement Based Products:
      a. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; AD Southwest Fireproofing Type 7GP.
      b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z106.
      c. Isolatek International; Cafco Blaze-Shield HP.
      d. Southwest Fireproofing Products Co.; Type 7GP.
   2. Bond Strength: Minimum 430-lbf/sq. ft. (20.59-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.

3. Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
5. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    a. Flame-Spread Index: 10 or less.
    b. Smoke-Developed Index: 10 or less.
6. Compressive Strength: Minimum 30 lbf/sq. in. (206 kPa) according to ASTM E 761.
7. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
8. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
10. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.
12. Sound Absorption: NRC or SAA of not less than 0.60 according to ASTM C 423 for Type A mounting according to ASTM E 795.
13. Finish: Rolled, spray-textured finish.

2.4 CONCEALED/ EXPOSED (MEDIUM DENSITY) SFRM (FOR OVER 420 FEET ABOVE GRADE)

A. Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
    1. Bond Strength: Minimum 1000-lbf/sq. ft. (47.9-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
    2. Density: Not less than 18 lb/cu. ft. (288 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.
    3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
    4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
        a. Flame-Spread Index: 10 or less.
        b. Smoke-Developed Index: 10 or less.
    5. Compressive Strength: Minimum 30 lbf/sq. in. (206 kPa) according to ASTM E 761.
    6. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
    7. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
    8. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.

9. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
10. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.
11. Sound Absorption: NRC or SAA of not less than 0.60 according to ASTM C 423 for Type A mounting according to ASTM E 795.
12. Finish: Rolled, spray-textured finish.

2.5 EXPOSED SFRM (FOR ALL HEIGHTS)

A. Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
1. Portland Cement Products:
   a. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; AD Southwest Fireproofing Type 5MD.
   b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z106.
   c. Isolatek International; Cafco BlazeShield HP.
   d. Southwest Fireproofing Products Co.; Type 5MD.
2. Bond Strength: Minimum 430lbf/sq. ft. (47.9-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
3. Density: Not less than 22 lb/cu. ft. (350 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
5. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 10 or less.
6. Compressive Strength: Minimum 100 lbf/sq. in. (689 kPa) according to ASTM E 761.
7. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
8. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
10. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.
12. Sound Absorption: NRC or SAA of not less than 0.60 according to ASTM C 423 for Type A mounting according to ASTM E 795.
13. Finish: Rolled, spray-textured finish.

B. Locations: _____

2.6 EXPOSED (VERY HIGH DURABILITY) SFRM (FOR OVER 420 FEET ABOVE GRADE)

A. Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
   1. Portland Cement Products:
      a. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; AD Southwest Fireproofing Type 7HD.
      b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z146.
      c. Isolatek International; Fendolite M-II.
      d. Southwest Fireproofing Products Co.; Type 7HD.
   2. Bond Strength: Minimum 1000-lbf/sq. ft. (47.9-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
   3. Density: Not less than 40 lb/cu. ft. (640 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.
   4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
   5. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 10 or less.
      b. Smoke-Developed Index: 10 or less.
   6. Compressive Strength: Minimum 500 lbf/sq. in. (3445 kPa) according to ASTM E 761.
   7. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
   8. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
   9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
   10. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
   11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.
   12. Sound Absorption: NRC or SAA of not less than 0.60 according to ASTM C 423 for Type A mounting according to ASTM E 795.
   13. Finish: Rolled, spray-textured finish.

B. Locations: _____.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fire protection and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers (If required): Primers approved by fire protection manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fire protection and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent (If required): Product approved by fire protection manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Reinforcing Fabric (If required): Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fire protection manufacturer.

E. Reinforcing Mesh (If required): Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fire protection manufacturer. Include pins and attachment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fire protection with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fire protection, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fire protection are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fire protection application.

B. Verify that concrete work on steel deck is complete before beginning fire protection work.

C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning fire protection work.

D. Conduct tests according to fire protection manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.

B. Clean substrates of substances that could impair bond of fire protection.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fire protection manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fire protection. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fire protection work.

B. Comply with fire protection manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fire protection with other construction to minimize need to cut or remove fire protection.
   1. Do not begin applying fire protection until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
   2. Defer installing ducts, piping, and other items that would interfere with applying fire protection until application of fire protection is completed.

D. Metal Decks:
   1. Do not apply fire protection to underside of metal deck substrates until concrete topping, if any, is completed.
   2. Do not apply fire protection to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fire protection.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fire protection manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fire protection manufacturer.

F. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fire protection manufacturer.

G. Extend fire protection in full thickness over entire area of each substrate to be protected.

H. Install body of fire protection in a single course unless otherwise recommended in writing by fire protection manufacturer.

I. Provide a uniform finish complying with description indicated for each type of fire protection material and matching finish approved for required mockups.

J. Cure fire protection according to fire protection manufacturer's written instructions.

K. Do not install enclosing or concealing construction until after fire protection has been applied, inspected, and tested and corrections have been made to deficient applications.

L. Finishes: Where indicated, apply fire protection to produce the following finishes:
   1. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness, unless noted otherwise.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
   1. Test and inspect as required by the IBC, Subsection 17 05 .13, "Sprayed Fire-Resistant Materials."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fire protection will be considered defective if it does not pass tests and inspections.
   1. Remove and replace fire protection that does not pass tests and inspections, and retest.
   2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fire protection, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fire protection is without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fire protection and repair damaged areas and fire protection removed due to work of other trades.

D. Repair fire protection damaged by other work before concealing it with other construction.

E. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 07 81 23

INTUMESCENT FIRE PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mastic and intumescent fire-resistive coatings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Shop Drawings: Framing plans or schedules, or both, indicating the following:
      a. Extent of fire protection for each construction and fire-resistance rating.
      b. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
      c. Minimum fire protection thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
      d. Treatment of fire protection after application.
   3. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

B. Informational Submittals:
   1. Qualification Data: For Installer and testing agency.
   2. Product Certificates: For each type of fire protection.
   3. Evaluation Reports: For fire protection, from ICC-ES.
   4. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fire protection manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockup of each type of fire protection and different substrate and each required finish as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fire protection when ambient or substrate temperature is 50 deg F (10 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fire protection, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fire protection dries thoroughly.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fire protection, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fire protection for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Primers, Sealers, and Undercoaters: 100 g/L.

E. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

A. Mastic and Intumescent Fire-Resistive Coating : Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.
1. Manufacturers:
a. Albi Manufacturing; a division of StanChem, Inc.
b. Carboline Company; a subsidiary of RPM International.

c. International Protective Coatings.
d. Isolatek International.

2. Basis of Design Products:
   a. Exterior Coatings:
      1) Albi Clad 800, as manufactured by Albi Manufacturing; a division of StanChem, Inc.
      2) Nullifire S605, as manufactured by Carboline Company; a subsidiary of RPM International.
      3) CAFCO SprayFilm WB 4, as manufactured by Isolatek International.
   b. Interior Coatings:
      1) Albi Clad TF, as manufactured by Albi Manufacturing; a division of StanChem, Inc.
      2) A/D Firefilm III, as manufactured by Carboline Company; a subsidiary of RPM International.
      3) Interchar 1120, as manufactured by International Protective Coatings.
      4) CAFCO SprayFilm WB 5, as manufactured by Isolatek International.
3. Application: Designated for "exterior" and "interior general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
5. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 50 or less.
6. Finish: As selected by Architect from manufacturer's standard finishes.
   a. Color and Gloss: Match Architect's sample.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fire protection and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers (If required by Manufacturer): Primers approved by fire protection manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Reinforcing Fabric (If required by Manufacturer): Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fire protection manufacturer.

D. Reinforcing Mesh (If required by Manufacturer): Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fire protection manufacturer. Include pins and attachment.

E. Topcoat (If required by Manufacturer): Suitable for application over applied fire protection; of type recommended in writing by fire protection manufacturer for each fire-resistance design.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
   1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fire protection with substrates under conditions of normal use or fire exposure.
   2. Verify that objects penetrating fire protection, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
   3. Verify that substrates receiving fire protection are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fire protection application.

B. Conduct tests according to fire protection manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.

B. Clean substrates of substances that could impair bond of fire protection.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fire protection manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fire protection. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fire protection work.

B. Comply with fire protection manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fire protection with other construction to minimize need to cut or remove fire protection.
   1. Do not begin applying fire protection until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
   2. Defer installing ducts, piping, and other items that would interfere with applying fire protection until application of fire protection is completed.

D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fire protection manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fire protection manufacturer.

E. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fire protection manufacturer.

F. Extend fire protection in full thickness over entire area of each substrate to be protected.

G. Install body of fire protection in a single course unless otherwise recommended in writing by fire protection manufacturer.

H. Provide a uniform finish complying with description indicated for each type of fire protection material and matching finish approved for required mockups.

I. Cure fire protection according to fire protection manufacturer's written instructions.

J. Do not install enclosing or concealing construction until after fire protection has been applied, inspected, and tested and corrections have been made to deficient applications.

K. Finishes: Where indicated, apply fire protection to produce the following finishes:
   1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
   2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
   3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Test and inspect as required by the IBC, Subsection 17 05 .14, "Mastic and Intumescent Fire-Resistant Coatings."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fire Protection will be considered defective if it does not pass tests and inspections.
   1. Remove and replace fire protection that does not pass tests and inspections, and retest.

2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fire protection, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fire protection is without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fire protection and repair damaged areas and fire protection removed due to work of other trades.

D. Repair fire protection damaged by other work before concealing it with other construction.

E. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Penetrations in fire-resistance-rated walls.

B. Penetrations in horizontal assemblies.

C. Penetrations in smoke barriers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Include the following participants:
      a. Contractor.
      b. Architect.
      c. Installers.
      d. 3rd party inspectors.
      e. Firestopping manufacturer.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
      a. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

B. Informational Submittals:
   1. Qualification Data: For Installer.
   2. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

C. Closeout Submittals:
   1. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
   1. For systems that utilize a pre-formed firestop device, Installer shall be trained directly from manufacturer.
   2. For systems that require sealants, putties, or sprays a firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors", or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements" is required.

B. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
         1) UL in its "Fire Resistance Directory."
         2) Intertek Group in its "Directory of Listed Building Products."

3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
   1. Manufacturers:
      a. 3M Fire Protection Products.
      b. Hilti, Inc.
      c. RectorSeal.
      d. Specified Technologies, Inc.
      e. Tremco, Inc.

B. Source Limitations:
   1. Obtain joint and penetration firestopping primary materials through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing principle materials described in this Section.
   2. Provide secondary materials of type and from source recommended by manufacturer of primary materials.

C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

E. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.

F. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of less than or equal to 1 determined by ASTM G21.

G. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
   1. Sealant shall have a VOC content of 250 g/L or less.

2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
1. Acceptable Products:
a. CP 680-P/M Cast-in Firestop Device by Hilti.
b. CFS-DID Firestop Drop-In Device by Hilti.
c. CFS-CID P/M Cast-in Firestop Device for Larger Pipes by Hilti.
d. CFS-CID MD P/M Cast in Devices for Metal Decks by Hilti.

B. Firestop Sealants: Single-component formulations that do not re-emulsify after cure during exposure to moisture.
1. Acceptable Products:
a. FS-ONE MAX Intumescent Firestop Sealant by Hilti.
b. CP 606 Flexible Firestop Sealant by Hilti.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
1. Acceptable Products:
a. CP 643 N and CP 644 Firestop Collar by Hilti.
b. CFS-CC Firestop Cable Collar by Hilti.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
1. Acceptable Products:
a. CFS-COS Firestop Composite Sheet by Hilti.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
1. Acceptable Products:
a. CFS-D Firestop Putty Disc, CP 617 Putty Pad, CP 618 Putty Stick, and CP 619 T Putty Roll by Hilti, Inc.
b. TREMstop Putty Pads by Tremco TREMstop Firestopping.
c. SpecSeal Series SSP Firestop Putty by Specified Technologies, Inc. (STI).

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
   1. Acceptable Products:
      a. CP 648 Firestop Wrap Strip, by Hilti, Inc.
      b. TREMstop Super Strips by Tremco TREMstop Firestopping.
      c. SpecSeal Series RED2 or BLU2 Wrap Strip by Specified Technologies, Inc. (STI).

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
   1. Acceptable Products:
      a. CP 637 Firestop Mortar by Hilti, Inc.
      b. TREMstop Fire Mortar by Tremco TREMstop Firestopping.
      c. SpecSeal Series SSM Firestop Mortar by Specified Technologies, Inc. (STI).

H. Blocks: Intumescent flexible block. Non-curing, reusable solution for medium to large openings. No compression required.
   1. Acceptable Product:
      a. CFS-BL Firestop Block by Hilti, Inc.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
   1. Acceptable Product:
      a. Flamesafe Pillow by Rectorseal.
      b. SpecSeal Series SSB Firestop Pillows by Specified Technologies, Inc. (STI).

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions and Spray mastic formulation for use with a power sprayer. For use in top-of-wall joints, curtain wall/edge of slab, expansion joints.
   2. Acceptable Products:
      a. CFS-S SIL SL (self-leveling), CFS-S SIL GG (gun grade), and CFS-SP SIL (spray mastic) by Hilti, Inc.
      b. TREMstop Fyre-Sil (self-leveling/gun grade) by Tremco TREMstop Firestopping.
      c. SpecSeal SIL300 Silicone Firestop Sealant or SIL300 SL Self-Leveling Silicone Firestop Sealant by Specified Technologies, Inc. (STI).

K. Firestop Sleeve Device: Factory assembled sleeves formed from galvanized steel and lined with intumescent material designed to handle 0 to 100 percent visual cable fill.
   1. Acceptable Products:
      a. CP653 Speed Sleeve by Hilti.
      b. EZ-PATH™ Fire Rated Pathway by Specified Technologies Inc. (STI).

L. Polyurethane Firestop Foam: Two component polyurethane foam created through chemical reaction of polyol, water and polyisocyanate, plus flame retardants and other additives (all included in the polyol component). Foam cures within one minute at room temperature to produce non-shrinking smoketight firestopping system and does not require additional firestop coating.
   1. Acceptable Product: CP620 Fire Foam by Hilti.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words similar to "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
   1. Equivalent approved systems by the following are acceptable:
      a. Intertek Group-listed systems designs in Intertek Group's "Directory of Listed Building Products" under "Firestop Systems."
      b. FM Global-approved systems designs listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

B. Penetration Firestopping Systems with No Penetrating Items. Comply with the following:
   1. Acceptable UL-Classified Systems with CAJ/CBJ/FA 0000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
      a. Or an Engineered Judgments by one of the listed manufacturer’s meeting the required rating.
   2. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Silicone sealant.
      c. Acrylic sealant.
      d. Intumescent putty.
      e. Mortar.
      f. Preformed intumescent blocks/plugs.
      g. Pillows/Bags

C. Firestop Systems for pipes, plastic or metal, conduit in vertical runs, installed through firestop devices. Comply with the following:
   1. Acceptable UL-Classified Systems with FA 1000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
      a. Or an Engineered Judgments by one of the listed manufacturer’s meeting the required rating.
   2. Type of Firestop Device:
      a. Cast-in Firestop Devices.
      b. Drop-In Devices.

D. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing. Comply with the following:
   1. Acceptable UL-Classified Systems with CAJ/CBJ/FA 1000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
      a. Or an Engineered Judgments by one of the listed manufacturer’s meeting the required rating.
   2. Type of Fill Materials: One or more of the following:
      a. Latex sealant.

b. Silicone sealant.
c. Acrylic sealant.
d. Intumescent putty.
e. Mortar.
f. Polyurethane firestop foam.

E. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing. Comply with the following:
1. Acceptable UL-Classified Systems with CAJ/CBJ/WL 2000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Type of Fill Materials: One or more of the following:
a. Intumescent sealant.
b. Intumescent putty.
c. Intumescent wrap strips.
d. Firestop device.
e. Firestop sleeve device.
f. Latex sealant.

F. Penetration Firestopping Systems for Electrical Cables. Comply with the following:
1. Acceptable UL-Classified Systems with CAJ/CBJ/WL 3000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Type of Fill Materials: One or more of the following:
a. Intumescent sealant.
b. Latex Sealant
c. Pillows/bags
d. Intumescent putty.
e. Silicone foam.

G. Penetration Firestopping Systems for Cable Trays with Electric Cables. Comply with the following:
1. Acceptable UL-Classified Systems with CAJ/CBJ/WL 4000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Type of Fill Materials: One or more of the following:
a. Intumescent sealant.
b. Latex Sealant
c. Pillows/bags
d. Intumescent putty.
e. Silicone foam.

H. Penetration Firestopping Systems for Insulated Pipes. Comply with the following:

1. Acceptable UL-Classified Systems with CAJ/CBJ/WL 5000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
   a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Type of Fill Materials: One or more of the following:
   a. Intumescent sealant.
   b. Silicone foam.
   c. Intumescent wrap strips.
   d. Pre-formed intumescent blocks.
   e. Latex sealant.

I. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants. Comply with the following:
1. Acceptable UL-Classified Systems with CAJ/CBJ/WL 6000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
   a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Type of Fill Materials: One or more of the following:
   a. Intumescent sealant.
   b. Latex sealant
   c. Intumescent putty.
   d. Mortar.

J. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants. Comply with the following:
1. Acceptable UL-Classified Systems with CAJ/CBJ/WL 7000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
   a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Type of Fill Materials: One or both of the following:
   a. Intumescent sealant.
   b. Latex sealant.
   c. Mortar.
   d. Acrylic sealant.
   e. Silicone sealant.

K. Penetration Firestopping Systems for Groupings of Penetrants. Comply with the following:
1. Acceptable UL-Classified Systems with CAJ/CBJ/WL 8000 Series or other Systems meeting the fire and smoke ratings specified or as indicated on Drawings.
   a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Type of Fill Materials: One or more of the following:
   a. Latex sealant.
   b. Mortar.
   c. Intumescent wrap strips.

d. Firestop device.
e. Intumescent composite sheet.
f. Pre-formed intumescent blocks.
g. Polyurethane firestop foam.

END OF SECTION

SECTION 07 84 43

JOINT FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Joints in or between fire-resistance-rated constructions.

B. Joints at exterior curtain-wall/floor intersections.

C. Joints in smoke barriers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Include the following participants:
      a. Contractor.
      b. Architect.
      c. Installers.
      d. 3rd party inspectors.
      e. Firestopping manufacturer.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
      a. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

B. Informational Submittals:
   1. Qualification Data: For Installer.
   2. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

C. Closeout Submittals:
   1. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
   1. For systems that utilize a pre-formed firestop device, Installer shall be trained directly from manufacturer.
   2. For systems that require sealants, putties, or sprays a firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors", or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements" is required.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
      a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
         1) UL in its "Fire Resistance Directory."
         2) Intertek Group in its "Directory of Listed Building Products."

2.2 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Basis-of-Design Products: The design for each fire-resistive joint system is based on products named in Part 2 articles. Subject to compliance with requirements, provide either the named products or comparable products by one of the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. RectorSeal.
d. Specified Technologies, Inc.
e. Tremco, Inc.

B. Source Limitations:
1. Obtain joint and penetration firestopping primary materials through one source from a single manufacturer with not less than ten years of successful experience in manufacturing principle materials described in this Section.
2. Provide Seconday materials of type and from source recommended by manufacturer of primary materials.

2.3 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.
1. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
1. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.

E. Joints at Intersection between Rated Wall Assemblies and Nonrated Horizontal Assemblies: Provide joint firestopping systems with ratings determined by ASTM E 2837.

F. Mold Resistance: Provide joint firestopping with mold and mildew resistance rating less than or equal to 1 as determined by ASTM G21.

G. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
1. Sealant shall have a VOC content of 250 g/L or less.

H. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

2.4 FILL MATERIALS

A. Pre-Formed Top of Wall Firestopping:
   1. Acceptable Products:
      a. CFS-TTS Firestop Top Track Seal by Hilti.
      b. CFS-TTS MD Firestop Top Track Seal for Metal Deck by Hilti.

B. Pre-Formed edge of Slab Firestopping:
   1. Acceptable Products:
      a. CFS-EOS QS Edge of Slab QuickSeal by Hilti.

C. Firestop Sealants: Single-Component formulations that do not re-emulsify after cure during exposure to Moisture.
   1. Acceptable Products:
      a. CP 606 Flexible Firestop Sealant by Hilti.

D. Firestop Water Based Spray: A sprayable water-based fire-rated mastic for construction joints. For use in top-of-wall joints, curtain wall/edge of slab, expansion joints.
   1. Acceptable Products:
      a. CFS-CP WB Water-Based Acrylic Sealant Spray by Hilti.

E. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions and Spray mastic formulation for use with a power sprayer. For use in top-of-wall joints, curtain wall/edge of slab, expansion joints.
   2. Acceptable Products:
      a. CFS-S SIL SL (self-leveling), CFS-S SIL GG (gun grade), and CFS-SP SIL (spray mastic) by Hilti, Inc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words similar to "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.6 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.
   1. Equivalent approved systems by the following are acceptable:
      a. Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under product category Expansion/Seismic Joints or Firestop Systems.

B. Floor-to-Floor, Joint Firestopping Systems. Comply with the following:
   1. UL-Classified Systems: FF-D/S Systems or other System meeting the fire and smoke ratings specified or as indicated on Drawings.
      a. Or an Engineered Judgments by one of the listed manufacturer’s meeting the required rating.
   2. Assembly Rating: As indicated on Drawings.
   3. Nominal Joint Width: As indicated on Drawings
   4. Movement Capabilities: Class II compression, extension, or horizontal shear.

C. Wall-to-Wall, Joint Firestopping Systems. Comply with the following:
   1. UL-Classified Systems: WW-D/S Systems or other System meeting the fire and smoke ratings specified or as indicated on Drawings.
      a. Or an Engineered Judgments by one of the listed manufacturer’s meeting the required rating.
   2. Assembly Rating: As indicated on Drawings.
   3. Nominal Joint Width: As indicated on Drawings
   4. Movement Capabilities: Class II compression or extension.

D. Floor-to-Wall, Joint Firestopping Systems. Comply with the following:
   1. UL-Classified Systems: FW-D/S Systems or other System meeting the fire and smoke ratings specified or as indicated on Drawings.
      a. Or an Engineered Judgments by one of the listed manufacturer’s meeting the required rating.
   2. Assembly Rating: As indicated on Drawings.
   3. Nominal Joint Width: As indicated on Drawings
   4. Movement Capabilities: Class II compression, extension, or horizontal shear.

E. Head-of-Wall, Fire-Resistive Joint Firestopping Systems. Comply with the following:

1. UL-Classified Systems: HW-D/S Systems or other System meeting the fire and smoke ratings specified or as indicated on Drawings.
    a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Assembly Rating: As indicated on Drawings.
3. Nominal Joint Width: As indicated on Drawings
4. Movement Capabilities: Class II compression or extension.

F. Bottom-of-Wall, Joint Firestopping Systems. Comply with the following:
1. UL-Classified Systems: BW-D/S Systems or other System meeting the fire and smoke ratings specified or as indicated on Drawings.
    a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Assembly Rating: As indicated on Drawings.
3. Nominal Joint Width: As indicated on Drawings
4. Movement Capabilities: Class II compression or extension.

G. Wall-to-Wall, Joint Firestopping Systems Intended for Use as Corner Guards. Comply with the following:
1. UL-Classified Systems: CG-D/S Systems or other System meeting the fire and smoke ratings specified or as indicated on Drawings.
    a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Assembly Rating: As indicated on Drawings.
3. Nominal Joint Width: As indicated on Drawings
4. Movement Capabilities: Class IIcompression or extension.

H. Perimeter Joint Firestopping Systems. Comply with the following:
1. UL-Classified Perimeter Fire-Containment Systems: CW-D/S Systems or other System meeting the fire and smoke ratings specified or as indicated on Drawings.
    a. Or an Engineered Judgments by one of the listed manufacturer's meeting the required rating.
2. Assembly Rating: As indicated on Drawings.
3. Linear Opening Width: As indicated on Drawings.
4. Movement Capabilities: Class II compression or extension.
5. F-Rating: As indicated on Drawings.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

(PART OF TRADE-BID SECTION 07 00 00 - WATERPROOFING, DAMPPROOFING, AND CAULKING)

PART 1 GENERAL

2.1 SECTION INCLUDES

A. Nonstaining silicone joint sealants.

B. Exterior urethane joint sealants.

C. Interior horizontal traffic urethane joint sealants.

D. Interior vertical and horizontal nontraffic joint sealants

E. Mildew-resistant joint sealants.

F. Butyl joint sealants.

G. Latex joint sealants.

2.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

2.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Joint sealants.
      b. Joint sealant backing materials.
   2. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
   3. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
   4. Joint-Sealant Schedule: Include the following information:
      a. Joint-sealant application, joint location, and designation.
      b. Joint-sealant manufacturer and product name.
      c. Joint-sealant formulation.
      d. Joint-sealant color.

B. Informational Submittals:
   1. Test and Evaluation Reports:
      a. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
         1) Joint-sealant location and designation.
         2) Manufacturer and product name.
         3) Type of substrate material.
         4) Proposed test.
         5) Number of samples required.
      b. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:
         1) Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
         2) Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
      c. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
   2. Field Quality-Control Submittals:
      a. Field-Adhesion-Test Reports: For each sealant application tested.
   3. Sample warranties.

C. Closeout Submittals:
   1. Warranty Documentation:
      a. Manufacturers' special warranties.
      b. Installer's special warranties.

2.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installers: Authorized representative who is trained and approved by manufacturer.
   2. Testing Agency: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

2.5 MOCKUPS

A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

2.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    a. Test Method: Test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

2.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

2.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.
   2. Silicone Sealants Warranty Period: 20 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

3.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

3.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content: Verify sealants and sealant primers comply with the following:
   1. Architectural sealants have a VOC content of 250 g/L or less.
   2. Sealants and sealant primers for nonporous substrates have a VOC content of 250 g/L or less.
   3. Sealants and sealant primers for porous substrates have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

3.3 NONSTAINING SILICONE JOINT SEALANTS (**DESIGNATION S-SP**)

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
   1. Manufacturers:
      a. Dow Corning Corporation; 790.
      b. Pecora Corporation; 890 NST.
      c. Tremco Incorporated; Spectrum 1.
      d. Sika Corporation; Sil 290 NB

C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
   1. Manufacturers:
      a. Dow Corning Corporation; 795.
      b. GE Construction Sealants; Momentive Performance Materials Inc.; SilPruf NB
      c. Pecora Corporation: 895NST.
      d. Tremco Incorporated: Spectrum 2.
      e. Sika Corporation; Sil 295 FPS NB

3.4 COLOR MATCHED SILICONE SEALANT (DESIGNATION S-CM)

A. Single-component Nonsag Color Matched Silicone Sealant: S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Products:
      a. Poly-Sil; ColorRite Incorporated.
      b. Color Sil. ColorRite Incorporated.

3.5 EXTERIOR URETHANE JOINT SEALANTS (**DESIGNATION U-TE**)

A. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.
   1. Manufacturers:
      a. Bostik, Inc.; Iso-Flex 880 GB.
      b. Master Builders Solutions; MasterSeal-SL-2.
      c. Pecora Corporation; Urexpan NR 200.
      d. Sherwin-Williams Company (The); Stampede-2SL.
      e. Tremco Incorporated; THC 900/901.

3.6 INTERIOR HORIZONTAL TRAFFIC URETHANE JOINT SEALANTS (**DESIGNATION U-TI**)

A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
   1. Manufacturers:
      a. Master Builders Solutions; MasterSeal-SL-1.
      b. Pecora Corporation; NR-201.
      c. Sherwin-Williams Company (The); Stampede 1SL.
      d. Tremco Construction Products Vulkem 45SSL

3.7 INTERIOR VERTICAL AND HORIZONTAL NONTRAFFIC JOINT SEALANTS (**DESIGNATION U-SC**)

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Manufacturers:
      a. Bostik, Inc.; Chem-Calk 915
      b. Master Builders Solutions; MasterSeal-TX-1.
      c. Pecora Corporation; Dynatrol I-XL.
      d. Sherwin-Williams Company (The); Loxon-TX.
      e. Sika Corporation; Silkaflex Textured Sealant.
      f. Tremco Incorporated; Dymonic 100.

3.8 MILDEW-RESISTANT JOINT SEALANTS (**DESIGNATION S-S)**.

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Manufacturers:
      a. Dow Corning Corporation: 786-M White.
      b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS 1700 Sanitary.
      c. Sika Corporation; Sil 100 WF.
      d. Tremco Incorporated; Tremsil 200.

3.9 BUTYL JOINT SEALANTS (**DESIGNATION BU**).

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.
   1. Manufacturers: Subject to compliance with requirements, provide products by manufacturers listed in Document 00 21 50 - Owner’s Preferred Vendor List. If products do not exist for this product group or listed products will create compatible issues, one of the other listed manufacturers will be acceptable.
   2. Manufacturers:

a. Pecora Corporation; BC-158.
b. Tremco Incorporated; Butyl.
c. Sherwin-Williams Company (The); White Lightning Butyl Rubber Caulk.

3.10 LATEX JOINT SEALANTS (**DESIGNATION L-GP**).

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
1. Manufacturers:
a. Master Builders Solutions; MasterSeal-NP 520.
b. Pecora Corporation; AC-20.
c. Sherwin-Williams Company (The); 950A.
d. Sika Corporation; Sil A 700.
e. Tremco Incorporated; Tremflex 834.

3.11 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) for all sealants, except silicone and horizontal joints. Type O (open-cell material) for silicone sealants. Provide size and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Backings shall be approximately 25% larger than joint.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

3.12 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

4.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean, porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
      d. Exterior insulation and finish systems.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Porcelain enamel.
      d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

4.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

4.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

4.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

4.6 JOINT-SEALANT SCHEDULE

A. Exterior joints in vertical surfaces and horizontal nontraffic surfaces (**Designation S-SP**):
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Joints between plant-precast architectural concrete units.
      c. Control and expansion joints in unit masonry.
      d. Joints in dimension stone cladding.
      e. Joints in glass unit masonry assemblies.
      f. Joints in exterior insulation and finish systems.
      g. Joints between metal panels.
      h. Joints between different materials listed above.
      i. Perimeter joints between materials listed above and frames of doors, windows and louvers.
      j. Control and expansion joints in soffits and other overhead surfaces.
      k. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, S, NS, 100/50 or 50, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Exterior joints in horizontal traffic surfaces (**Designation U-TE**):
   1. Joint Locations:
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Joints between plant-precast architectural concrete paving units.
      d. Joints in stone paving units, including steps.
      e. Tile control and expansion joints.
      f. Joints between different materials listed above.
      g. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, M, P/NS, 25, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Interior joints in horizontal traffic surfaces **(Designation U-TI**):
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in stone flooring.
      c. Control and expansion joints in brick flooring.
      d. Where open gaps / joints occur between base and floor finishes.
      e. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, S, P/NS, 25, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Interior joints in vertical surfaces and horizontal nontraffic surfaces (**Designation U-SC**):
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Control and expansion joints in tile flooring.

c. Vertical joints on exposed surfaces of unit masonry, concrete, walls and partitions.
d. Joints on underside of plant-precast structural concrete beams and planks.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P/NS, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces (**Designation S-S**):
1. Joint Locations:
a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Silicone, mildew resistant, neutral curing or acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Color Matched sealant for interior joints in vertical surfaces and horizontal nontraffic surfaces (**Designation S-CM**):
1. Joint Locations:
a. Joints between adjoining walls and counters.

G. Concealed mastics (**Designation BU**):
1. Joint Locations:
a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement (**Designation L-GP**):
1. Joint Locations:
a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
c. Joints between interior wall surfaces and countertops and millwork.
d. Other joints as indicated on Drawings.
2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

SECTION 07 92 13

ACOUSTICAL JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acoustical joint sealants.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Acoustical joint sealants.
   2. Samples for Verification: For each type and color of acoustical joint sealant required.
      a. Size: 1/2-inch- (13-mm-) wide sealant joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
   3. Acoustical Joint-Sealant Schedule: Include the following information:
      a. Joint-sealant application, joint location, and designation.
      b. Joint-sealant manufacturer and product name.
      c. Joint-sealant formulation.
      d. Joint-sealant color.

B. Informational Submittals:
   1. Test and Evaluation Reports:
      a. Product Test Reports: For each type of acoustical joint sealant, for tests performed by qualified testing agency or manufacturer and witnessed by a qualified testing agency.
   2. Sample warranties.

C. Closeout Submittals:
   1. Warranty Documentation:
      a. Manufacturers' special warranties.
      b. Installer's special warranties.

1.3 WARRANTY

A. Installer's Special Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Manufacturer's Special Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACOUSTICAL JOINT SEALANTS

A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.
   1. Verify sealant has a VOC content of 250 g/L or less.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
   1. Manufacturers:
      a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
      b. Grabber Construction Products; Acoustical Sealant GSC.
      c. Hilti Incorporated; CP 506 Smoke and Acoustic Sealant.
      d. Pecora Corporation; AC-20 FTR.
      e. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
      f. Tremco; Acoustical Sealant.
   2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 07 95 00

EXPANSION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior expansion control systems.

B. Exterior wall expansion control systems.

1.2 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
2. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches (150 mm) long in size.
3. Samples for Initial Selection: For each type of expansion control system indicated.
    a. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
4. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches (150 mm) long in size.
5. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
    a. Manufacturer and model number for each expansion control system.
    b. Expansion control system location cross-referenced to Drawings.
    c. Nominal joint width.
    d. Movement capability.
    e. Classification as thermal or seismic.
    f. Materials, colors, and finishes.
    g. Product options.
    h. Fire-resistance ratings.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
   1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
   2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall and soffit expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

B. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
   2. Component Importance Factor is 1.5.

2.3 MANUFACTURERS

A. Basis-of-Design Products: The design for each architectural joint system specified in Part 2 "Architectural Joint System" Article below is based on the products named in Part 3 Joint Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers listed.
   1. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
   2. Balco, Inc.
   3. Construction Specialties, Inc.
   4. InPro Corporation (IPC).
   5. MM Systems Corporation.
   6. Nystrom, Inc.
   7. Watson Bowman Acme Corp.
   8. Sika; Emseal.

B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

2.4 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.
   1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Cellular Foam Seals: Extruded, compressible foam with silicone weather facing, designed to function under compression and extension.
   1. Basis of Design: Seismic Colorseal® by Sika Emseal

D. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.

E. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.5 ARCHITECTURAL JOINT SYSTEMS

A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces. Refer to Schedule at end of Section.
   1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
   2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
   3. Frames for Strip Seals: Designed with semiclosed cavity that provides a mechanical lock for seals of type indicated.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Anodized Finish:
   1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
   2. Location: Wall and ceiling joint covers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
   1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
   2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.

3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
5. Install frames in continuous contact with adjacent surfaces.
   a. Shimming is not permitted.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Foam Seals: Install with adhesive recommended by manufacturer.

E. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.
1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

3.5 JOINT SCHEDULE

A. Basis of Design Products:
1. Construction Specialties.

B. Provide fire rated devices where required or indicated to maintain fire rating of assembly through which device is penetrating.

C. Interior Expansion Control Systems.
1. Floor-to-Floor Expansion Joint Covers:
   a. Type EJ INT F 01: APF-300.
   b. Type EJ INT F 03: GFPS-300.
2. Wall to Wall Expansion Joint Covers:

a. Type EJ INT W 01: FWS-300.
b. Type EJ INT W 02: FWS-300 w/ RFX-2W (2-hour rated).
c. Type EJ INT W 03: FCF-300.
d. Type EJ INT W 04: FCF-300 w/ RFX-2W (2-hour rated).
e. Type EJ INT W 05: AWF-300.
f. Type EJ INT W 06: AWF-300 w/ RFX-2W (2-hour rated).

3. Wall to Corner Expansion Joint Covers:
   a. Type EJ INT WW 01: FWSC-300.
   b. Type EJ INT WW 02: FWSC-300 w/ RFX-2FW (2-hour rated).
   c. Type EJ INT WW 03: AFWC-300.
   d. Type EJ INT WW 04: AFWC-300 w/RFX-2W (2-hour rated).
4. Wall to Ceiling Expansion Joint Covers:
   a. Type EJ INT WC 01: HC-300.
   b. Type EJ INT WC 02: AFWC-300.

D. Exterior Expansion Control Systems. Include manufactured standard second seal and vapor barrier with all systems.
   1. Wall-to-Wall Expansion Joint Covers:
   2. Basis-of-Design Product: MM Systems, VERTICAL SEALING SYSTEM (VSS).
      a. Nominal Width: As indicated on the Drawings.
      b. Color: As selected by Architect from manufacturer's full range of colors minimum
   3. Wall Corner Expansion Joint Covers:
   4. Basis-of-Design Product: MM Systems, VERTICAL SEALING SYSTEM (VSS).
      a. Nominal Width: As indicated on the Drawings.

END OF SECTION

SECTION 08 00 01

GLASS AND GLAZING (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
2. The following shall appear on the upper left hand of the envelope:
   a. Name of Sub-Bidder: Print Name of Sub-bidder
   b. Project: Insert project name
   c. Sub-Bid for Section: xxxx - Trade
3. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
4. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
   1. 01-GENERAL Series.
   2. 05-ARCHITECTURAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Interior Work of Section 08 80 00 - GLAZING.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior standard steel doors and frames.

B. Exterior standard steel doors and frames.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
   2. Shop Drawings: Include the following:
      a. Elevations of each door type.
      b. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
      c. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
      d. Locations of reinforcement and preparations for hardware.
      e. Details of each different wall opening condition.
      f. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.

g. Details of anchorages, joints, field splices, and connections.
h. Details of accessories.
i. Details of moldings, removable stops, and glazing.
j. Samples for Verification:

3. Fabrication: Prepare Samples approximately 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:
   a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
4. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

B. Informational Submittals:
1. Qualification Data: For door inspector.
   a. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
   b. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
   c. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
2. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly, fire-rated borrowed-lite assembly, windborne-debris impact resistance door, and thermally-rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.
3. Field quality control reports.

C. Closeout Submittals:
1. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:

B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies is to meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high (102 mm high) wood blocking. Provide minimum 1/4-inch (6 mm) space between each stacked door to permit air circulation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Mesker Door Inc.
4. Pioneer Industries, Inc.
5. Republic Doors and Frames.
6. Steelcraft; an Allegion company.

B. Source Limitations:
1. Obtain interior hollow-metal work from single source from single manufacturer.
2. Obtain exterior hollow-metal work from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Limit: Where indicated on drawings, provide doors that have a maximum transmitted temperature end point of not more than 450 degrees F (250 degrees C) above ambient after 30 minutes of standard fire-test exposure.
4. FM Global approval Standard for Fire Doors, Class Number 4100.

B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

C. Labeling Agency:

1. If labeling agency is Underwriters' Laboratories: Manufacture doors and frames under the UL factory inspection program and in strict compliance to UL procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
2. If labeling agency is Intertek Testing Services/Warnock Hersey: Manufacture doors and frames under the ITS/WH factory inspection program and in strict compliance to ITS/WH procedures, and provide the degree of fire protection capability indicated by the opening class.
3. If labeling agency is FM Global: Manufacture doors and frames under the FM Global factory inspection program and in strict compliance to FM Global procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.

D. Metal labels, bearing the name of the labeling agency, shipped on items located as follows:
1. Door Frames: Placed on the rabbet between the two upper hinge locations as to be concealed when doors are shut.
2. Doors: Placed on the hinge stile between the two upper hinge locations as to be concealed when doors are shut.
3. Window frames: Placed on the public side rabbet approximately 5 ft above finished floor - do not place on the face of the frame.

E. The following label materials/methods will not be acceptable and will be cause for rejection of all work of this Section:
1. Paper or plastic labels.
2. Stamped or embossed label markings.
3. Loose labels to be applied at the site.

F. Provide stairway doors to meet 250 degrees F (139 degrees C) Rise Class criteria minimum.

G. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for Basic protection.
1. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.

H. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg BTU/F x h x sq.ft. (2.16 W/K x sq.m) when tested in accordance with ASTM C1363 or ASTM E1423.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B.
1. Doors:
a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches (44.5 mm) .
1) Face:

(a) Uncoated steel sheet, minimum thickness of 0.042 inch (18 ga.) (1.0 mm).
(b) Doors opening to the Apratus Bay: Metallic-coated steel sheet, minimum thickness of 0.042 inch (18 ga.) (1.0 mm), with minimum A60 (ZF180) coating.

c. Edge Construction: Model 1, Full Flush.
d. Edge Bevel: Provide manufacturer's standard beveled or square edges.
e. Non-Fire Rated Core: Manufacturer's standard, non-foam core.
f. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.
1) Fire Rating: As indicated on drawings, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
(a) Temperature-Rise Rating (TRR) Across Door Thickness: 250 degrees F (139 degrees C).
(b) Provide units listed and labeled by UL (DIR) or ITS (DIR).
(c) Attach fire rating label to each fire rated unit.
g. Reinforcing: Channel shaped vertical stiffeners at 6 inches (152 mm), welded to both sheets.
h. Top Closures for Doors in Sterile Environments: Flush with top of faces and edges.

2. Frames:
a. Materials:
1) Uncoated steel sheet, minimum thickness of 0.053 inch (16 ga.) (1.3 mm).
2) Doors opening to the Apratus Bay: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 ga.) (1.3 mm), with minimum A60 (ZF180) coating.
b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Face welded.

3. Exposed Finish: Primed and field finished.

C. Extra-Heavy-Duty Doors and Frames (Sound Rated): ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.
1. Doors:
a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches (44.5 mm).
c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch (16 ga.) (1.3 mm).
d. Edge Construction: Model 1, Full Flush.
e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Core Material: Manufacturer's standard construction as required to meet acoustic requirements indicated.
g. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 35, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
h. Sound Seals: Integral, concealed in door and/or frame.
i. Opening Force of Sound-Rated Doors, Non-Fire Rated: 5 lbs. (2.27 kg), maximum, in compliance with ADA Standards.

2. Frames:
   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (16 ga.) (1.3 mm).
   b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
   c. Construction: Face welded.
3. Exposed Finish: Primed and field finished.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.
1. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches (44.5 mm).
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 ga.) (1.3 mm), with minimum A60 (ZF180) coating.
   d. Edge Construction: Model 1, Full Flush.
   e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
   f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
   g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
   h. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   i. Core: Manufacturer's standard polyurethane.
      1) Reinforcing: 20 gage channel shaped or hat shaped vertical stiffeners at 6 inches (152 mm) oc, welded to both sheets.
      2) Insulating Value: U-value of 0.38, when tested in accordance with ASTM C1363.
2. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (14 ga.) (1.7 mm), with minimum A60 (ZF180) coating.
   b. Construction: Face welded.
3. Exposed Finish: Primed and field finished.

2.5 BORROWED LITES

A. Fabricate of same material and face dimensions to match door frames.
1. Welds: Continuously weld joints along all surfaces along the throat of the frames. Grind and finish all exposed surfaces of joints so that no traces of the mitered joints are visible. Frames showing traces of mitered joints are not acceptable.

B. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

C. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 FRAME ANCHORS

A. Jamb Anchors:
   1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
   2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
   3. Postinstalled Expansion Anchor: Minimum 3/8-inch (9.5 mm) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51 mm) height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

H. Glazing: Comply with requirements in Section 08 80 00 - Glazing.

2.8 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
   1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
      b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with BHMA A156.115W for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
   1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
   4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
b. Install frames with removable stops located on secure side of opening.
2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.
a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
4. Solidly pack mineral-fiber insulation inside frames.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
3. Smoke-Control Doors: Install doors in accordance with NFPA 105.

D. Glazing: Comply with installation requirements in Section 08 80 00 - Glazing and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.3 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Five-ply flush wood veneer-faced doors for transparent finish.

B. Factory finishing flush wood doors.

C. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product, including the following:
      a. Door core materials and construction.
      b. Door edge construction
      c. Door face type and characteristics.
      d. Door trim for openings.
      e. Factory-machining criteria.
      f. Factory-finishing specifications.
   2. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
      a. Door schedule indicating door location, type, size, fire protection rating, and swing.
      b. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
      c. Details of frame for each frame type, including dimensions and profile.
      d. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
      e. Dimensions and locations of blocking for hardware attachment.
      f. Dimensions and locations of mortises and holes for hardware.
      g. Clearances and undercuts.
      h. Requirements for veneer matching.
      i. Doors to be factory finished and application requirements.
   3. Samples for Verification:

a. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

B. Informational Submittals:
1. Qualification Data: For door inspector.
a. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Field quality-control reports.
3. Sample Warranty: For special warranty.

C. Closeout Submittals:
1. Special warranties.
2. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.4 QUALITY ASSURANCE

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

1. Temperature-Rise Limit: Where indicated on Drawings, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards." and ANSI/WDMA I.S. 1A, whichever is stricter.

B. Regional Materials: Manufacture wood doors within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

2.3 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS AND TRANSOM PANELS FOR TRANSPARENT FINISH

A. Interior Doors :

1. Manufacturers:
   a. Lambton Doors.
   b. Forte Opening Solutions (Formerly Masonite Architectural).
   c. Oshkosh Door Company.
   d. VT Industries Inc.
2. Performance Grade:
   a. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated.
   b. ANSI/WDMA I.S. 1A Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, exits, patient rooms, and where indicated on Drawings.
   c. ANSI/WDMA I.S. 1A Standard Duty: Closets (not including janitor's closets), private toilets, and where indicated on Drawings.
3. Architectural Woodwork Standards or ANSI/WDMA I.S. 1A Grade: Premium.
4. Faces: Single-ply wood veneer not less than 1/50 inch (0.508 mm) thick.
   a. Species: As indicated on the Drawings.
   b. Cut: Rift cut.
   c. Match between Veneer Leaves: Slip match.
   d. Assembly of Veneer Leaves on Door Faces: Balance match.
   e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   f. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
   g. Transom Match: Continuous match.

5. Exposed Vertical and Top Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.
    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
    b. Fire-Rated Pairs of Doors: Provide formed-steel meeting edges and astragals with intumescent seals.
        1) Finish steel edges and astragals to match door hardware (locksets or exit devices).
    c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
        1) Screw-Holding Capability: 475 lbf (2110 N) in accordance with WDMA T.M. 10.
6. Core for Non-Fire-Rated Doors:
    a. ANSI A208.1, Grade LD-2 particleboard, made with binder containing no urea-formaldehyde resin.
        1) Blocking: Provide wood blocking in particleboard-core doors as follows:
            (a) 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
            (b) 5-inch (125-mm) bottom-rail blocking, in doors indicated to have kick, mop, or armor plates.
        2) Provide doors with WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 71 00 "Door Hardware."
    b. WDMA I.S. 10 structural composite lumber.
        1) Screw Withdrawal, Door Face: 550 lbf (2440 N).
        2) Screw Withdrawal, Vertical Door Edge: 475 lbf (2110 N).
    c. Either ANSI A208.1, Grade LD-2 particleboard or WDMA I.S. 10 structural composite lumber.
7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
    a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as follows:
        1) 5-inch (125-mm) top-rail blocking.
        2) 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
        3) 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
        4) 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
   1. Wood Species: Same species as door faces.
   2. Profile: Flush rectangular beads.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated on Drawings.

D. Metal Louvers:
   1. Manufacturers:
      a. Activar Construction Products Group, Inc.
      b. Allegion PLC.
      c. Anemostat Products; a Mestek Company.
      d. ASSA ABLOY
      e. L & L Louvers, Inc.
      f. LL Building Products, Inc.
      g. McGill Architectural Products.
   2. Blade Type: Vision-proof, inverted V.
   3. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, factory primed for paint finish.
   4. Metal and Finish: Extruded aluminum with Class II, clear anodic finish, AA-M12C22A31.
   5. Metal and Finish: Extruded aluminum with light bronze, Class II, color anodic finish, AA-M12C22A32/A34.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.
   1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.
   1. Locate hardware to comply with DHI-WDHS-3.
   2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
   3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
   4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels:
1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
3. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.
4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.
1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:
1. Architectural Woodwork Standards or ANSI/WDMA I.S. 1A Grade: Premium.
2. Finish: Architectural Woodwork Standards System-5, Varnish, Conversion.
3. Staining: Match Architect's sample.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.
   1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3.2 mm in 2400 mm).
   2. Anchor frames to anchors or blocking built in or directly attached to substrates.
      a. Secure with countersunk, concealed fasteners and blind nailing.
      b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
         1) For factory-finished items, use filler matching finish of items being installed.
   3. Install fire-rated doors and frames in accordance with NFPA 80.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 16 13

FIBERGLASS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fiberglass (FRP) doors.
2. Fiberglass (FRP) door frames.
3. Factory finishing fiberglass doors and frames.
4. Factory fitting fiberglass doors to frames and factory machining for hardware.

B. Sustainable Building Requirements:
1. The Contractor is to implement practices and procedures to meet the project's sustainable performance goals, which include achieving LEED v4 Silver certification based on USGBC's "LEED Version 4 for Building Design and Construction: Schools" (LEED v4 BD+C: Schools).
2. The work of this Section includes responding to Architect or Contractor requests for additional information or product data and may be required following initial Green Building Certification Institute (GBCI) review of LEED Application.
3. Product substitution requests are subject to additional LEED submittal requirements including, but not limited to, Environmental Product Declarations (EPD), Health Product Declarations (HPD), and General Emissions Testing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:
1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door trim for openings.
5. Door frame construction.
6. Factory-machining criteria.
7. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.

6. Clearances and undercuts.

C. Samples: For factory-finished doors and factory-finished door frames.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Operation and Maintenance Data: For each product installed including but not limited to methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum 10 years documented experience whose products have been in satisfactory use in similar service for not less than 10 years

1.5 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's standard limited warranty that products will be free of manufacturing defects in materials or workmanship:
1. Doors and frames: 5 years.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of design: Subject to compliance with the requirements, provide products by Tiger Door, or comparable products by an acceptable manufacturer.

B. Acceptable Manufacturers:
1. Pella.
2. Taylor Entrance Systems, Inc.
3. Tiger Door.
4. Upstate Door.

2.2 FIBERGLASS DOORS

A. Fiberglass Door Panels:

1. Design: FRP doors shall be of seamless press-molded construction. Laminated FRP face sheets shall be applied while wet and uncured to an internal door stile and rail subframe/core assembly and then pressmolded under heat and pressure. The composite door panel must be integrally fused over its entire surface area, not just adhesive-bonded at perimeter stiles and rails. Doors shall remain under pressure during curing for flat, warp-free surfaces.
2. Stiles & Rails: A high-modulus pultruded FRP square or rectangular tube subframe is to be provided within the door. Tubes are to be mitered and joined internally at the corners with solid polymer blocks to yield a one-piece unit that does not require any secondary external sealing. Provide a tubular midrail across width of door at lock height, and additional horizontal rails where specific design conditions dictate. Doors shall incorporate molded-in FRP edge strips, chemically bonded to the subframe stiles, for machining of hardware mortises so as not to cut or otherwise compromise the integrity of the pultruded stiles, nor allow moisture to penetrate into the core of the door. All connections shall be chemically welded. No mechanical fasteners will be allowed. The use or inclusion of aluminum, steel, gypsum or wood into stile and rail construction is not permitted.
3. Core: For maximum rigidity and compressive strength a triangular shaped 3/8" cell phenolic resin impregnated kraft paper honeycomb core shall be used. Molding pressure and resin gel time shall be sufficient to allow for penetration of resin into the cellular structure of the core to maximize shear and peel strengths at the skin/core interface and eliminate the possibility of delamination. The honeycomb is to be completely enclosed within the stile and rail subframe. Use of balsa wood is not permitted. 4. Internal Reinforcement: High-modulous pultruded tubular FRP, high-density polymer compression blocks, or plastic compression blocking at all hardware locations, and corner locations. No wood blocking, steel or aluminum reinforcing plates, ribs or fittings shall be used. A minimum of 900 lbs of pullout strength is required for each factory supplied hinge screw.
4. Faces: Door facings shall utilize a chemical resistant thermosetting polyester resin system with fiber reinforcing layers. Supplier shall furnish door faces as shown on the drawings and in the door elevations. Chopped strand mat layers shall be used to provide bond integrity between gelcoat, laminated facings and the internal door structure. Structural reinforcement shall be in the form of a knitted multi-layer material with layers of uni-directional glass fiber oriented in both the vertical and horizontal directions for high stiffness, impact resistance and resistance to warping. Gelcoat surface integrally molded to be 25/30 mils thick (wet) ultra-violet light stabilized marine grade NPG-isophthalic polyester gelcoat.
5. Finish: The exposed FRP door faces shall have a 3-4 mils (0.1016 mm) factory applied two-part aliphatic polyurethane fully cured coating of industrial urethane. Coating shall have a minimum hardness of H to 2H. Finish shall be a slightly textured semi-gloss to minimize the visual effects of wear and tear.
6. Astragals: All pairs of doors shall be furnished with an astragal from door manufacturer made of same pultruded FRP material as door stile, rail and edge as required. Astragal shall be located on the meeting stile edge of each inactive leaf of double door pairs. Architect shall advise active leaf of door, and astragal shall be installed to cover meeting stile gap to effect seal and security.

7. Lites: Glass per job specification shall be factory furnished, glazed and installed. Standard glass thickness is ¼". Centered glazing shall be installed between 45 degree pultruded FRP glazing stops and vinyl foam tape with concealed compression retainers for ¼" glazing. No exposed fasteners or exposed silicone will be allowed for securing ¼" glazing. Stainless steel screws may be allowed for other glazing thicknesses. All glazing stop material shall be pultrued FRP with a minimum fiberglass content of 50%. Metal, pvc, or vinyl "Glass Kit" type lites are not acceptable for non-fire rated openings
8. Panel Thickness: 1-3/4 inches (44 mm).
9. Color: Match Architect's samples.

2.3 DOOR FRAMES

A. Frames:
   1. Design: FRP Door frames furnished under this specification shall utilize a high-modulus pultruded structural FRP shape. The frame section shall be standard double rabbeted 5-3/4" deep x 2" face, 3/16" thick, with integral 5/8" doorstop, to match typical hollow metal configurations. Additional jamb profiles and widths are available.
   2. Corner Joints: Frame jambs and header shall be joined at corners via miter connections with hidden FRP angle clips and associated fasteners. Post and beam corners will not be acceptable.
   3. Hardware Reinforcements: FRP reinforcing shall be chemically welded to door frame material at required locations. Minimum screw pullout strength of 1100 lb per #12 x 1-1/4" sheet metal screw is required. Mechanically fastened reinforcements are not permitted.
   4. Anchors:
      a. BOLT-IN: Provide manufacturer's required number of 3/8" diameter x 4" long flat head stainless steel sleeve anchors for masonry openings, 3/8" diameter x 4" machine screw with nut and washers for structural steel openings, #14 x 4" stainless steel flat head sheet metal screws for wood or steel stud openings. Include extra anchors for additional frame height in two foot increments above 8'-0". Provide single bolt anchor at center of all headers over four feet in nominal width. Stainless Steel fasteners shall be furnished by the factory.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.
   1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied.
   1. Locate hardware to comply with DHI-WDHS-3.
   2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
   3. Coordinate with hardware mortises in frames, to verify dimensions and alignment before factory machining.

4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.5 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.
1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Door Frame Exterior Finish System:
1. Color: Same as the doors.

D. Door Panel Exterior Finish:
1. Color: Match Architect’s sample.

PART 3 EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Door and frame configurations:
1. Single leaf swing door.
2. Pair of single swing doors.
3. Double leaf bi-fold door.

D. Install frames level, plumb, true, and straight.
1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm).
2. Anchor frames to anchors or blocking built in or directly attached to substrates.
a. Secure with countersunk, concealed fasteners and blind nailing.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Access doors and frames.

B. Fire-rated access doors and frames.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

B. Closeout Submittals:
   1. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Manufacturers:
   1. ACUDOR Products, Inc.
   2. Babcock-Davis.
   3. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
   4. Karp Associates, Inc.
   5. Larsen's Manufacturing Company.
   6. Milcor; Hart & Cooley, Inc.
   7. Nystrom.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Exposed Flanges:
   1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
   2. Features:
   3. Locations: Wall and ceiling as scheduled.
   4. Door Size: As scheduled at the end of this Section.
   5. Materials:
      a. Painted Finishes: Uncoated Steel Sheet, nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
      b. Stainless Steel: Stainless Steel Sheet, nominal 0.062 inch (1.59 mm), 16 gage, ASTM A480/A480M No. 4 finish.
   6. Frame Material: Same material, thickness, and finish as door.
   7. Latch and Lock: Cam latch, screwdriver operated.

D. Flush Access Doors with Concealed Flanges:
   1. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
   2. Locations: Wall and ceiling as scheduled.
   3. Door Size: As scheduled at the end of this Section.
   4. Materials:
      a. Painted Finishes: Uncoated Steel Sheet, nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
      b. Stainless Steel: Stainless Steel Sheet, nominal 0.062 inch (1.59 mm), 16 gage, ASTM A480/A480M No. 4 finish.
   5. Frame Material: Same material and thickness as door.
   6. Latch and Lock: Cam latch, screwdriver operated.

E. Recessed Access Doors with Concealed Flanges:
   1. Description: Door face recessed 1/2 inch (13 mm) for gypsum board infill; with concealed flange for gypsum board installation and concealed hinge.
   2. Locations: Wall and ceiling as scheduled.
   3. Door Size: As scheduled at the end of this Section.
   4. Materials:
      a. Painted Finishes: Uncoated Steel Sheet, nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
      b. Stainless Steel: Stainless Steel Sheet, nominal 0.062 inch (1.59 mm), 16 gage, ASTM A480/A480M No. 4 finish.
   5. Frame Material: Same material and thickness as door.
   6. Latch and Lock: Cam latch, screwdriver operated.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Exposed Flanges:
   1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
   2. Features:
      a. Upward-opening doors for ceilings.
   3. Locations: Wall and ceiling.

4. Door Size: As scheduled at the end of this Section.
5. Fire-Resistance Rating: Same rating as wall or ceiling in which it is located.
6. Temperature-Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
7. Materials:
    a. Painted Finishes: Uncoated Steel Sheet, nominal 0.036 inch (0.91 mm), 20 gage.
        1) Finish: Factory prime.
    b. Stainless Steel: Stainless-Steel Sheet, nominal 0.038 inch (0.95 mm), 20 gage ASTM A480/A480M.
        1) Finish: No. 4.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self-latching door hardware, operated by knurled-knob.

B. Fire-Rated, Flush Access Doors with Concealed Flanges:
1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
2. Features:
3. Locations: Wall and ceiling.
4. Door Size: As scheduled at the end of this Section.
5. Fire-Resistance Rating: Same rating as wall or ceiling in which it is located.
6. Temperature-Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
7. Materials:
    a. Painted Finishes: Uncoated Steel Sheet, nominal 0.036 inch (0.91 mm), 20 gage.
        1) Finish: Factory prime.
    b. Stainless Steel: Stainless-Steel Sheet, nominal 0.038 inch (0.95 mm), 20 gage ASTM A480/A480M.
    c. Finish: No. 4.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self-latching door hardware, operated by knurled-knob.

C. Fire-Rated, Recessed Access Doors with Concealed Flanges:
1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
2. Locations: Wall and ceiling.
3. Door Size: As scheduled at the end of this Section.
4. Fire-Resistance Rating: Same rating as wall or ceiling in which it is located.
5. Temperature-Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
6. Materials:
    a. Painted Finishes: Uncoated Steel Sheet, nominal 0.036 inch (0.91 mm), 20 gage.
        1) Finish: Factory prime.
    b. Stainless Steel: Stainless-Steel Sheet, nominal 0.038 inch (0.95 mm), 20 gage ASTM A480/A480M.
        1) Finish: No. 4.
7. Frame Material: Same material, thickness, and finish as door.

8. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled-knob.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666/A666M, Type 316. Remove tool and die marks and stretch lines, or blend into finish.

E. Stainless Steel Flat Bars: ASTM A666/A666M, Type 316. Remove tool and die marks and stretch lines, or blend into finish.

F. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063.

G. Aluminum Sheet: ASTM B209/B209M, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

H. Frame Anchors: Same material as door face.

I. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329/F2329M.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
   1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
   2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.
   1. For recessed doors with plaster infill, provide self-furring expanded-metal lath attached to door panel.

E. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

E. Stainless Steel Finishes:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: ASTM A480/A480M No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.
a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

3.4 ACCESS DOOR SCHEDULE

A. Wall and ceiling access doors are required:

1. Where specifically scheduled or noted on Drawings.
2. Where service access is required by Code.
3. Where service access is required for serviceable, operable, adjustable or re-settable fire suppression, plumbing, mechanical, electrical, life safety, security, and communications systems items.

B. Sizes: Unless noted otherwise on Drawings.
   1. Ceilings, Soffits: 24 inches by 24 inches.
      a. Refer to access requirements in applicable Divisions 21 through 28 Sections.
   2. Toilet Room Walls, Washroom Walls: 12 inches by 12 inches at fixture chase wall.

C. Provide stainless steel access doors in restroom, toilet room, locker room, operating room and other sterile areas, and food service area walls scheduled to receive ceramic tile finish, epoxy paint, or FRP panels.

END OF SECTION

SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulated service doors.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
      a. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
      b. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
   2. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
      a. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
      b. Wiring Diagrams: For power, signal, and control wiring.
   3. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
      a. Curtain Slats: 12 inches (305 mm) long.
      b. Bottom Bar: 6 inches (150 mm) long with sensor edge.
      c. Guides: 6 inches (150 mm) long.
      d. Brackets: 6 inches (150 mm) square.
      e. Hood: 6 inches (150 mm) square.

B. Informational Submitals:
   1. Delegated-Design Submittal: Overhead coiling doors, including support framing, connections, and related hardware shall be designed under the direct supervision of a Professional Structural Engineer experienced in the design of the work and licensed in the State of Massachusetts, using performance and design criteria, and requirements specified in this Section.
      a. Detail fabrication and assembly of seismic restraints.
      b. Summary of forces and loads on walls and jambs.
   2. Qualification Data: For qualified Installer.
   3. Seismic Qualification Certificates: For overhead coiling doors, accessories, and components, from manufacturer.

C. Closeout Submittals:

1. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
   1. Obtain operators and controls from overhead coiling door manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a Professional Structural Engineer licensed in the State of Massachusetts, using performance requirements and design criteria indicated.

B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
   1. Wind Loads: As indicated on Drawings.
   2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

C. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   2. Seismic Component Importance Factor: 1.5.

D. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

2.2 MANUFACTURERS

A. ACME Rolling Doors.

B. Cookson Company.

C. Cornell Iron Works, Inc.

D. McKeon Rolling Steel Door Company, Inc.

E. Overhead Door Corporation.

F. Raynor.

G. Wayne-Dalton Corp.

H. Windsor Door.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
   1. For Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A653/A653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm) and as required to meet requirements.
   2. For Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within slat faces.
   3. For Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
   4. For Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.

B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.

D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.
   1. Removable Posts and Jamb Guides for Counter Doors: Manufacturer's standard.

2.4 HOOD

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
   1. For Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A653/A653M.
   2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
   3. For Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.5 LOCKING DEVICES

A. Chain Lock Keeper: Suitable for padlock.
   1. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.6 CURTAIN ACCESSORIES

A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
   1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
   2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.

B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
   1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.

2.7 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

2.8 MANUAL DOOR OPERATORS

A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.

B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25 lbf (111 N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.9 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
   1. Comply with NFPA 70.
   2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA IA 10030, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.
   1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.

D. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 00001; with overload protection; sized to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
   1. Electrical Characteristics:
      a. Phase: Single phase.
      b. Volts: 115 V.
      c. Hertz: 60.
   2. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
   3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. For fire-rated doors, activation delays closing.

1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
   a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
   1. For Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA IA 10030, Type 1 enclosure.
   2. For Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA IA 10030, Type 4 enclosure, key operated.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.10 ELECTRIC DOOR ASSEMBLY

A. Electric Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

B. Operation Cycles: Not less than 50,000.
   1. Include tamperproof cycle counter.

C. Curtain R-Value: 11 average - with Isocyanuratene Insulation.

D. Door Curtain Material: Galvanized steel.

E. Door Curtain Slats: Flat profile slats of between 1-7/8-inch (48-mm) 3-1/4-inch (83-mm) center-to-center height.
   1. Insulated-Slat Interior Facing: Metal.

F. Curtain Jamb Guides: Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

G. Hood: Match curtain material and finish.
   1. Shape: Square.
   2. Mounting: As shown on Drawings.

H. Locking Devices: Equip door with locking device assembly and chain lock keeper.

I. Electric Door Operator:
   1. Usage Classification: Standard duty, up to 60 cycles per hour.
   2. Operator Location: As shown on Drawings.
   3. Motor Exposure: Interior.
   4. Emergency Manual Operation: Chain type.
   5. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar; self-monitoring type.
      a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.
   6. Remote-Control Station: Where shown on Drawings.

J. Door Finish:
   1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
   2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

K. Basis-of-Design: Reynor.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As indicated by manufacturer's designations..

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 08 34 73.13

METAL SOUND CONTROL DOOR ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal sound control door assemblies.

1.2 COORDINATION

A. Coordinate installation of anchorages for sound control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages. Deliver sleeves, inserts, anchor bolts, and items with integral anchors to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review procedures for coordinating frame and anchor installation with wall construction.
   2. Review required field quality-control procedures.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product. Include sound ratings, construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
   2. Shop Drawings: For sound control door assemblies.
      a. Include elevations of each door design.
      b. Include details of sound control seals, door bottoms, and thresholds.
      c. Include details of doors, including vertical- and horizontal-edge details and metal thicknesses.
      d. Include frame details for each frame type, including dimensioned profiles and metal thicknesses.
      e. Include locations of reinforcements and preparations for hardware.
      f. Include details of each different wall opening condition.
      g. Include details of anchorages, joints, field splices, and connections.
      h. Include details of accessories.
      i. Include details of moldings, removable stops, and glazing.
      j. Include details of conduits and preparations for power, signal, and control systems.

3. Schedule: Provide a schedule of sound control door assemblies prepared using same reference numbers for details and openings as those on Drawings. Coordinate with the Door Hardware Schedule.

B. Informational Submittals:
1. Qualification Data: For Installer, manufacturer, and acoustical testing agency.
2. Product Certificates: For each type of sound control door assembly.
3. Product Test Reports: For each sound control door assembly, for tests performed by manufacturer and witnessed by a qualified testing agency.
4. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
5. Field quality-control reports.
6. Sample Warranty: For manufacturer's special warranties.

C. Closeout Submittals:
1. Maintenance Data: For sound control door assemblies to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Avoid the use of nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sound control door assemblies that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Failure to meet sound rating requirements.
b. Faulty operation of sound seals.
c. Deterioration of metals, metal finishes, and other materials beyond normal use or weathering.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sound Rating: Provide sound control door assemblies identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:
   1. STC Rating: As indicated in the Door Schedule as calculated by ASTM E413 when tested in an operable condition according to ASTM E90.

B. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings[and temperature-rise limits] indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Smoke- and Draft Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.2 STEEL SOUND CONTROL DOORS

A. Manufacturers:
   1. AMBICO Limited.
   2. Ceco Door; AADG, Inc.; ASSA ABLOY.
   3. Curries, AADG, Inc.; ASSA ABLOY Group.
   4. Krieger Specialty Products Company.
   5. Overly Door Company.
   6. Pioneer Industries; AADG, Inc.; ASSA ABLOY.

B. Source Limitations: Obtain steel sound control door assemblies, including doors, frames, sound control seals, hinges, thresholds, and other items essential for sound control, from single source from single manufacturer.

C. Doors: Flush-design sound control doors, thickness as required to provide STC rating, of seamless construction; with manufacturer's standard sound-retardant core as required to provide STC and fire rating indicated. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges. Fabricate according to NAAMM-HMMA 865.
   1. Exterior Doors: Fabricate from metallic-coated steel sheet 0.052-inch (1.32-mm) nominal thickness or thicker as required to provide STC rating indicated.
   2. Interior Doors: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.048-inch (1.21-mm) nominal thickness or thicker as required to achieve STC rating indicated.
   3. Core: Manufacturer's standard sound control core.
   4. Loose Stops for Glazed Lites in Doors: Same material as face sheets.
   5. Top and Bottom Channels: Closed with continuous channels of same material as face sheets, spot welded to face sheets not more than 6 inches (152 mm) o.c.
   6. Hardware Reinforcement: Same material as face sheets.

D. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with G60 (Z180) zinc (galvanized) or A40 (ZF120) zinc-iron-alloy (galvannealed) coating designation.
4. Glazing: As required by sound control door assembly manufacturer to comply with sound control[and fire-rated-door labeling] requirements.

E. Finishes:
1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.3 SOUND CONTROL FRAMES

A. Frames: Fabricate sound control door frames with corners mitered, reinforced, and continuously welded the full depth and width of frame. Fabricate according to NAAMM-HMMA 865.

B. Weld frames according to NAAMM-HMMA 820.

C. Exterior Frames: Fabricate from metallic-coated steel sheet 0.079-inch (2.01-mm) nominal thickness or thicker as required to provide STC rating indicated.
1. Interior Frames: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.075-inch (1.90-mm) nominal thickness or thicker as required to provide STC rating indicated.
2. Hardware Reinforcement: Fabricate according to NAAMM-HMMA 865 of same material as face sheets.
3. Head Reinforcement: Metallic-coated steel channel or angle stiffener, 0.108-inch (2.74-mm) nominal thickness.
4. Jamb Anchors:
a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.064-inch (1.63-mm) nominal-thickness metallic-coated steel with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.156 inch (3.9 mm) thick.
b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.048-inch (1.21-mm) nominal-thickness uncoated steel unless otherwise indicated.
c. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter, metallic-coated steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
5. Floor Anchors: Not less than 0.079-inch (2.01-mm) nominal-thickness metallic-coated steel, and as follows:

a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

6. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- (9.5-mm-thick by 51-mm-) wide uncoated steel unless otherwise indicated.
7. Plaster Guards: Metallic-coated steel sheet, not less than 0.026 inch (0.6 mm) thick.

D. Materials:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with G60 (Z180) zinc (galvanized) or A40 (ZF120) zinc-iron-alloy (galvannealed) coating designation.
4. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A153/A153M, Class B.
5. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A153/A153M or ASTM F2329.
6. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching sound control door frames of type indicated.
7. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

E. Finishes:
1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.4 HARDWARE

A. Sound Control Door Hardware: Manufacturer's standard sound control system, including head and jamb seals, door bottoms, and thresholds, as required by testing to achieve STC and fire rating indicated.
1. Head and Jamb Seals:
a. Neoprene Compression Seals: One-piece units consisting of closed-cell sponge neoprene seal held in place by metal retainer, with retainer cover of same material as door frame; attached to door frame with concealed screws.
2. Automatic Door Bottoms: Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.

a. Mounting: Mortised or semimortised into bottom of door as required by testing to achieve STC rating indicated.

3. Door Bottoms: Neoprene or silicone gasket held in place by metal housing; mortised into bottom edge of door.
4. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from aluminum.
   a. Finish: Clear anodic finish.

B. Other Hardware: Comply with requirements in Section 08 71 00 - Door Hardware.

2.5 SOUND CONTROL ACCESSORIES

A. Glazing: Manufacturers' standard factory-installed glazing.

2.6 FABRICATION

A. Steel Sound Control Door Fabrication: Sound control doors to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.
   1. Comply with requirements in NFPA 80 for fire-rated and smoke control doors.
   2. Seamless Edge Construction: Fabricate doors with faces joined at vertical edges by welding; welds shall be ground, filled, and dressed to make them invisible and to provide a smooth, flush surface.
   3. Exterior Doors: Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
   4. Glazed Lites: Factory install glazed lites according to requirements of tested assembly to achieve STC rating indicated. Provide fixed stops and moldings welded on secure side of door.
   5. Hardware Preparation: Factory prepare sound control doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
      a. Reinforce doors to receive nontemplated mortised and surface-mounted door hardware.
      b. Locate door hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
   6. Tolerances: Fabricate doors to tolerances indicated in NAAMM-HMMA 865.

B. Sound Control Frame Fabrication: Fabricate sound control frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
   1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
4. Jamb Anchors: Provide number and spacing of anchors as follows:
5. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
    a. Two anchors per jamb up to 60 inches (1524 mm) in height.
        1) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
        2) Four anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
        3) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm), or fraction thereof, more than 96 inches (2438 mm) in height.
    b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
        1) Three anchors per jamb up to 60 inches (1524 mm) in height.
        2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
        3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm), or fraction thereof, more than 96 inches (2438 mm) in height.
        5) Two anchors per head for frames more than 42 inches (1066 mm) wide and mounted in metal-stud partitions.
    c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
6. Hardware Preparation: Factory prepare sound control frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
7. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
    a. Locate hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
8. Tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 865.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of sound control door frame connections before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace sound control door frames to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install sound control door assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.

B. Frames: Install sound control door frames in sizes and profiles indicated.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.
      b. At openings requiring smoke and draft control, install frames according to NFPA 105.
      c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, and dress; make splice smooth, flush, and invisible on exposed faces.
      d. Install sound control frames with removable glazing stops located on secure side of opening.
      e. Remove temporary braces only after frames or bucks have been properly set and secured.
      f. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Fully fill frames with mineral-fiber insulation.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Installation Tolerances: Adjust sound control door frames for squareness, alignment, twist, and plumbness to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Doors: Fit sound control doors accurately in frames, within clearances indicated below. Shim as necessary.
   1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
      a. Jambs: 1/8 inch (3 mm).
      b. Head with Butt Hinges: 1/8 inch (3 mm).
      c. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8 inch (9.5 mm).
      d. Sill: Manufacturer's standard.
      e. Between Edges of Pairs of Doors: 1/8 inch (3 mm).
   2. Fire-Rated Doors: Install fire-rated doors with clearances according to NFPA 80.

D. Sound Control Seals: Where seals have been factory prefit and preinstalled and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.

E. Thresholds: Set thresholds in full bed of sealant complying with requirements in Section 07 92 00 - Joint Sealants.

F. Glazing: Comply with installation requirements in Section 08 80 00 - Glazing and with sound control door assembly manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Perform testing for verification that assembly complies with STC rating requirements.
   1. Acoustical testing and inspecting agency shall select _____ sound control door(s) at random from sound control door assemblies that are completely installed for testing.
   2. Field tests shall be conducted according to ASTM E336, with results calculated according to ASTM E413. Acceptable field NIC values shall be within 5 dB of laboratory STC values.
   3. Inspection Report: Acoustical testing agency shall submit report in writing to Architect and Contractor within 24 hours after testing.
   4. If tested door fails, replace or rework all sound control door assemblies to bring them into compliance at Contractor's expense.
      a. Additional testing and inspecting at Contractor's expense will be performed to determine if replaced or additional work complies with specified requirements.

C. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and adjust seals, door bottoms, and other sound control hardware items right before final inspection. Leave work in complete and proper operating condition.

B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.

C. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.

D. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible, rust-inhibitive, air-drying primer.

E. Metallic-Coated Surfaces: Clean abraded areas of doors and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 34 73.16

WOOD SOUND CONTROL DOOR ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood sound control door assemblies.

1.2 COORDINATION

A. Coordinate installation of anchorages for sound control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages. Deliver sleeves, inserts, anchor bolts, and items with integral anchors to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review procedures for coordinating frame and anchor installation with wall construction.
   2. Review required field quality-control procedures.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product. Include sound ratings, construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
   2. Shop Drawings: For sound control door assemblies.
      a. Include elevations of each door design.
      b. Include details of sound control seals, door bottoms, and thresholds.
      c. Include details of doors, including vertical- and horizontal-edge details and metal thicknesses.
      d. Include frame details for each frame type, including dimensioned profiles and metal thicknesses.
      e. Include locations of reinforcements and preparations for hardware.
      f. Include details of each different wall opening condition.
      g. Include details of anchorages, joints, field splices, and connections.
      h. Include details of accessories.
      i. Include details of moldings, removable stops, and glazing.
      j. Include details of conduits and preparations for power, signal, and control systems.

3. Schedule: Provide a schedule of sound control door assemblies prepared using same reference numbers for details and openings as those on Drawings. Coordinate with the Door Hardware Schedule.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sound control door assemblies to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Avoid the use of nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wood sound control doors until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sound control door assemblies that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure to meet sound rating requirements.
      b. Faulty operation of sound seals.
      c. Deterioration of metal frames, metal finishes, and other materials beyond normal use or weathering.
         1) Warranty Period: Two years from date of Substantial Completion.
      d. Wood doors that are warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch (0.25 mm) in a 3-inch (0.01 inch (0.25 mm) in a 75-mm) span.

1) Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sound Rating: Provide sound control door assemblies identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:
   1. STC Rating: As indicated on Drawings as calculated by ASTM E413 when tested in an operable condition according to ASTM E90.

B. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Smoke- and Draft Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.2 WOOD SOUND CONTROL DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AMBICO Limited.
   2. Krieger Specialty Products Company.
   3. Overly Door Company.

B. Source Limitations: Obtain wood sound control door assemblies, including doors, frames, sound control seals, hinges, thresholds, and other items essential for sound control, from single source from single manufacturer.

C. Doors: Flush-design sound control doors, thickness as required to provide STC rating ; with manufacturer's standard sound-retardant core as required to provide STC and fire rating indicated. Fabricate according to WDMA 1.S.1-A.

D. Materials: Comply with Section 08 14 16 "Flush Wood Doors" for grade, faces, veneer matching, fabrication, finishing, and other requirements unless otherwise indicated.
   1. Glazing: As required by sound control door assembly manufacturer to comply with sound control and fire-rated-door labeling requirements.

E. Finishes:
   1. Factory finish sound control wood doors to match doors specified in Section 08 14 16 "Flush Wood Doors."

2.3 SOUND CONTROL FRAMES

A. Frames: Fabricate sound control door frames with corners mitered, reinforced, and continuously welded the full depth and width of frame. Fabricate according to NAAMM-HMMA 865.
   1. Weld frames according to NAAMM-HMMA 820.
   2. Exterior Frames and where induicated: Fabricate from metallic-coated steel sheet 0.079-inch (2.01-mm) nominal thickness or thicker as required to provide STC rating indicated.
   3. Interior Frames nit indicated to be galvanized: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.075-inch (1.90-mm) nominal thickness or thicker as required to provide STC rating indicated.
   4. Hardware Reinforcement: Fabricate according to NAAMM-HMMA 865 of same material as face sheets.
   5. Head Reinforcement: Metallic-coated steel channel or angle stiffener, 0.108-inch (2.74-mm) nominal thickness.
   6. Jamb Anchors:
      a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.064-inch (1.63-mm) nominal-thickness metallic-coated steel with corrugated or perforated straps not less than 2 inches (50.8 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.156 inch (3.96 mm) thick.
      b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.048-inch (1.21-mm) nominal-thickness uncoated steel unless otherwise indicated.
      c. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter, metallic-coated steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
   7. Floor Anchors: Not less than 0.079-inch (2.01-mm) nominal-thickness metallic-coated steel, and as follows:
      a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
      b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.
   8. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- (9.5-mm-thick by 50-mm-) wide uncoated steel unless otherwise indicated.

B. Materials:
   1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
   2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
   3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with G60 (Z180) zinc (galvanized) or A40 (ZF120) zinc-iron-alloy (galvannealed) coating designation.
   4. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A153/A153M, Class B.

5. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A153/A153M or ASTM F2329.
6. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching sound control door frames of type indicated.
7. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

C. Finishes:
1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.4 HARDWARE

A. Sound Control Door Hardware: Manufacturer's standard sound control system, including head and jamb seals, door bottoms, and thresholds, as required by testing to achieve STC and fire rating indicated.
1. Head and Jamb Seals:
a. Neoprene Compression Seals: One-piece units consisting of closed-cell sponge neoprene seal held in place by metal retainer, with retainer cover of same material as door frame; attached to door frame with concealed screws.
2. Automatic Door Bottoms: Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.
a. Mounting: Mortised or semimortised into bottom of door as required by testing to achieve STC rating indicated.
3. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from aluminum.
a. Finish: Clear anodic finish.

B. Other Hardware: Comply with requirements in Section 08 71 00 "Door Hardware."

2.5 SOUND CONTROL ACCESSORIES

A. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.6 FABRICATION

A. Wood Sound Control Door Fabrication: Factory fit doors to suit frame-opening sizes indicated, with uniform clearances and bevels according to WDMA I.S.1-A unless otherwise indicated. Comply with final door hardware schedules and hardware templates.
1. Comply with requirements in NFPA 80 for fire-rated and smoke control doors.

2. Glazed Lites: Factory install glazed lites according to requirements of tested assembly to achieve STC rating indicated.
3. Locate door hardware as indicated, or if not indicated, according to DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
    a. Coordinate measurements of hardware mortises in steel frames to verify dimensions and alignment before factory machining.

B. Sound Control Frame Fabrication: Fabricate sound control frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
    1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
    2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
    3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
    4. Jamb Anchors: Provide number and spacing of anchors as follows:
        a. Masonry Type: Locate anchors not more than 18 inches (457.2 mm) from top and bottom of frame. Space anchors not more than 32 inches (812.8 mm) o.c. and as follows:
            1) Two anchors per jamb up to 60 inches (1524 mm) in height.
            2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
            3) Four anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
            4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (609.6 mm), or fraction thereof, more than 96 inches (2438.4 mm) in height.
        b. Stud-Wall Type: Locate anchors not more than 18 inches (457.2 mm) from top and bottom of frame. Space anchors not more than 32 inches (812.8 mm) o.c. and as follows:
            1) Three anchors per jamb up to 60 inches (1524 mm) in height.
            2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
            3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
            4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (609.6 mm), or fraction thereof, more than 96 inches (2438.4 mm) in height.
            5) Two anchors per head for frames more than 42 inches (1066.8 mm) wide and mounted in metal-stud partitions.
        c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152.4 mm) from top and bottom of frame. Space anchors not more than 26 inches (660.4 mm) o.c.

5. Hardware Preparation: Factory prepare sound control frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
   a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
6. Tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 865.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of sound control door frame connections before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace sound control door frames to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch (1.59 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch (1.59 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install sound control door assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.

B. Frames: Install sound control door frames in sizes and profiles indicated.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.

b. At openings requiring smoke and draft control, install frames according to NFPA 105.
c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, and dress; make splice smooth, flush, and invisible on exposed faces.
d. Install sound control frames with removable glazing stops located on secure side of opening.
e. Remove temporary braces only after frames or bucks have been properly set and secured.
f. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Fully fill frames with mineral-fiber insulation.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces. Fully fill frames with mineral-fiber insulation.
5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces. Fully fill frames with mineral-fiber insulation.
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Installation Tolerances: Adjust sound control door frames for squareness, alignment, twist, and plumbness to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch (1.59 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.59 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a perpendicular line from head to floor.

C. Doors: Fit sound control doors accurately in frames, within clearances indicated below. Shim as necessary.
1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
   a. Jambs: 1/8 inch (3.18 mm).
   b. Head with Butt Hinges: 1/8 inch (3.18 mm).

c. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8 inch (9.52 mm).
d. Sill: Manufacturer's standard.
e. Between Edges of Pairs of Doors: 1/8 inch (3.18 mm).

2. Fire-Rated Doors: Install fire-rated doors with clearances according to NFPA 80.

D. Sound Control Seals: Where seals have been factory prefit and preinstalled and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.

E. Thresholds: Set thresholds in full bed of sealant complying with requirements in Section 07 92 00 "Joint Sealants."

F. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with sound control door assembly manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (228.6 mm) o.c. and not more than 2 inches (50.8 mm) o.c. from each corner.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Perform testing for verification that assembly complies with STC rating requirements.
1. Acoustical testing and inspecting agency shall select sound control door(s) at random from sound control door assemblies that are completely installed for testing.
2. Field tests shall be conducted according to ASTM E336, with results calculated according to ASTM E413. Acceptable field NIC values shall be within 5 dB of laboratory STC values.
3. Inspection Report: Acoustical testing agency shall submit report in writing to Architect and Contractor within 24 hours after testing.
4. If tested door fails, replace or rework all sound control door assemblies to bring them into compliance at Contractor's expense.
a. Additional testing and inspecting at Contractor's expense will be performed to determine if replaced or additional work complies with specified requirements.

C. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and adjust seals, door bottoms, and other sound control hardware items right before final inspection. Leave work in complete and proper operating condition.

B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.
1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.

C. Prime-Coat Touchup: Immediately after erection of frames, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible, rust-inhibitive, air-drying primer.

D. Metallic-Coated Surfaces: Clean abraded areas of frames and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 35 14

ACCORDION FIRE DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Accordion fire doors.

1.2 SYSTEM REQUIREMENTS

A. Design Requirements: Electrically operated, self-closing, UL approved accordion folding fire rated assembly, top supported from overhead track without floor guides, compete with hardware, seals, track, motor operators, closing devices, controls and accessories necessary for intended operation.
   1. Self-closing operation initiated by signal from fire alarm system.
   2. Controls: Allow manual operation in either conventional or emergency mode. When opened manually during emergency mode, control mechanism automatically closes assembly.
   3. Designed to remain in normal open (stacked) position; equip with automatic closing system.
   4. Fire Rating: As indicated on the Drawings.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Include color charts for finishes indicating manufacturer's standard colors available for selection.
   2. Shop Drawings: Indicate following:
      a. Fabrication and installation details not shown on manufacturer's literature.
      b. Fire-Release System: Describe system, including testing and resetting instructions.
      c. Fully dimensioned layout showing details of conditions at head, jambs, and sill.
      d. Dimensions of stacked assemblies and total weight in stacked position.
      e. Materials and components used in fabricating assemblies.
      f. Materials and components for suspension system, tracks, seals and associated hardware.
      g. Electronic operating and control mechanisms.
      h. Access requirements, include sizes and locations.
   3. Samples for Verification:
      a. Submit assemblies showing panel construction, trim, and seal arrangements.
      b. Submit 3 by 6 inch minimum size panel sections indicating quality of finish in selected colors.

B. Informational Submittals:
   1. Product Certificates: For each type of fire-rated folding door, signed by product manufacturer.
   2. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-rated folding doors. Include the following:
      a. Name of manufacturer submitting test specimen.
      b. Detailed description of specimen tested, including weights.
      c. Date of test.
      d. Testing laboratory's identification or test number.
      e. Testing procedures employed.
      f. Results of test.
      g. Signature of independent laboratory's official attesting report.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual authorized, approved, or licensed by fire-rated folding door manufacturer to install manufacturer's products.

B. Fire-Test-Response Characteristics: Provide folding doors with the following fire-test-response characteristics, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
   1. Surface-Burning Characteristics: As follows, per ASTM E 84:
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.

C. Fire-Rated Folding Doors: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify folding door openings and storage arrangements by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordinate provisions for electrical service, sensing devices and final connections.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Manufacture:
   1. Won-Door
   2. McKeon,
   3. Overhead

B. Basis of Design: FireGuard by Won-Door Corporation

2.2 ACCORDION FIRE DOOR MATERIALS AND COMPONENTS

A. Panel Construction:
   1. Two parallel wall assemblies independently suspended with no interconnections except at lead posts.
   2. Formed steel, 24 gage, specifically formed (V-groove) for maximum strength and resilience, connected by formed steel hinges.

B. Fire Insulation:
   1. Cover interior surface of both walls with continuous fire resistant blanket, secured to each panel with patented metal clip system.
   2. Extend fire insulation from bottom edge of panels to tracks, and meet at interior centers of fixed jamb and lead post, forming effective fire barrier.

C. Perimeter Seal: Provide each wall of dual system with extruded vinyl sweep top and bottom, forming effective smoke and draft seal.

D. Track and Trolley System:
   1. Two parallel tracks on 8 inch centers, 14 gage steel, with positive alignment and integral directional guides.
   2. Support each panel by steel hanger pin and 1-1/4 inch diameter double-race ball bearing rollers.

E. Lead Posts: Formed 24 gage steel, connected to double walls by specifically adapted panels, and equipped with manufacturer's standard handle on each side.

F. Operators and Controls:
   1. Operators: Factory assembled power drive unit consisting of motor, control box, limit switches, torque limiting devices, clutch, reversing magnetic motor control, leading edge obstruction detectors, and rest key switch control for conventional operation.
      a. Motor: 1/2 HP, controlled by reversing magnetic starter and equipped with overload protection.
      b. Limit Switches: Provide to prevent over-travel.
      c. Roller Chain: Connected to lead posts by means of vertical stabilizer bar assembly.
      d. Travel Speed: 18 inches per second maximum; 6 inches per second minimum.
   2. Electrical Service: Equip for 120 volt, single phase, 60 cycle, AC current.
   3. Battery:
      a. Electrical current connected through relay to battery charger that continuously charges 12 volt DC battery, automatically maintains battery at capacity.
      b. Automatic audible signal device to sound off when battery falls below proper charge or exceeds proper charge, when power loss has occurred, or when high AC line voltage has been experienced.
   4. One exit device with "exit" spelled in English and Spanish.

2.3 FINISHES

A. Baked enamel finish for panels and hinges in colors selected by Architect from manufacturer's full range of standard colors.

1. Manufacturer's standard finish for handles.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of folding doors, and the following:
   1. Verify that headers are level with finished floor to within plus or minus 1/16-inch (1.6-mm) tolerance over the entire length of opening.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. For folding doors supported by or anchored to permanent construction, advise installers of specific requirements for placement of anchorage devices. Furnish installers of other work with templates and drawings showing locations of anchorage devices and similar items.

B. In path of fire-rated folding doors, level floor with header to tolerance of plus or minus 1/16 inch (1.6 mm) across opening; grind or fill floor as necessary.

3.3 INSTALLATION

A. Install plumb and level in accordance with manufacturer's installation instructions and recommendations, and approved Shop Drawings, anchored securely and adjusted for smooth and easy operation.
   1. Comply with NFPA 80 for installing fire-rated folding doors.

B. Standard Floor Clearances: 1/4 to 3/4 inch (6.4 to 19 mm) maximum (above floor finish).
   1. Comply with NFPA 80 for clearances required for fire-rated folding doors.

C. Coordinate provisions for electrical service, sensing devices, and final connections for fire-rated folding doors.

3.4 FIELD QUALITY CONTROL

A. After installation, conduct inspection in presence of Architect, Owner's Representative, and local Fire Official.
   1. Demonstrate self-closing mechanism when in fire mode.
   2. If installation is found significantly deficient by services of independent consultant or testing laboratory, correct work to meet specified requirements.

3.5 ADJUSTING

A. Adjust units as necessary to ensure smooth, quiet operation without warping or binding. Check and readjust operating hardware so latches engage accurately and securely without forcing or binding.
   1. Fire-Rated Folding Doors: Verify that all operations are functional and meet requirements of authorities having jurisdiction.

B. Pocket Doors: Adjust to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to **train** Owner's maintenance personnel to adjust, operate, and maintain fire-rated folding doors. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 08 36 13

SECTIONAL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

D. Stop-Go lights.

1.2 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

C. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

E. DASMA 102 - American National Standard Specifications for Sectional Doors.

F. ITS (DIR) - Directory of Listed Products.

G. NFPA 70 - National Electrical Code.

H. UL (DIR) - Online Certifications Directory.

I. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Delegated-Design Submittal: Sectional Doors, connections and related hardware shall be designed under the direct supervision of a Professional Structural Engineer experienced in the design of the work and licensed in the State of Michigan, using performance and design criteria, and requirements specified in this Section.

E. Samples: Three panel finish samples, in manufacturer's standard size, illustrating color and finish.

F. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

G. Manufacturer's qualification statement. Manufacturer 's certificate that products meet or exceed specified requirements.

H. Installer's qualification statement.

I. Operation Data: Include normal operation, troubleshooting, and adjusting.

J. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

K. Specimen warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience. Approved by manufacturer, and an authorized distributor of the manufacturer in order to ensure accessibility to parts, updated product changes, recalls, and warranty claims.

C. Comply with applicable code for motor and motor control requirements.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.5 WARRANTY

A. Manufacturer Warranty:
1. Component parts to be free from defects in material and workmanship for a period of one (1) year from installation date.
2. Door shall be free from delamination for ten (10) years from installation date.
3. Insulation shall maintain its R-Value for twenty (20) years from installation date.
4. Provide 5-year manufacturer warranty for electric operating equipment. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a Professional Structural Engineer licensed in the State of Massachusetts, using performance requirements and design criteria indicated.

B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
   1. Wind Loads: As indicated on Drawings.
   2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

C. Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.

D. Air Leakage Rate: Less than 0.40 cfm/sq ft (2.0 L/sec/sq m) when tested in accordance with ASTM E283/E283M at test pressure difference of 1.57 psf (75 Pa).

2.2 MANUFACTURERS

A. Sectional Doors:
   1. C.H.I. Overhead Doors www.chiohd.com/#sle.
   2. Clopay Building Products www.clopaydoor.com/#sle.
   3. Raynor Garage Doors www.raynor.com/#sle.

B. Basis of Design: Raynor Garage Doors; Product TM Series, "TM320".

2.3 PERFORMANCE REQUIREMENTS

A. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.

B. Air Leakage Rate: Less than 0.40 cfm/sq ft (2 L/sec/sq m) when tested in accordance with ASTM E283/E283M at test pressure difference of 1.57 psf (75 Pa).

C. Thermal Conductivity: Minimum R-Value of 24.54 (U Value of .04), calculated in accordance with ASTM C518 and DASMA Technical Data Sheet #163. Insulation must not be manufactured with nor contain chlorofluorocarbons (CFC) which are known to have harmful effects on the earth' s ozone layer and the environment.

D. Door Nominal Thickness: 3 inches thick.

2.4 STEEL DOORS

A. Type SSD-1 - Doors: Flush steel, insulated; Lift height as indicated on the Drawings, operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Door Panels: Steel construction; outer steel sheet of 20 gauge, 0.0359 inch (0.91 mm) minimum thickness, flush profile; inner steel sheet of 26 gauge, 0.0188 inch (0.45) mm) minimum thickness, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.
   2. Door Nominal Thickness: 3 inches (76 mm) thick.
   3. Glazed Sections: Aluminum Sections with full view insulated glass.
   4. Electric Operation: Electric control station.

2.5 ALUMINUM DOOR SECTIONS

A. Door sections: Stile and rail aluminum with glazed panels;
   1. Door Nominal Thickness: 3 inches (75 mm) thick.
   2. Glazed Lites: Full panel width, set in place with resilient glazing channel.
      a. Glazing: Fully tempered glass; insulated glass units; Low e coated, see Section 08 80 00 - Glazing.

2.6 COMPONENTS

A. Track: Rolled galvanized steel, 0.125 inch thick; 3 inch wide, continuous one piece per side, fully adjustable for adequate sealing of door to jamb or weatherseal; floor-to-header angle mount galvanized steel mounting brackets not less than 1/8 inch thick and minimum 3-1/2 x 5 inch size.
   1. Configuration Type: As indicated on drawings.
   2. Tracks to be continuous angle mounted and fully adjustable for sealing door to jamb. Continuous angle mount to be not less than 16-gauge steel angle, 2-5/16'' x 4'' for 3-inch track. Horizontal track to be adequately reinforced with continuous angle.
   3. Doors over 12 ft. high must be center hung by using 2 x 2 galvanized hanger angle.
   4. Ensure that transitions between adjacent sections of track are smooth and without gaps.
   5. Provide graduated seal for weathertight closing.
   6. Provide center hanger on tracks for door over 12'-0" high: 2" x 2" galvanized hanger angles.
   7. Provide continuous angle reinforcement for horizontal tracks.
   8. Provide manufacturer's standard stop at the end of the track.
   9. Ensure that transitions between adjacent sections of track are smooth and without gaps.
   10. Furnish and install all supplemental steel framing required to hang track from roof support structure.

B. Hinges, Brackets, and Roller Assemblies: Full heavy-duty hinges, brackets, and adjustable roller holders of galvanized steel; 3" diameter heavy duty, floating hardened steel bearing rollers with minimum ten (10) ball bearings, located at top and bottom of each panel, each side.

C. Lift Mechanism: Heavy-duty, oil-tempered wire torsion springs on a continuous ball-bearing cross head shaft, with heavy-duty oil-tempered braided galvanized, aircraft type steel lifting cables with a minimum safety factor of 5.
   1. Spring Requirements: 100,000 cycles.

D. Weatherstripping shall be replaceable without removal of track, angle mounting, or door hardware

E. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

F. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

G. Head Weatherstripping: EPDM rubber seal, one piece full length.

H. Panel Joint Weatherstripping: Dual durometer vinyl extrusion, one-piece full length to form an effective thermal break and a complete weather-tight seal along section joint., one piece full length.

2.7 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating, plain surface.

B. Float Glass: Provide float glass glazing, unless noted otherwise.
   1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

C. Insulation: Foamed-in-place polyurethane, bonded to facing.

D. Windows:
   1. Frames: Aluminum.
   2. Glass: Tempered insulating glass, one inck thick, Low-E, See Section 08 80 00 - Glass.

2.8 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure:
      a. Continuous Duty Industrial – 1/2 hp.; manually operable in case of power failure, belt-drive, jackshaft with transit speed of 6 to 12 inches per second.
      b. 115/230V, single phase, 60 Hz. Verify with power supplied.

3. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
4. Controller Enclosure: NEMA 250, Type 1.
5. Opening Speed: 6 to 12 inches per second.
6. Brake: Adjustable friction clutch type, activated by motor controller.
7. Manual override in case of power failure.
8. Refer to Section 260583 for electrical connections.
9. Duty Cycle: 30 cycles/hour.

C. Motor: NEMA MG1, Type 1; separate from reduction mechanism for ease of maintenance.

D. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

E. Roller Chain Drive – door shall be driven by roller chain at 6" to 12" per second.

F. Reduction Mechanism: V-belt drive from motor to full ball bearing power train with additional reduction by chain and sprockets. All power train shafts shall be minimum 3/4" diameter.

G. Adjustable Friction Clutch shall be provided to protect door and operator if door movement is obstructed.

H. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

I. Electric Operator: Jackshaft; adjustable safety friction clutch; electro-mechanical type brake system actuated by solenoid motor starter; enclosed, positive chain drive screw type limit switch, enclosed in electrical control box, easily accessible for precision setting; heavy duty, enclosed magnetic cross line reversing starter with mechanical interlock; auxiliary contact type SR2 wiring; mounting brackets and hardware; with hoist.

J. Obstruction Detection Devices:
1. Equip motorized door with indicated external automatic safety sensors capable of protecting full width of door opening. Activation of either device immediately stops and reverses downward door travel.
2. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
   a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
   b. Provide one sensor at 6” height AFF and one at the mid-point height of the forwardmost part of apparatus of the truck using the door.
   c. Activation of device immediately stops and reverses downward door travel.
3. Master Control Station: Three button (open-close-stop) SR5 momentary contact -type control for each electric lifting hoist operator. See drawing A17-32 for details.
   a. 24-volt circuit
   b. Recess mounted.

4. Open override feature. Open button, and Photoelectric Sensor will reverse door to open position when door is closing.
5. Configure and provide wiring to open door closest to Watch Room one foot when emergency carbon monoxide gas exhaust fan system is activated. Emergency exhaust fan system is independent of vehicle exhaust fan system. Coordinate this action with Mechanical and Electrical Subcontractors.
6. Provide an additional override to allow the door to be closed completely at end of carbon monoxide exhaust operation.
7. Configure and provide wiring to start vehicle exhaust fan system when door is being opened and then shut the fan(s) off when the doors are fully closed with an override control
8. Provide recessed mounted control stations in Watch Room wall per Drawings and Architect's direction. Control stations shall operate all doors with open-close-stop from Watch Room. Provide individual switches with pilot lights for each door. Pilot lights to show door closed (red) and door open (green). Provide Long Wiring Kit to ensure proper voltage for multiple push button stations. Provide a brushed stainless steel bezel with finished edges for installation of the switches. See Drawings for all remaining information.
   a. Product: Raynor Model PBS-3, 3-button push button switch assembly.
9. Overload Protection: Provide manual reset for overload protection. All electrical components shall be in NEMA 1 enclosures.
10. Stop-Go Light: Red and green, stop-go lights at each door that indicate fully open-fully closed installed as Semi-recessed application to assure in-wall installation of all low-voltage signal wiring from stop-go lights up to control board located on the electric motor hoist assembly; Model RGL24LY (Safety Yellow Housing) as manufactured by *Lift Master*.
11. Receivers and Transmitters:
    a. Receivers: Provide a receiver to operate each overhead door.
    b. Hand-Held Transmitter: Digital control, resettable; four channel, four button; required for all Building sectional doors.

K. Emergency Manual Operation
1. Emergency Operation Disconnect Device – Equip operator with hand- operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
   a. Manual operation: Hand chain.

2.9 FINISHES

A. Aluminum Finishes:
1. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Color and Gloss: Match Architect's sample.

B. Steel finishes:
   1. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Color and Gloss: Match Architect's sample..

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

C. Correct unsatisfactory conditions before installing doors. Beginning installation shall constitute acceptance of related work and corrected existing conditions by Installer and Contractor.

3.2 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.3 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Tracks:
   1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
   2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door operating equipment.
   3. Repair galvanized coating on tracks according to ASTM A780.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

G. Complete door control, operating device, and unit component connections to other building systems.

H. Select, identify, and locate controls so safety of users and protection of property and vehicles is ensured.

I. Provide inserts, anchors, hangers, brackets, moldings, seal strips, and welding as needed to make door assembly secure against air pressure, operating loads and intrusion, and so that air infiltration is held to minimum.

J. Conceal bolt heads so that access cannot be made from outside.

K. Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces. Repair galvanizing to comply with ASTM A780.

3.4 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch (1.5 mm).

B. Maximum Variation from Level: 1/16 inch (1.5 mm).

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch (3 mm) from 10 ft (3 m) straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.5 SYSTEM STARTUP

A. Engage a factory-authorized service representative to perform system startup after door assemblies are complete and connected to other building systems.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Follow manufacturer's written instructions.

3.6 ADJUSTING

A. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

B. Adjust door assembly for smooth operation and full contact with weatherstripping, maintaining airtightness and watertightness around the entire perimeter, under all conditions of normal and emergency use. Contractor will perform this task as needed until Final Completion of the project.

C. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

D. Lubricate bearings and sliding parts as recommended by manufacturer.

3.7 CLEANING

A. Clean doors and frames.

B. Remove labels and visible markings.

C. Comply with manufacturer's written recommendations for final cleaning and maintenance.

D. Clean doors and frames and glazing immediately after installation. Avoid damaging protective coatings and finishes.

E. Remove excess sealants, glazing materials, dirt, and other substances.

F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.8 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior storefront framing.

B. Interior storefront framing.

C. Storefront framing for ribbon walls.

D. Storefront framing for punched openings.

E. Exterior manual-swing entrance doors and door-frame units.

F. Interior manual-swing entrance doors and door-frame units.

G. Aluminum Plate Frame at Metal Panel locations.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of product.
    a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
    a. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
    b. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
        1) Joinery, including concealed welds.
        2) Anchorage.
        3) Expansion provisions.
        4) Glazing.
        5) Flashing and drainage.
    c. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

3. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
4. Delegated-Design Submittal: Aluminum-framed entrances and storerfont systems, including support framing, connections, and related hardware shall be designed under the direct supervision of a Professional Structural Engineer experienced in the design of the work and licensed in the State of Massachusetts, using performance and design criteria, and requirements specified in this Section.

B. Informational Submittals:
1. Qualification Data: For Installer.
2. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
a. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
3. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
4. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
5. Source quality-control reports.
6. Field quality-control reports.
7. Sample Warranties: For special warranties.

C. Closeout Submittals:
1. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
2. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.

1.5 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Special Warranty: Manufacturer and Installer agree(s) to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration created by wind and thermal and structural movements.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Water penetration through fixed glazing and framing areas.
      e. Failure of operating components.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a Professional Structural Engineer licensed in the State of Massachusetts, as defined in Section 01 40 00 - Quality Requirements, to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.
      e. Failure of operating units.

C. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

E. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Fixed Framing and Glass Area:
      a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
   2. Entrance Doors:

a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

J. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.43 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.22 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 65 as determined according to NFRC 500.

K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

L. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

M. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

A. Arcadia.

B. Kawneer North America.

C. Oldcastle BuildingEnvelope.

D. United States Aluminum.

E. YKK AP America Inc.

F. Basis of Design:
1. Oldcastle;
a. MS-375TC / WS-500TC Wide Stile Door (with a System U-Value = 0.431)

G. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on two sides and structural sealant on two sides.
3. Glazing Plane: Front.
4. Finish: High-performance organic finish.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).

c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
   1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   2. Door Design: As indicated.
   3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
      a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 - Door Hardware.

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.
   1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
   2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
   3. Opening-Force Requirements:
      a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
      b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

C. Cylinders: As specified in Section 08 71 00 - Door Hardware.

D. Weather Stripping: Manufacturer's standard replaceable components.
   1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
   2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

E. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

F. Silencers: BHMA A156.16, Grade 1.

2.6 GLAZING

A. Glazing: Comply with Section 08 80 00 - Glazing.

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

E. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
   1. Color: As selected by Architect from manufacturer's full range of colors.

G. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
   1. Color: Match structural sealant.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
   1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using shear-block system.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: PPG: Cafe Noir.

2.10 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 - Joint Sealants to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 08 80 00 - Glazing.

F. Install weatherseal sealant according to Section 07 92 00 - Joint Sealants and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
   2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
      c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
   4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage and Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
      a. Perform a minimum of two tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:
   1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
   2. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION

SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coventionally glazed aluminum curtain walls.

B. Two-sided, structural-sealant-glazed aluminum curtain walls.

C. Insulated metal spandrel panels.

D. Vent windows.

E. Sun-control.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
      a. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
      b. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
         1) Joinery, including concealed welds.
         2) Anchorage.
         3) Expansion provisions.
         4) Glazing.
         5) Flashing and drainage.
         6) Window and door position switches and concealed wiring.
      c. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
   3. Delegated-Design Submittal: Glazed aluminum curtain wall systems, including support framing, connections, and related hardware shall be designed under the direct supervision of a Professional Structural Engineer experienced in the design of the work and licensed in the State of Massachusetts, using performance and design criteria, and requirements specified in this Section.

B. Informational Submittals:
   1. Qualification Data:
      a. For Installer.
      b. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.
   2. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
      a. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
   3. Product Test Reports: For glazed aluminum curtain walls, for tests performed by manufacturer and witnessed by a qualified testing agency.
   4. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
   5. Source quality-control reports.
   6. Field quality-control reports.
   7. Sample Warranties: For special warranties.

C. Closeout Submittals:
   1. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.
   2. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
   1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of curtain wall assemblies.

1.5 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Provide mock-up in accordance with provisions of Section 01 43 39
   2. Build mockup of typical wall area as shown on Drawings.
   3. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
   4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Special Assembly Warranty: Manufacturer and Installer agree(s) to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration created by wind and thermal and structural movements.
      c. Deterioration of metals and other materials beyond normal weathering.
      d. Water penetration through fixed glazing and framing areas.
      e. Failure of operating components.
   2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage Professional Structural Engineer licensed in the State of Massachusetts, as defined in Section 01 40 00 - Quality Requirements, to design glazed aluminum curtain walls.

B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.
      e. Failure of operating units.

C. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
      a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
   3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
      a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch (6. 35-mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).

E. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Fixed Framing and Glass Area:
      a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.28, as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.29 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 65 as determined according to NFRC 500.

L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
   a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
   b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).

M. Structural-Sealant Joints:
1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

N. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
   1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
   2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

A. Arcadia, Inc.

B. Kawneer North America.

C. Oldcastle BuildingEnvelope.

D. Shuco US LP.

E. United States Aluminum.

F. YKK AP America Inc.

G. Basis of Design Products:
   1. Oldcastle:
      a. Reliance HTC 2-1/2” x 7-1/4” Curtainwall (with a System U-Value = 0.269)
      b. Reliance HTC 2-1/2” X 10” Curtainwall (with a System U-Value = 0.27)
      c. TCR-225 2-1/4” X 5” Window Wall, using SSG Mullions (available details provided show system use with 1-inch IGU’s, but it can accept 1-3/4”) (with a System U-Value = 0.279)
      d. WS-500 TC Wide Stile Door (with a System U-Value = 0.431)
      e. Signature Series 3375 3-3/4” Overall Sightline Casement Window (Not Zero-Sightline) (with a System U-Value = 0.32)

H. Source Limitations: Obtain all components of curtain wall system, including framing, entrances and accessories from single manufacturer.

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Construction: Thermally broken.
   2. Glazing System: Retained mechanically with gaskets on four sides and Retained mechanically with gaskets on two sides and structural sealant on two sides.
   3. Glazing Plane: Front.
   4. Finish: High-performance organic finish.
   5. Fabrication Method: Either factory- or field-fabricated system.

B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
   1. Include snap-on aluminum trim that conceals fasteners.

2. Provied extended trim where indicated.

C. Extruded Aluminum Interior Stools: 0.90 inch thickness, finished to match curtain wall.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

E. Shadow box back pans: Provide 0.090-inch thickness back pans shadow box spandrel areas, both sides of insulation. At fire-rated construction provide steel backpan, instad of aluminum at fire-safing.
1. Color: As selected by Architect from Manufacturer’s standards.

2.4 INSULATED SPANDREL PANELS

A. Insulated Spandrel Panels: Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.
1. Overall Panel Thickness: As indicated.
2. Exterior Skin: Aluminum.
a. Thickness: Manufacturer's standard for finish and texture indicated.
b. Finish: Match framing system.
c. Texture: Smooth.
d. Backing Sheet: 1/8-inch- (3.2-mm-) thick, tempered hardboard.
3. Interior Skin: Aluminum.
a. Thickness: Manufacturer's standard for finish and texture indicated.
b. Finish: Matching curtain-wall framing.
c. Texture: Smooth.
d. Backing Sheet: 1/8-inch- (3.2-mm-) thick, tempered hardboard.
4. Thermal Insulation Core: Manufacturer's standard rigid, closed-cell, polyisocyanurate board.
5. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 50 or less.

B. Glazing: As specified in Section 08 80 00 "Glazing".

C. Finish: Match adjacent glazed aluminum curtain-wall finish.

2.5 ENTRANCES

A. Entrances: Comply with Section 08 41 13 - Aluminum-Framed Entrances And Storefronts.

2.6 VENT WINDOWS

A. Project out casement.

B. Minimum Performance Class: AW.

C. Minimum Performance Grade: 50.

D. Energy Performance: Certify and label energy performance according to NFRC as follows:
   1. Thermal Transmittance (U-factor): Operable whole-window U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
   2. SHGC: Operable whole-window SHGC of no greater than 0.40 as determined according to NFRC 200.
   3. Condensation Resistance: Operable whole-window NFRC-certified condensation resistance rating of no less than 55 as determined according to NFRC 500.

E. Window Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, or bronze; including the following:

F. Glazing: Same as adjacent glazed aluminum curtain-wall glazing.

G. Finish: Match curtain wall framing.

2.7 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
   1. Type and Location: Full, inside for project-out sashes.

B. Aluminum Frames: Complying with SMA 1004 or SMA 1201.

C. Glass-Fiber Mesh Fabric: 18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.
   1. Mesh Color: Manufacturer's standard.

2.8 LOUVERS

A. See Section 08 91 21 - Wind-Driven Rain-Resistant Louvers.

2.9 SUN CONTROL

A. Sunshades: Assemblies consisting of manufacturer's standard or custom outrigger brackets, designed for attachment to curtain wall with mechanical fasteners.
   1. Orientation: Vertical.
   2. Projection from Wall: As indicated on Drawings.
   3. Perforated aluminum plate fins:
      a. Thickness: 3/8 inch, unl;ess otherwise indicated.
      b. Perforation pattern: As indicated on the Drawings, or if not indicated, as selected by the Architect, with 1-inch perimeter margine.
   4. Finish: Match adjacent glazed aluminum curtain wall.

2.10 GLAZING

A. Glazing: Comply with Section 08 80 00 - Glazing.

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: Comply with Section 08 80 00 - Glazing.
   1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less.
   2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.
   1. Color: As selected by Architect from manufacturer's full range of colors.

E. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.
   1. Color: Match structural sealant.

2.11 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.

D. Structural Profiles: ASTM B308/B308M.

E. Steel Reinforcement:
   1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
   2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.12 ALUMINUM TRIM ACCESSORIES

A. Formed Closures Trim Pieces:
   1. ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance requirements.
      a. Jambs / Brake Metal Closures.
         1) Thickness: 0.090 inches (2.38 mm).

2) Finish: Matching framing system.
3) Texture: Smooth.

b. Interior trim at abutting partitions:
1) Thickness: 0.090 inches (2.38 mm).
2) Finish: Matching framing system.
3) Texture: Smooth.

c. Sills:
1) Thickness: 0.090 inches
2) Finish: Matching framing system.
3) Texture: Smooth.
4) Joint backing plate: Aluminum 0.040 inches thickness.
5) Joint seal: Pre-cured silicone membrane.
6) Keeper: Continuous; Aluminum 0.040 inches thickness.
7) Dimensions: As indicated.

B. Extruded Aluminum Closures Trim Pieces:
1. ASTM B 221 (ASTM B 221M), alloy as standard with manufacturer for finish required, with temper as required to suit extruded operations and performance requirements.
a. Interior Window Stools:
1) Thickness: 0.090 inches (2.38 mm).
2) Finish: Matching framing system.
3) Texture: Smooth.
4) End caps: To match stools.

b. Interior Grille Stools:
1) Thickness: 0.090 inches.
2) Finish: Matching framing system.
3) Texture: Smooth.
4) End caps: To match stools.

c. Corner bar at structural glazed corners:
1) Thickness: 1-inch square bar
2) Finish: Anodized.
3) Color: Black.

2.13 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

D. Wall Jamb Closure: 'F' – shaped, 0.125-inch- (3.175-mm-) thick by 4-inches long (100-mm) aluminum jamb closure designed to install in mullion glazing pocket.

E. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.14 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Provisions for safety railings mounted on interior face of mullions.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
8. Components curved to indicated radii.

D. Fabricate components to resist water penetration as follows:
1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.

F. Factory-Assembled Frame Units:
1. Rigidly secure nonmovement joints.
2. Prepare surfaces that are in contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion.
3. Preparation includes, but is not limited to, cleaning and priming surfaces.
4. Seal joints watertight unless otherwise indicated.
5. Install glazing to comply with requirements in Section 08 80 00 - Glazing.

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.15 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As indicated by manufacturer's designations.

2.16 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify locations possition switches and concealed witing connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
   7. Seal joints watertight unless otherwise indicated.
   8. Coordinate with _____for installation of possition switches and concealed wiring.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

3.4 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 08 80 00 - Glazing.
1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.5 INSTALLATION OF WEATHERSEAL SEALANT

A. Install weatherseal sealant according to Section 07 92 00 - Joint Sealants and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.6 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
   c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Test Area: Perform tests on one bay at least 30 feet (9.1 m), by one story.

C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
      a. Perform a minimum of two tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
   2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
      a. Perform a minimum of two tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
   3. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

D. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
   1. Test a minimum of two areas on each building facade.
   2. Repair installation areas damaged by testing.

E. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 08 44 35

PROTECTIVE FRAMED GLAZING ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior protective framed glazing assembly.

1.2 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

G. ITS (DIR) - Directory of Listed Products.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

I. UL (DIR) - Online Certifications Directory.

J. UL 263 - Standard for Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

A. Product Data: Provide evidence of compliance with fire performance criteria and manufacturer's published product data on framing components, glazing, anchorage and fasteners, and doors, if any.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

C. Samples: Submit samples as follows illustrating each exposed metal finish of interior and exterior project-specific applications.
   1. For factory-finished aluminum members, submit minimum of three color selection samples.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least ten years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.6 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C), and maintain above this minimum temperature during and for 48 hours after installation.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 INTERIOR PROTECTIVE FRAMED GLAZING ASSEMBLIES

A. Fabricators:
1. Basis of Design: GGI - General Glass International; PyroFrames: www.generalglass.com/#sle.

B. Provide factory fabricated, factory finished framing members with glazing and related flashings, anchorage and attachment devices.
1. Glazing: See Section 08 80 00 - Glazing for Fire-Protection-Rated glazing.

C. Structural Performance: Design to support dead loads and horizontal live loads equivalent to the following; coordinate connection to main structural members.
1. Design Live Loads: Comply with requirements of the following:
   a. Positive Design Live Load: 10 lbf/sq ft (478.8 Pa).
   b. Negative Design Live Load: 10 lbf/sq ft (478.8 Pa).
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.

3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths or 3/4 inch (19 mm), whichever is less, under specified design load.

D. Fire Performance: Provide hourly fire-resistance-rating as indicated; tested as an assembly including glazing in compliance with NFPA 257 or UL 9, and requirements of local authorities having jurisdiction.
1. Acceptable evidence of compliance includes listing by UL (DIR), ITS (DIR), or testing agency acceptable to authorities having jurisdiction.

2.2 COMPONENTS

A. Framing Members: Formed steel structural members with aluminum cladding and non-combustible thermally-resistive material as required for fire rating.
1. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
2. Cross-Section: As indicated on drawings.

2.3 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Structural Steel Sections: ASTM A36/A36M; shop primed.

D. Sealants Within Fire-Rated Assembly: As required by fire-rating and manufacturer's assembly.

E. Sealants: See Section 07 92 00 for additional information.

F. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

2.4 FINISHES

A. Finishing: Apply factory finish to surfaces that will be exposed in completed assemblies.
1. Manufacturer's standard universal primer for field finishing.
2. Touch-up surfaces cut during fabrication so that no natural metal surfaces are visible in completed assemblies, including joint edges.

B. Aluminum Finish: Class I natural anodized.
1. Apply factory finish to surfaces that will be exposed in completed assemblies.
2. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

C. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Color and Gloss: Match curtain wall.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive work of this section; see Section 07 25 00 for additional information.

C. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

A. Install framed glazing assemblies in accordance with NFPA 80 and requirements of local authorities having jurisdiction.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of acoustic barrier.

F. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch every 3 feet (1.6 mm every 0.914 m) non-cumulative or 1/2 inch per 100 ft (12.7 mm per 30.5 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

C. Sealant Space Between Mullions and Adjacent Construction: Maximum of 3/4 inch (19 mm) and minimum of 1/4 inch (6.4 mm).

3.4 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.5 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes: Door hardware for wood doors, steel doors, aluminum framed entrance doors, all glass entrance doors, and miscellaneous hardware items.

B. Provide hardware not described herein but otherwise required for proper completion of the project, conforming to size, function, quality, and finish of other specified hardware.

1.2 RELATED SECTIONS

A. Division 6: Rough Carpentry.

B. Division 8: Aluminum Doors and Frames

C. Division 8: Hollow Metal Doors and Frames.

D. Division 8: Wood Doors.

E. Division 26 Electrical

F. Division 28: Electronic Security

1.3 REFERENCED STANDARDS

A. American National Standards Institute (ANSI):
   1. ANSI A117.1 Accessible and Usable Buildings and Facilities.

B. Builders Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.1 Butts and Hinges.
   2. ANSI/BHMA A156.2 Bored and Preassembled Locks and Latches.
   3. ANSI/BHMA A156.3 Exit Devices.
   4. ANSI/BHMA A156.4 Door Controls - Closers.
   5. ANSI/BHMA A156.5 Auxiliary Locks and Associated Products.
   6. ANSI/BHMA A156.6 Architectural Door Trim.
   7. ANSI/BHMA A156.7 Template Hinge Dimensions.
   8. ANSI/BHMA A156.8 Door Controls - Overhead Stops and Holders.
   9. ANSI/BHMA A156.10 Power Operated Pedestrian Doors.
   10. ANSI/BHMA A156.13 Mortise Locks and Latches.
   11. ANSI/BHMA A156.14 Sliding and Folding Door Hardware.
   12. ANSI/BHMA A156.15 Release Devices: Closer Holders, Electromagnetic and Electromechanical.

13. ANSI/BHMA A156.16 Auxiliary Hardware.
14. ANSI/BHMA A156.17 Self-Closing Hinges and Pivots.
15. ANSI/BHMA A156.18 Materials & Finishes.
16. ANSI/BHMA A156.19 Power Assist & Low Energy Power Operated Doors.
17. ANSI/BHMA A156.21 Thresholds.
18. ANSI/BHMA A156.22 Door Gasketing and Edge Seal Systems.
19. ANSI/BHMA A156.23 Electromagnetic Locks.
20. ANSI/BHMA A156.24 Delayed Egress Locks.
21. ANSI/BHMA A156.25 Electrified Locking Devices.
22. ANSI/BHMA A156.26 Continuous Hinges.
23. ANSI/BHMA A156.28 Recommended Practices for Mechanical Keying Systems.
24. ANSI/BHMA A156.29 Exit Locks, Exit Locks with Exit Alarms, Exit Alarms, Alarms for Exit.
25. ANSI/BHMA A156.30 High Security Cylinders.
26. ANSI/BHMA A156.31 Electrified Strikes and Frame Mounted Activators.
27. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors with Steel Frames.
28. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames.

C. Door and Hardware Institute (DHI):
1. ANSI/DHI A115.IG Installation Guide for Doors and Hardware
2. DHI Keying Systems and Nomenclature
3. DHI Sequence and Format for the Hardware Schedule

D. International Building Code (IBC)

E. National Fire Protection Association (NFPA):
1. NFPA 80 Fire Doors and Fire Windows
2. NFPA 252 Fire Tests of Door Assemblies

F. Underwriters Laboratories Inc. (UL):
1. UL 10C Positive Pressure Fire Tests Of Door Assemblies
2. UL 305 Panic Hardware
3. UL 437 Drill and Pick Resistant Key Cylinders
4. UL 1034 Burglary-Resistant Electric Locking Mechanisms

1.4 SUBMITTALS

A. Products other than those designated herein must be approved as substitutions prior to submittal of Door Hardware.

B. Door Hardware Schedule: Vertical format conforming to DHI "Sequence and Format for the Hardware Schedule." Horizontal format schedules will be rejected without review. Format shall be 8-1/2 by 11 inch page size. Organize Schedule into headings, grouping doors to receive same hardware items, indicating quantity and complete designations of every item required for each door opening.

C. Schedule shall be submitted in searchable digital file format.

D. The schedule shall include:
   1. Cover sheet indicating name and location of Project; name of Architect; name of Contractor; name, address and phone of hardware supplier, name of hardware consultant preparing the schedule; date of submittal or revised submittal.
   2. A list of abbreviations used in schedule.
   3. An index of door openings, listed in numerical order, with hardware heading identification cross-referenced to Architect’s set identification.
   4. Hardware headings shall be listed in numerical order corresponding, as closely as possible, with numerical order of Architect's set numbers.
   5. Each hardware heading shall have each door listed in numerical order according to door numbers in the Architect's door schedule, and denoting: location, configuration (single, pair, etc.), type (elevation, etc.), door and frame size(s), door and frame material(s), handing, fire rating, and key set identification.
   6. Type, complete model number, style, function, size, hand, and finish of each door hardware item.
   7. Manufacturer of each item.
   8. Fastenings and other pertinent information.

E. Manufacturer's Technical Product Data / Catalog Cut Sheets: Clearly marked for each hardware item, including installation details, material descriptions, dimensions of individual components and profiles, and finishes. Format shall be 8-1/2 by 11 inch page size.

F. Wiring Diagrams: No later than 14 days after receipt of reviewed hardware schedule submittal, submit detailed wiring diagrams for power, signaling, monitoring, and control of the access control system electrified hardware or other system electrified components such as sensors, switches, or indicator/ strobe lights; identified by door number(s), and detailed specifically for each type and function of electrified door opening. Format shall be 8-1/2 by 11 inch page size. Include the following:
   1. System Description of Operation. Include description of component functions including, but not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.
   2. Elevation single-line diagram, showing interface between electrified door hardware and fire alarm, power, access control, and security systems as applicable.
   3. Point-to-point wiring diagram for field-installed wiring.

G. Keying Schedule: In accordance with Owner's final keying instructions for locks. Conform to DHI “Keying Systems and Nomenclature.” Format shall be 8-1/2 by 11 inch page size.

H. Operation and Maintenance Data: Provide complete operating and maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides.

I. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

B. Manufacturers, Hardware Supplier, and Installer shall have no less than five years' experience in the provision of Door Hardware for projects similar in size, complexity and type to this Project.

C. Hardware Schedule and Keying Schedule submittals shall be prepared by a Hardware Consultant holding the credentials of Architectural Hardware Consultant (AHC) issued by the Door and Hardware Institute. Hardware Consultant shall have no less than five years' experience in the scheduling of Door Hardware for projects similar in size, complexity and type to this Project; and shall be available, at no additional cost, during the course of the Work to consult with Contractor, Architect, and Owner regarding door hardware and keying.

1.6 REGULATORY REQUIREMENTS

A. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with all applicable regulations, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. At rated doors with panic exit devices, provide devices labeled as "Fire Exit Device."

B. Comply with all applicable accessibility regulations as set forth in the 2010 ADA Standards.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines (ADAAG) and the Regulations of the Massachusetts Architectural Barriers Board (MAAB).

D. Latching and locking doors that are hand-activated and that are in a path of travel shall be operable with a single effort by lever-type hardware, panic bars, push-pull activating bars, or other hardware designed to be easy to grasp with one hand, not requiring tight grasping, tight pinching or twisting of the wrist; from egress side shall not require the use of a key, tool, or special knowledge for operation.
   1. All hand-activated hardware shall be mounted between 34 inches and 48 inches above finished floor.

E. At sliding and pocket doors, when fully open, operating hardware shall be exposed and usable from both sides.

F. Door closing devices shall comply with the following maximum opening-force requirements:

1. Interior Hinged Doors: 5 lbf applied perpendicular to door at latch.
2. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
3. Fire Rated Doors: 5 lbf applied perpendicular to door at latch. To ensure latching, may be increased to the minimum force allowable by the appropriate administrative authority, not to exceed 15 lbf.

G. Thresholds shall be maximum 1/2 inch in height above floor and landing on both sides of openings. Bevel raised thresholds with a slope of not more than 1:2.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Each article of hardware shall be delivered individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule.

B. Manufacturer's printed installation instructions, fasteners, and special tools shall be included in each package.

C. Hardware shall be stored in a dry, secure locked area, complete with shelving for unpacking and sorting of the door hardware.

D. Deliver all master keys by restricted, receipted delivery directly from the manufacturer to the Owner.

1.8 COORDINATION

A. Provide hardware templates to the parties involved for doors, frames, and other work specified to be factory prepared for door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. When required by door or frame fabricator, furnish physical samples of each mortised and recessed hardware item required.

C. Coordinate layout and installation of recessed pivots and closers with floor construction.

D. Electrical System Rough-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, and security system as applicable.

E. Pre-Installation Conference: Arrange conference at job site to coordinate door, frame, hardware and electronic security hardware installation; to be attended by the Architect, Owner, Contractor and representative personnel of firms involved in the provision and installation of said items.

F. Keying Conference: Arrange conference with Owner, or designated representative, and Manufacturer’s/ Hardware Supplier’s Architectural Hardware Consultant to establish keying requirements. Incorporate keying conference decisions into Keying Schedule.

1.9 WARRANTY

A. In addition to, and not precluding, other warranty requirements in the Contract Documents, the following hardware items shall carry extended minimum warranties as indicated:
   1. Hinges: Ten years from date of Substantial Completion.
   2. Locks: Five years from date of Substantial Completion.
   3. Exit Devices: Three years from date of Substantial Completion.
   4. Door Closers: Ten years from date of Substantial Completion.

1.10 MAINTENANCE

A. Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Provide the following:
   1. Two Locks
   2. Two Door Closers
   3. Two Door Stops.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements herein, provide products by one of the following manufacturers for each type of hardware:
   1. Butt Hinges: Hager, Ives, McKinney.
   2. Cam Lift Hinges: ABH, McKinney, Zero.
   3. Continuous Pinned Hinges: Architectural Builders Hardware, Hager, Markar, Select, BEST.
   4. Continuous Geared Hinges: Architectural Builders Hardware, Hager, National Guard Products, Pemko, Select.
   5. Concealed/Invisible Hinge: Tectus, McKinney, RocYork, Soss.
   6. Pivots: Architectural Builders Hardware, dormakaba, Ives, Rixson.
   7. Cylinders and Keying: Per Owner’s Requirements.
   8. Locksets and Latchsets: Accurate, Best, Corbin Russwin, Sargent, Schlage.
   9. Multi-Family Housing Unit Entry Door Lockset: Latch M2, Accentra, dormakaba, Schlage
   10. Narrow Backset Mortise Lock: Adams Rite, Accurate.
   11. Push-Pull Locksets and Latchsets: Architectural Builders Hardware, Corbin Russwin, Glynn-Johnson, Sargent.
   12. Exit Devices: Corbin Russwin, Precision, Sargent, Von Duprin.
   13. Weatherized Exit Devices: Detex, Locinox.
   14. Tubular Exit Devices: CR Laurence PA100, Rockwood PDU8000/8500 Series.

15. Electric Strikes: Folger Adam, Hanchett Entry Systems (HES), Rutherford Controls Intl. (RCI), Von Duprin.
16. Electromagnetic Lock Assemblies: Rutherford Controls Intl. (RCI), Schlage, Securitron.
17. Electrical Power Transfers: Architectural Builders Hardware, Precision, Securitron, Von Duprin.
18. Locking Ladder Pulls: Architectural Builders Hardware, Rockwood, CRL.
19. Power Supplies for Electrified Hardware: Securitron, Security Door Controls, Von Duprin.
20. Flush Bolts and Door Coordinators: Architectural Builders Hardware, Ives, Rockwood, Trimco.
21. Surface Door Closers: LCN, Norton, Sargent.
22. Surface Cam and Roller Door Closers: Dorma TS93 Series, Sargent 421 Series.
23. Overhead Concealed Door Closers: Dorma, LCN, Rixson.
24. Floor Closers: Dorma, Jackson, Rixson.
25. Overhead Holders and Stops: Architectural Builders Hardware RA Series, Glynn-Johnson, Rixson.
26. Overhead Surface and Concealed Automatic / Low Energy Door Operators: Allegion, Assa Abloy Entrance Systems, Horton, Motion Access, Norton, Stanley.
27. Automatic Door Actuators: BEA, Horton, Motion Access, Norton.
28. Bollards: BEA, Norton, Wikk.
29. Automatic Door Controls Kit for Restrooms: Camden Door Controls.
30. In-Floor Automatic / Low Energy Door Operator: Assa Abloy Entrance Systems, Tormax, Opcon,
31. In-Floor Automatic / Low Energy Door Operator Converters: Assa Abloy Entrance Systems, dormakaba, Motion Access, Record USA.
32. Electromagnetic Holder / Releases: Architectural Builders Hardware, LCN, Rixson, Security Door Controls.
33. Architectural Door Trim: Architectural Builders Hardware, Ives, Rockwood, Trimco.
34. Auxiliary Hardware: Ives, Rockwood, Trimco.
35. Electric Door Hardware Accessories: Allegion, Assa Abloy, dormakaba, SDC.
36. Door Bottoms, Metal Thresholds, Weatherstripping and Gaskets: National Guard Products, Pemko, Zero.
37. Pocket, Folding and Sliding Door Hardware: Cavity Sliders, Hafele, KN Crowder, Pemko.
38. Key Storage System: Lund, MMF Industries, Telkee.

2.2 MATERIALS AND FABRICATION

A. Requirements for grade, materials, size, and other distinctive qualities of each type of door hardware are indicated herein. Furnish items in types, sizes or weight, in accordance with manufacturer's standards, appropriate for the conditions of installation and service, unless otherwise indicated.

B. Products named or identified by make or model number, or other designation and described herein are base products. Base products establish the standards of type, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.

2.3 FASTENERS

A. Provide concealed fasteners for hardware items on exterior doors which are exposed when door is closed.

B. Combination machine screws and expansion shields shall be used for attaching hardware to concrete or masonry.

C. Fasteners exposed to the weather in the finished work shall be of brass, bronze, or stainless steel.

2.4 BUTT HINGES

A. Butt hinges shall meet the requirements of ANSI/BHMA A156.1.

B. Hinge dimensions shall meet the requirements of ANSI/BHMA A156.7.

C. Base Metal shall be steel plated for fire-rated doors; bronze or stainless steel for exterior out swinging doors; bronze or plated steel elsewhere as scheduled.

D. Provide hinges with antifriction bearings for doors with closers.

E. Unless otherwise indicated, provide hinges in heights and weights as follows:
1. Doors to 36 inches wide: 4-1/2 inches Standard Weight.
2. Doors over 36 inches to 48 inches wide: 5 inches Heavy Weight.
3. Doors over 48 inches wide: 6 inches Heavy Weight.
4. Doors over 1-3/4 inch thick shall be per hinge manufacturers published listings or recommendations.

F. Provide in minimum width sufficient to clear trim when door swings 180 degrees, whether or not shown on Drawings to swing 180 degrees.

G. Number of hinges per leaf shall be as follows:
1. Doors to 60 inches in height: 2 hinges.
2. Doors over 60 to 90 inches in height: 3 hinges.
3. Doors over 90 to 120 inches in height: 4 hinges.
4. For doors over 120 inches in height: 4 hinges plus 1 hinge for every 30 inches, or fraction thereof, door height greater than 120 inches.

H. Screws: Flat head wood screws not less than 1-1/2 inches long for hinges for wood doors; flat head machine screws elsewhere.

I. Hinges reverse bevel doors with key locks shall have pins that are made non-removable [NRP] when the door is in the closed position by means of a set screw in the hinge pin barrel. Where passage or privacy sets, push/pulls openings are specified, non-removable pins are not required.

J. Electrified hinges:
1. Coordinate number and size of wires for electrified hardware served.
2. Provide junction box/ mortar shield for each electrified hinge.
3. All electric hinges to have quick connector-type connectors.

2.5 CONTINUOUS PINNED HINGES

A. Continuous hinges shall meet ANSI/BHMA A156.26 requirements.

B. Type: Pin and barrel construction; 1/4 inch diameter stainless steel pin; split nylon or stainless steel bearings. Fabricated from 14 gauge cold-rolled steel or 304 stainless steel as indicated.

C. Provide in minimum width sufficient to clear trim when door swings 180 degrees, whether or not shown on Drawings to swing 180 degrees.

D. Hole pattern for fasteners shall be symmetrical and located to template dimensions.

E. All electric hinges to have quick connector-type connectors.

2.6 CONTINUOUS GEARED HINGES

A. Continuous hinges shall meet ANSI/BHMA A156.26 requirements.

B. Type: Heavy duty assembly of 3 interlocking aluminum extrusions. Door leaf and jamb leaf shall be continuously geared together the full hinge length; secured together with full length cover channel permitting 180 degree operation. Vertical door loads carried on integrated thrust bearings spaced no more than 3 inches apart.

C. Hinges shall have non-removable cap at hinge top to prevent foreign material from becoming lodged in hinge gear mechanism.

D. Unless otherwise noted, provide factory finished to match door and frame finish.

E. Hole pattern for fasteners shall be symmetrical and located to template dimensions.

F. All electric hinges to have quick connector-type connectors.

2.7 CONCEALED/ INVISIBLE HINGES

A. Concealed Hinges: Hinges mortised into door and frame so that they are concealed when the door is closed.

B. Hinges shall be adjustable three ways:
1. Vertically
2. Horizontally
3. Compression (in/out) (i.e., capable of a 180 degree swing).

C. Hinges are to be non-handed.

D. Provide fastener type, size, and quantity as recommended by hinge manufacturer for properly installing concealed hinges in the door and frame type application.

E. Provide steel receiver for metal door and frame cutouts for receiving concealed hinges.

F. Provide option for applied panels and flush mounting.

G. Electrified concealed/invisible hinges:
1. Coordinate number and size of wires for electrified hardware served.
2. Provide junction box/ mortar shield for each electrified hinge.

2.8 PIVOT HINGES

A. Pivot hinges shall meet ANSI/BHMA A156.4 Grade 1 requirements.

B. Pivots shall be constructed of steel, cast or forged bronze, or stainless steel as indicated by BHMA finish specified.

C. Where offset pivots are used, provide intermediate pivots as follows:
1. Doors over 60 to 90 inches in height provide one intermediate pivot.
2. For doors over 90 inches in height provide one additional intermediate pivot for every 30 inches, or fraction thereof.

D. Electrified pivots:
1. Coordinate number and size of wires for electrified hardware served.
2. Provide junction box/ mortar shield for each electrified pivot.

E. All electric pivots to have quick connector-type connectors.

2.9 CYLINDERS, KEYING AND KEY STORAGE

A. Lock cylinders shall meet ANSI/BHMA A156.5 requirements.

B. Keying system shall meet ANSI/BHMA A156.28 requirements.

C. All cylinders shall be interchangeable core type.

D. Provide mortise or rim type cylinders as required by device for all exit devices having key locking function.

E. Keying shall be provided per the Owner’s requirements.

F. Cylinders shall be keyed according to approved Keying Schedule.

G. Provide a temporary keying system for interim use during construction.

H. Provide change keys in individual envelopes for each cylinder delivered. Envelopes shall be marked with respective door identification numbers.

I. Key set symbol, and inscription "Do Not Duplicate" shall be stamped on all keys.

J. Key set symbol shall be concealed stamped on all cylinders/ removable/ Interchangeable cores.

K. Keys shall be supplied as follows:
1. Locks: 2 change keys each lock.
2. Master keyed sets: 2 keys each set.
3. Grand master keys: 5 total.
4. Great Grand master keys: 5 total.
5. Interchangeable Core control keys: 2 total.
6. Construction keys: 10 total.

7. Blank keys: 100 total.

2.10 LOCKSETS AND LATCHSETS

A. Mortise Locks and Latches shall meet ANSI/BHMA A156.13 Grade 1 requirements.

B. Cylindrical Locks and Latches shall meet ANSI/BHMA A156.2 Series 4000 Grade 1 requirements.

C. Auxiliary Locks shall meet ANSI/BHMA A156.5 requirements.

D. Electrified Locks shall also meet ANSI/BHMA A156.25 requirements.

E. Operating trim shall be lever type: Refer to hardware sets.

F. Lock functions which include thumb turn trim shall be provided with thumb turns compliant with accessibility code requirements.

G. Lock Throw: Comply with requirements for length of latch bolts to comply with labeled fire door requirements.

H. Lock backset shall be 2-3/4 inches unless otherwise indicated.

I. Electromechanical locksets utilized at fire rated openings shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction, and shall maintain door in positive latched position when power is off.

J. Narrow backset locksets to be used when standard width/ backset devices do not fit door stile.

K. Provide occupancy indicator at all cylindrical and mortise privacy sets. Architect to select if wording to be Unlocked/Locked or Vacant/Occupied. Indicator shall be at each side of door. Example, Sargent V11/V21.

L. All electric locks to have quick connector-type connectors.

2.11 EXIT DEVICES

A. Exit devices and exit device accessories shall meet ANSI/BHMA A156.3, Grade 1 requirements.

B. Electromechanical exit devices shall also meet ANSI/BHMA A156.25 requirements.

C. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

D. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

E. Outside Trim: Design, material and finish to match locksets, unless otherwise indicated.

F. Adjustable strikes shall be provided for rim type and vertical rod devices.

G. Fire Exit Removable Mullions: Where indicated, provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

H. Electromechanical exit devices utilized at fire rated openings shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction, and shall maintain door(s) in positive latched position when power is off.

I. Narrow backset devices shall be provided to match specified device when standard width chassis/ devices do not fit door stile.

J. Provide flush end caps at exit devices.

K. Provide device for proper door thickness.

L. Weatherized exit device:
1. Areas where hardware is prone to corrosion provide powder coated metal finish.

M. At locations where exit devices are being used in a Pool/Aquatic area, provide 628 or powder coated metal finish.

N. All electric exit devices to have quick connector-type connectors.

2.12 MULLIONS

A. Extruded Aluminum Removable Mullions: ANSI/BHMA A156.3 anodized, removable mullions with malleable-iron top and bottom retainers. Mullions to be provided standard with stabilizers and imbedded weatherstrip.
1. Manufacturers: Same as exit device manufacturer.

B. Steel Removable Mullions: ANSI/BHMA A156.3 steel removable mullions with options for fire rating, locking, through-wire electrification and hurricane compliance as specified.
1. Provide mullions with functions and features as follows:
a. At openings designed for severe wind load conditions due to hurricanes or tornadoes, provide manufacturer’s certified mullion and accessories to meet applicable state and local windstorm codes.
b. Provide keyed removable feature where specified in the Hardware Sets.
c. Provide stabilizers and mounting brackets as required.
d. Provide electrical quick connection wiring options as specified in the hardware sets.
e. Manufacturers: Same as exit device manufacturer.

2.13 TUBULAR EXIT DEVICES

A. Tubular exit devices with grip diameter of 1-1/4".
   1. Stainless steel and powder coat finishes shall be certified to ANSI/BHMA A156.18.
   2. Style: Exposed vertical rod. 1-1/4" grip diameter with interior operating panic handle in combination with exterior fixed pull handle. Panic mechanism shall be concealed within brass or stainless steel tubing. Optional entrance from exterior by a keyed cylinder.
   3. Configurations (provide as specified):
      a. Full Height L-Shape Pull.
      b. Half Height L-Shape Pull.
      c. Full Height Straight Pull.
      d. Half Height Straight Pull.
      e. Half Height Centered Straight Pull.
      f. Horizontal Straight Pull.
      g. Exit Only (No Exterior Pull).
   4. Push/pull operation when dogged from the inside.
   5. Latching: Top latching. Reversed, flat, Pullman style. Roller-type latching not acceptable.
   6. Engraved "PUSH" signage with optional paint infill and boundary grooves.

2.14 ELECTRIC STRIKES

A. Electric strikes shall meet ANSI/BHMA A156.31 Grade 1 requirements and be listed and labeled under UL 1034 Burglary Resistant Electric Locking Equipment.

B. Electric strikes for fire rated openings shall be listed and labeled for such use by a testing agency acceptable to authorities having jurisdiction. Fail Secure (fail locked) strikes shall be used at all fire rated openings.

C. All electric strikes to have quick connector-type connectors.

2.15 ELECTROMAGNETIC LOCK ASSEMBLIES

A. Electromagnetic lock assemblies shall meet ANSI/BHMA A156.23 Grade 1 requirements and be labeled under UL 294

B. Locks shall be field-selectable for 12 or 24 VDC operation, and provide 1,500 lbf minimum holding force for direct pull applications and 2,000 lbf holding force for shear type applications.

C. Wiring connections shall be via on-board screw terminal connections. Lock shall have built-in circuit/ surge and voltage kickback suppression protection.

D. Where indicated, locks shall be equipped with concealed sensors to monitor magnetic bond status and door position status.

E. Locks used on fire rated doors shall be listed and labeled for such use by a testing agency acceptable to authorities having jurisdiction.

F. All electric magnetic locks to have quick connector-type connectors.

2.16 FLUSH BOLTS

A. Automatic flush bolts shall meet ANSI/BHMA A156.3

B. Manual flush bolts shall meet BHMA A156.16 requirements.
   1. Bottom bolt shall have 12 inch long operating rod. Top bolt operating rod shall be determined by door height, assuring the operator is located less than 72 inches above the floor.
   2. Manual Flush Bolts are not to be utilized except where a pair of non-rated doors serving a room not normally occupied is needed for the movement of equipment.

C. Provide dust proof strikes for bottom bolts. Dust proof strikes shall meet BHMA A156.16.

2.17 DOOR COORDINATORS

A. Door coordinators shall meet ANSI/BHMA A156.3 requirements.

B. Door coordinators shall be flat bar type; stop mounted with all necessary filler bars and mounting brackets to accommodate required hardware.

C. Provide carry bar at each pair of doors equipped with an overlapping astragal, except when automatic or self-latching bolts are used.

2.18 SURFACE DOOR CLOSERS

A. Door closing devices shall meet ANSI/BHMA A156.4, Grade 1 requirements.

B. Surface closers shall be fully adjustable with sweep speed, latch speed and back check position valves.

C. Provide closers size adjusted in accordance with ANSI/BHMA A156.4; sized as required to insure closing and latching of doors.

D. Arm selection shall follow the requirements of the manufacturer's recommendations with brackets, drop plates and miscellaneous accessories provided as necessary.

E. Provide closers with arms designed to permit openings of doors as far as job conditions will permit; unless otherwise indicated closers with arms restricting opening of door will not be acceptable.

2.19 OVERHEAD CONCEALED DOOR CLOSERS

A. Overhead Concealed Door Closers shall meet ANSI/BHMA A156.4 requirements.

B. Closers shall be fully adjustable with sweep speed, latch speed and back check position valves.

C. Provide closers size adjusted in accordance with ANSI/BHMA A156.4; sized as required to ensure closing and latching of doors.

D. Closer shall be sized to suit door weight and size.

2.20 FLOOR CLOSERS

A. Floor Closers shall meet ANSI/BHMA A156.4, Grade 1 requirements.

B. Closers shall be fully adjustable with sweep speed, latch speed and back check position valves.

C. Floor closers shall have cement boxes.

D. Pivots used on doors with floor closers shall be of the same manufacturer as the floor closers.

E. Provide flush floor cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.

F. Provide recessed floor plates/ pans to accommodate insert of floor finish material for floor closers, unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.

2.21 LOW ENERGY DOOR OPERATORS

A. Surface Applied Operator: The operator header shall be mounted to the surface of the door frame or wall. Connecting hardware shall be a double arm arrangement that can either push the door or pull the door open to suit the job condition. Provide parallel arm when operator mounting is on the pull side, and adjacent wall is within 4 inches of the door frame. Provide fire labeled unit for use at rated doors.

B. Overhead Concealed Operator: The operator header shall be mounted directly over the door and serve as the door frame header. The operator output shaft shall connect to an arm that transmits power to the door via a slide block which moves in track that is recess mounted in the top of the door.

C. In-Floor Operator Converter: Manufacturer’s specialized unit to adapt specified automatic swing door operator to in-floor use. The converter shall be mounted beneath the door leaf and jamb area utilizing a standard pivot setback. Heavy-duty pivot shall incorporate 1200 pound rated, sealed thrust bearings in 1 inch steel bearing plate.

D. Low Energy Door Operators shall meet ANSI/BHMA A156.19 requirements.
   1. Provide safety sensors and features to meet A156.19 requirements and all applicable codes.
   2. Door shall not open to back check faster than 3 seconds, and shall require no more than 15 lbf applied 1 inch from latch edge to stop door movement.
   3. Door shall remain in fully open position for no less than 5 seconds.

4. Door shall close from 90 degrees to 10 degrees no faster than 3 seconds, and 10 degrees to fully close no faster than 1-1/2 seconds.
5. Power operation shall be activated by push plate switch, or other actuators as indicated.

E. Provide UL labeled operators at fire-rated openings. Provide power-disconnect interface to Fire Alarm; doors to be self closing and latching, in full compliance with Code requirements for "Fire Assembly, Self Closing" doors.

F. Provide UL labeled operators at smoke barrier openings. Provide hold-open circuitry and power-disconnect interface to Fire Alarm; doors to be automatic closing and latching, in full compliance with Code requirements for "Fire Assembly, Automatic Closing" doors.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

2.22 AUTOMATIC DOOR ACTUATORS

A. Provide as a standard, one at each side of automated entrance. Refer to hardware sets for type.

2.23 ELECTROMAGNETIC HOLDER / RELEASES

A. Electromagnetic holders shall meet ANSI/BHMA A156.15 requirements.

B. Size and configuration shall provide degree of swing and hold open position as indicated on the drawings.

C. Coordinate length for attachment based on lever and locking device trim to wall.

2.24 ARCHITECTURAL DOOR TRIM

A. Architectural door trim shall meet ANSI/BHMA A156.6 requirements.

B. Door Protection Plates: Kick, mop, and armor plates shall be 0.050 inch thick brass, bronze, or stainless steel depending on finish indicated. Plates shall have beveled edges, and shall be provided with countersunk mounting holes and No. 6 oval head screw fasteners. Width of kick and armor plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. Width of mop plates shall be 1 inch less than door width.
1. Kick Plates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.
2. Mop Plates: Provide with four beveled edges ANSI J103, 4 inches high by width less 1 inch on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

3. Armor Plates: Provide ANSI J101 with four beveled edges, 30 inches high by width less 1 inch on single or pairs of doors. Furnish oval-head countersunk screws to match finish.
4. At fire rated doors, provide UL labeled protection plates in sizes, types, fasteners and materials only in accordance with door manufacturer's listings for respective ratings.
5. Provide cutouts for hardware as listed in the hardware sets.

C. Door Edging and Astragals: Fabricated from 18 gauge cold-rolled steel or 304 stainless steel as indicated; factory prepared for all mortise hardware; countersunk screw mounting.
1. At fire rated doors, provide UL labeled edge protection in sizes, types, fasteners and materials only in accordance with door manufacturer's listings for respective ratings.

D. Push and pull plates shall be 0.050 inch thick brass, bronze, or stainless steel depending on finish indicated. Plates shall have beveled edges, and shall be furnished with countersunk mounting holes and No. 6 oval head screw fasteners. Pull plates shall also be furnished with flat-head through bolts for pull grip.

E. Push and pull bars and grip handles shall be brass, bronze, or stainless steel depending on BHMA finish indicated.

2.25 LOCKING LADDER PULLS

A. Lock functions which include thumb turn trim shall be provided with thumb turns compliant with accessibility code requirements.

2.26 AUXILIARY HARDWARE

A. Auxiliary hardware shall meet ANSI/BHMA A156.16 requirements.

B. A door stop shall be bid/provided at every door location, regardless if one is itemized in the heading/group.

C. Door Stops: Provide floor stop or wall bumper. Where it is not possible to properly place a floor or wall type stop, provide heavy duty overhead type stop, or when door closer is indicated on the push side of the door, provide heavy-duty dead stop function in closer.
1. Stops shall be of heavy duty construction.
   a. Wall bumpers shall have no visible fasteners.
   b. Floor stops shall be of height required by floor conditions.
   c. At areas where ligature resistant is required, provide Kingsway Group KG182.
2. Overhead Stops
   a. Overhead holders and stops shall meet ANSI/BHMA A156.8 requirements.
   b. Overhead door holders and stops shall be adjustable from 90 to 110 degrees dead stop or hold open position, as applicable.

c. Overhead door stops shall have shock absorbers providing 5 to 7 degrees compression before dead stop.
d. Overhead stops shall not be provided with hold open function when used at fire rated doors.
e. Overhead stop to work with closer.

D. Silencers: Rubber, non-marring configured for metal or wood frames as scheduled. Provide quantity based on door size.

2.27 ELECTRICAL POWER TRANSFERS

A. Electrical power transfers shall be capable of transferring sufficient electrical current to properly operate electrified hardware in door.

B. Electrical power transfers used on fire rated doors shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

C. Verify and provide at all doors with Pivots.

D. At frames that are 1.5” or less or doors with swing clear hinges, provide Securitron EPT or ABH PT1000SC power transfer.

E. Provide with quick connector. Coordinate with hardware item being provided.

F. Power over Ethernet transfer shall incorporate pin connector to match locking device.

2.28 POWER SUPPLIES FOR ELECTRIFIED HARDWARE

A. Power supplies shall be UL listed for applicable use; shall be housed in an approved enclosure; and provide both Class 1 and Class 2 outputs. Provide security relays as part of power supply.

B. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to related security components; and shall be assembled, connected, and fully contained within the power supply enclosure. A fire alarm emergency release input terminal shall be provided for connection to fire / life safety system at fire-rated openings.

C. Power supplies shall provide sufficient power capacity for the worst-case condition that could occur in the operating environment without any loss or degradation of operation.

D. Power supplies shall be provided at all doors where electric latch retraction is specified.

2.29 ELECTRIFIED ACCESSORIES

A. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires.

Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
   a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
2. Manufacturers - Coordinate with hardware item being provided:
   a. Hager Companies (HA) - Quick Connect.
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.
   c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – PoE Series.
   d. Allegion CON.
   e. dormakaba

B. Request-to-Exit Motion Sensor: Request-to-Exit Sensors motion detectors specifically designed for detecting exiting through a door from the secure area to a non-secure area. Include built-in timers (up to 60 second adjustable timing), door monitor with sounder alert, internal vertical pointability coverage, 12VDC or 24VDC power and selectable relay trigger with fail safe/fail secure modes.

2.30 DOOR BOTTOMS

A. Door bottoms shall be of aluminum or extruded bronze of the type and finish indicated and shall provide proper clearance and an effective seal with specified thresholds.

B. Door bottom shall have a vinyl, neoprene, silicone rubber, polyurethane or brush seal as indicated.

C. The door bottom shall exclude light when the door is in the closed position and shall inhibit the flow of air through the unit.

2.31 METAL THRESHOLDS

A. Thresholds shall meet ANSI/BHMA A156.21 requirements.

B. Thresholds shall be heavy-gauge aluminum or bronze of the configuration and finish indicated, and shall provide an effective seal with door bottom.

C. Where required, thresholds shall be prepared to accommodate floor closers, pivots, and projecting bolts of latching hardware.

D. Thresholds at floor closers shall have mitered returns and removable access portion for floor closer maintenance.

E. Provide thresholds at doors where indicated. Refer to Door Schedule and Drawing details for type and configuration required. Additionally, where combustible flooring passes under doors, provide fire door thresholds in accordance with applicable regulatory requirements.

2.32 METAL HOUSED TYPE WEATHERSTRIP

A. Metal Housed Type Weatherstrip shall meet ANSI/BHMA A156.22 requirements.

B. Metal Housed Type Weatherstrip shall be aluminum or bronze of the type and finish indicated, comprised of metal retainers with vinyl, neoprene, silicone rubber, polyurethane or brush inserts as indicated.

2.33 GASKETING

A. Gasketing shall meet ANSI/BHMA A156.22 requirements.

B. Shall be a compression type product for use with wood or steel doors; labeled for use on smoke-control and fire-rated doors where required.

2.34 POCKET, FOLDING AND SLIDING DOOR HARDWARE

A. Folding and Sliding Door Hardware shall meet ANSI/BHMA A156.14 requirements.

B. Provide complete sets of type indicated, consisting of overhead track, hangers, supports, track stoppers, floor guides, and other required accessories.

C. Provide soft close stop as part of folding, or sliding track assembly.

2.35 FINISHES

A. Provide hardware in finishes as indicated in hardware set or as noted below:

B. Aluminum Framed Entrance Hardware Finish to be Selected by Architect.

C. Finish hardware to be Satin Stainless.

D. Finish for Thresholds and Surface Door Bottoms shall be Aluminum

E. Closers shall be Powder Coated.

F. Adhesive Gasketing shall be Black.

G. Areas where hardware may be prone to corrosion, 32D-316 metal finish or Clear Powder Coat Finish.

H. Interior and Exterior Aluminum Framed Openings: Finish to be selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine rough-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Steel doors shall be factory prepared for hardware per ANSI/BHMA A156.115.

B. Wood doors shall be factory prepared for hardware per ANSI/BHMA A156.115W.

C. Installation shall be in accordance with DHI A115.IG.

D. Hardware for fire door assemblies shall be installed conforming with NFPA 80, and all other applicable building codes and regulations.

E. Hardware for smoke door assemblies shall be installed conforming with NFPA 105, and all other applicable building codes and regulations.

F. Install each door hardware item according to manufacturer's printed instructions, utilizing templates and proper fasteners provided by manufacturer.

G. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

H. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in other Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

I. Install each door hardware item to comply with manufacturer's written instructions. Install overhead surface closers for maximum degree of opening obtainable. Place on room side of corridor doors, stair side of stair doors, secondary corridor side of doors between corridors. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be finished, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

J. All wall stops shall be installed with reinforced blocking in wallboard construction. Drywall anchors are not an acceptable means of reinforcement/blocking.

Provide intermediate steel plates or channel reinforcement backing at wall stops mounted in wallboard construction.

K. Do not install permanent key cylinders in locks until the time of preliminary acceptance by the Owner. At the time of preliminary acceptance, and in the presence of the Owner's representative, permanent key all lock cylinders. Record and file all keys in the key control system specified, and turn system over to Owner for sole possession and control.

L. Key control storage system shall be installed where directed by the Owner.

M. Thresholds shall be secured with a minimum of 3 fasteners per single door width and 6 fasteners per double door width with a maximum spacing of 12 inches; with a minimum of 1 inch thread engagement into the floor or anchoring device used. Thresholds over 6 inches in width shall be secured with a double row of fasteners.

N. Exterior thresholds shall be installed in a bed of sealant with combination expansion anchors and stainless steel machine screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws.

3.3 CONTINUOUS HINGES

A. Prevent conflicts with other installed hardware mounted in the same location.

B. Coordinate continuous hinge lengths to prevent conflicts with other door hardware such as door sweeps and door bottoms. Door bottoms shall be installed full width of door to create a full seal.

3.4 DOOR CLOSING DEVICES

A. Surface closers on doors opening to or from halls and corridors shall be mounted on the room side of the door.

B. Surface closers on doors opening into stairs or stair vestibules shall be mounted on the stair or stair vestibule side of the door.

C. Surface closers on exterior doors shall be mounted on the interior side of building utilizing regular arm, or parallel arm mounting as required.

D. Door closing devices with adjustable spring power shall be adjusted for proper door operation, and compliance with all applicable codes and regulations.

E. Cutting of gasketing or weatherstripping to accommodate closer installation is not acceptable.

3.5 PUSH-PULL PLATES

A. Pull plate grip handles shall be through bolted through the door. When push plate is indicated on opposite door side, through bolts shall be countersunk with push plate mounted to conceal through bolts.

3.6 KEY CONTROL STORAGE SYSTEMS

A. Key control storage system shall be installed where directed by the Architect.

B. Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

3.7 GASKETING/ WEATHERSTRIPPING

A. Prevent conflicts with other installed hardware mounted in the same location.

B. Coordinate door sweep and door bottom widths to prevent conflicts with other door hardware such as continuous hinges. Door bottoms shall be installed full width of door to create a full seal.

3.8 ASTRAGALS

A. Unless otherwise indicated install overlapping astragals as follows:
   1. At out-swing pairs of doors, mount astragal on active leaf.
   2. At in-swing pairs of doors, mount astragal on inactive leaf.

3.9 HARDWARE LOCATIONS

A. Unless otherwise indicated install hardware as follows or as local codes require:
   1. Bottom Hinge: 10 inches from door bottom to bottom of hinge.
   2. Top Hinge: 5 inches from door top to top of hinge.
   3. Center Hinge(s) or Pivot(s): Spaced equidistantly between top and bottom hinges/ pivots.
   4. Lockset / Latchset: 38 inches from finished floor to center of lever.
   5. Hospital Push-Pull Latchset/ Lockset: 42 inches from finished floor to center of latch.
   6. Exit Device: 38 inches from finished floor to device centerline.
   7. Deadlock: 42 inches from finished floor to center key cylinder / thumb turn.
   8. Push Plate/ Pull Plate: 42 inches from finished floor to center of pull.
   9. Wall Bumper: Centered at point on wall where lever, or other operating trim, first makes contact with wall.
   10. Floor Stop: Adjacent to wall; not to exceed 4 inches from face of wall; located 3 inches from latch edge of door; in any case never more than 50 percent of door width from latch edge of door.

3.10 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended.

B. Engage a factory-authorized service representative to adjust door closing devices, compensating for final operation of heating and ventilating equipment, and to comply with referenced accessibility requirements.

C. Follow-up Adjustment: Approximately 6 months after date of Substantial Completion, Installer shall perform the following:
   1. Examine and readjust each item of door hardware as necessary to ensure function of door hardware.
   2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
   3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

D. Where door closers are provided, adjust sweep speed so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.

3.11 COMPLETION

A. When complete all hardware shall be properly secured in place and all exposed surfaces shall be clean and free from scratches, paint, and other defects and damages.

B. Contractor shall demonstrate that all keys properly operate the locks as identified in the approved Keying Schedule.

3.12 DOOR HARDWARE SETS

A. The following is a general listing of hardware requirements. Provide hardware items required by established standards and practices to meet state and local codes, whether or not specifically indicated in the following sets.

B. Silencers and gasketing, where listed in Hardware Sets, may be omitted at openings where door frames are provided with integral seals if integral seals satisfy all applicable Codes and Regulations.

C. Refer to Door Schedule and/ or Drawings for door opening information, hardware set assignment, and related requirements.

D. Door contacts where indicated on security drawings.

E. Access Control Reader where indicated on security drawings.

F. Provide spacer, blade stop, drop plate as required for door closers.

G. At aluminum openings, coordinate gasketing, and/or astragal with Aluminum Entrances and Storefronts Section.

H. Provide knurled lever at boiler, electrical, mechanical, and required rooms per 521 CMR.

Set: 1.0

Description: Paired Opening – Exterior, Main Entry

2	Continuous Hinge	FM-HD1	Pemko
1	Mullion	KRM	Von Duprin
1	Rim Exit Only, Cylinder Dogging	CD 33A.EO	Von Duprin
1	Rim Exit Device, Aux TT, Cylinder Dogging	CD 33A.T .360T(Std)	Von Duprin
2	Offset Door Pull	RM3312 x Height Selected by Architect x Mtg-Type 12XHD [MP]	Rockwood
2	Overhead Stop	6-ADJ Series	Rixson
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Door Operator	4600 x Two BEA MS41 Actuators	LCN
1	Threshold	1/2" High	NGP

Notes: Coordinate gasketing, and/or astragal with Aluminum Entrances and Storefronts Section
Provide spacer, blade stop, drop plate as required for door closer
Operator on LHR leaf

Set: 2.0

Description: Single Opening – Exterior, Main Entry

1	Continuous Hinge	FM-HD1	Pemko
1	Rim Exit Device, Aux TT, Cylinder Dogging	CD 33A.T .360T(Std)	Von Duprin
1	Offset Door Pull	RM3312 x Height Selected by Architect x Mtg-Type 12XHD [MP]	Rockwood
1	Overhead Stop	6-ADJ Series	Rixson
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Threshold	1/2" High	NGP

Notes: Coordinate gasketing, and/or astragal with Aluminum Entrances and Storefronts Section
Provide spacer, blade stop, drop plate as required for door closer

Set: 3.0

Description: Paired Opening - Access Controlled, Main Entry Vestibule

2	Continuous Hinge x Power Transfer	FM-HD1 ACC8	Pemko
1	Mullion	KRM	Von Duprin
1	Rim Exit Only, QEL, RX	QEL RX 33A.EO	Von Duprin
1	Rim Exit Device, QEL, RX, Aux TT	QEL RX 33A.T .360T(Std)	Von Duprin
2	Offset Door Pull	RM3312 x Height Selected by Architect x Mtg-Type 12XHD [MP]	Rockwood
2	Overhead Stop	6-ADJ Series	Rixson
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Door Operator	4600 x Two BEA MS41 Actuators	LCN
1	Threshold	1/2" High	NGP
2	Door Harness		
2	Frame Harness		

Notes: Coordinate gasketing, and/or astragal with Aluminum Entrances and Storefronts Section
Provide spacer, blade stop, drop plate as required for door closer
Operator on LHR leaf

Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Coordinate power with electrical/LV contractor
* Provide door/frame harnesses

Set: 4.0

Description: Single Opening - Exterior – Exercise, Stairwell, Exit Only

1	Continuous Hinge	FMHD1 SLF	Pemko
1	Rim Exit Device, Exit Only	99.NL x Less Trim [F]	Von Duprin
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Gasketing	290 x 2891 APK	Pemko
1	Gasketing	120NA	NGP
1	Drip Strip	16A	NGP
1	Door Shoe	234AV	Pemko
1	Sweep	198NA	NGP
1	Threshold	1/2" High	NGP

Set: 5.0

Description: Single Opening - Exterior – Training Tower

1	Continuous Hinge	FMHD1 SLF	Pemko
1	Rim Exit Device, Exit Only	99L-.NL x 996L-NL [F]	Von Duprin
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Gasketing	290 x 2891 APK	Pemko
1	Gasketing	120NA	NGP
1	Drip Strip	16A	NGP
1	Door Shoe	234AV	Pemko
1	Sweep	198NA	NGP
1	Threshold	1/2" High	NGP

Set: 6.0

Description: Single Opening - Access Controlled, Exterior

	Hinge, Full Mortise, Hvy Wt	5BB1HW [NRP]	Ives
1	Electric Power Transfer	EPT10	Von Duprin
1	Rim Exit Device, Fail Secure, RX	RX 99.L .FSE .M996L(Std)	Von Duprin
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Gasketing	5050C	NGP
1	Drip Strip	16A	NGP
1	Perimeter Gasket	290 x 2891APK	Pemko
1	Door Shoe	234AV	NGP
1	Sweep	198NA	NGP
1	Threshold	1/2" High	NGP
2	Door Harness		
2	Frame Harness		

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Coordinate power with electrical/LV contractor
* Provide door/frame harnesses

Set: 7.0

Description: Single Opening - Access Controlled, Garage, Stair

1	Continuous Hinge x Power Transfer	FM300 EL8	Markar
1	Rim Exit Device, QEL, RX, Aux TT	QEL RX 33A.T .360T(Std) [F]	Von Duprin
1	Offset Door Pull	RM3312 x Height Selected by Architect x Mtg-Type 12XHD [MP]	Rockwood
1	Surf Overhead Stop	9-ADJ-Series	Rixson
1	Surface Closer	4040XP SCUSH	LCN
1	Kick Plate	K1050 16" High x CSK x 4BE	Rockwood
1	Gasketing	5050C	NGP
1	Sweep	198NA	NGP
1	Threshold	1/2" High	NGP
1	Rain Drip at Exterior Doors		NGP

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Coordinate power with electrical/LV contractor
* Provide door/frame harnesses

Set: 8.0

Description: Single Opening - Vestibule

1	Continuous Hinge	FM300	Markar
1	Push Bar	330	Von Duprin
1	Offset Door Pull	RM3312 x Height Selected by Architect x Mtg-Type 12XHD [MP]	Rockwood
1	Surf Overhead Stop	9-ADJ-Series	Rixson
1	Surface Closer	4040XP SCUSH	LCN
1	Kick Plate	K1050 16" High x CSK x 4BE	Rockwood

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Coordinate power with electrical/LV contractor
* Provide door/frame harnesses

Set: 9.0

Description: Single Opening - Office

	Hinge, Full Mortise	5BB1	Ives
1	Office Lock	ND50 ATH	Schlage
1	Door Stop	446	Rockwood

Provide acoustical gasketing where indicated on door schedule

Set: 10.0

Description: Single Opening – Toilet, Shower

	Hinge, Full Mortise	5BB1	Ives
1	Privacy Lock x Occupancy Indicator	ND40 ATH x Indicator	Schlage
1	Door Stop	404	Rockwood
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Kick Plate	K1050 16" High x CSK x 4BE	Rockwood
1	Gasketing	5050C	NGP
1	Coat Hook	RM802	Rockwood

Set: 11.0

Description: Single Opening – Bunk Room

	Hinge, Full Mortise	5BB1	Ives
1	Privacy Lock x Occupancy Indicator	ND40 ATH x Indicator	Schlage
1	Overhead Stop	9-ADJ Series	Rixson
1	Kick Plate	K1050 16” High x CSK x 4BE	Rockwood
1	Door Bottom	234AV	Pemko
1	Perimeter Gasket	290 x 2891	Pemko

Set: 12.0

Description: Single Opening – Corridor

	Hinge, Full Mortise	5BB1	Ives
1	Lockset	TBD	
1	Overhead Stop	9-ADJ Series	Rixson
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Kick Plate	K1050 16” High x CSK x 4BE	Rockwood
1	Door Bottom	234AV	Pemko
1	Perimeter Gasket	290 x 2891	Pemko

Set: 13.0

Description: Closet – Sliding Door

1	Bypassing Door Set		Pemko
2	Door Pulls	BF97L	Rockwood

Set: 14.0

Description: Single Opening – Access Controlled

	Hinge, Full Mortise	5BB1	Ives
1	Continuous Hinge x Power Transfer @ doors 42” and wider and heavy use doors		
1	Electric Power Transfer	EPT10	Von Duprin
1	Fail Secure Lock, RX	RX ND80EU ATH	Schlage
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI Provide Rockwood 404/446 where SCUSH arm will not work	LCN
1	Kick Plate	K1050 16" High x CSK x 4BE	Rockwood
1	Gasketing	5050C - Head and Jambs	NGP
1	Door Harness		
1	Frame Harness		

Notes: Operation:
*Door normally closed and secured.
*Upon use of mechanical key or presentation of authorized credentials door to unlock allowing authorized entry.
*Built in request to exit switch to shunt door contact where contacts are indicated on security drawings.
*Upon loss of power door to remain locked from key side.
*Always free egress.
*Coordinate Power with Electrical/LV Contractor
* Provide Door/Frame Harnesses

Set: 15.0

Description: Single Opening –, Locker Room

1	Continuous Hinge	A500	ABH
1	Push Plate/Pull Set	110 x 73C/73CL	Rockwood
1	Surface Closer x Optional Hold Open x Stop Arm	4040XP .SCUSH .SRI	LCN
1	Armor Plate	K1050 30" High x CSK x 4BE	Rockwood
1	Gasketing	5050C	NGP

Set: 16.0

Description: Single Opening – Stairwell, Rated Fire Pole Door

	Continuous Hinge	A500	ABH
1	Exit Device, Passage	99.L-NL [F] 996L-NL	Von Duprin
1	Surface Closer	4040XP SCUSH	LCN
1	Gasketing	5050C - Head and Jambs	NGP

Set: 17.0

Description: Paired Opening – Electrical Room

	Hinge, Full Mortise	5BB1	Ives
2	Flush Bolt	555 / 557	Rockwood
1	Dust Proof Strike	570	Rockwood
1	Storeroom Lock	ND80 ATH x Knurled Lever	Schlage
1	Surf Overhead Stop	9-ADJ-Series	Rixson
1	Surface Closer	4040XP SCUSH	LCN

Set: 18.0

Description: Paired Opening – Storage, Ice, Table and Chair Storage

	Hinge, Full Mortise	5BB1	Ives
2	Flush Bolt	555 / 557	Rockwood
1	Dust Proof Strike	570	Rockwood
1	Classroom Lock	ND70 ATH	Schlage
2	Surf Overhead Stop	9-ADJ-Series	Rixson
2	Kick Plates	K1050 12” High CSK 4BE	Rockwood
2	Armor Plates at table and chair storage	K1050 30” High CSK 4BE	Rockwood

Set: 19.0

Description: Single Opening – Water Service, MEP

	Hinge, Full Mortise	5BB1	Ives
1	Storeroom Lock	ND80 ATH	Schlage
1	Surface Closer	4040XP Reg	LCN
1	Door Stop	404	Rockwood
	Silencers		

Set: 20.0

Description: Single Opening – Storage, Exercise, Training Room, Watch Room

	Hinge, Full Mortise	5BB1	Ives
1	Classroom Lock	ND70 ATH	Schlage
1	Surface Closer	4040XP Reg/SCUSH Provide hold open arm per conditions	LCN
1	Door Stop	404	Rockwood
	Silencers		

Set: 21.0

Description: Single Opening – Custodial

	Hinge, Full Mortise	5BB1	Ives
1	Storeroom Lock	ND80 ATH	Schlage
1	Surface Closer x Hold Open Arm	4040XP SHCUSH	LCN
1	Kick Plate	K1050 16” High CSK	Rockwood

Set: 22.0

Description: Single Opening – Electrical Room

	Hinge, Full Mortise, Heavy Weight	5BB1 HW	Ives
1	Exit Device, Nightlatch, Knurled Lever	99.L-NL [F] 996L-NL	Von Duprin
1	Surface Closer	4040XP EDA	LCN
1	Gasketing	5050C - Head and Jambs	NGP

Set: 23.0

Description: Paired Opening – Electrical Room

	Hinge, Full Mortise, Heavy Weight	5BB1 HW	Ives
1	Auto Flush Bolt Set	2845	Rockwood
1	Dust Proof Strike	570	Rockwood
1	Exit Device, Nightlatch, Knurled Lever	9975.L-NL [F] 996L-NL x Knurled Lever	Von Duprin
2	Surface Closer	4040XP EDA	LCN
1	Gasketing	5050C - Head and Jambs	NGP
1	Astragal Set	178SA	NGP

Set: 24.0

Description: Single Opening –Shower

1	Continuous Hinge	FMHD1	Pemko
1	Push Plate	70C x US32D316 finish	Rockwood
1	Door Pull	107 x US32D316 Finish	Rockwood
1	Overhead Stop	9-ADJ Series	Rixson
1	Deadbolt	L460 x OCC O/S	Schlage
1	Gasketing	5050C	NGP

Set: 25.0

Description: Paired Opening – Compressor, Work Room

	Hinge, Full Mortise, Heavy Weight	5BB1 HW	Ives
1	Auto Flush Bolt Set	2845	Rockwood
1	Dust Proof Strike	570	Rockwood
1	Classroom Lock	ND70 ATH	Schlage
2	Surface Closer	4040XP SCUSH	LCN
1	Gasketing	5050C - Head and Jambs	NGP
1	Astragal Set	178SA	NGP

Set: 26.0

Description: Single Opening – Storage Gate

Balance of hardware by gate manufacturer

1	Storeroom Lock	ND80 ATH	Schlage

Set: 27.0

Description: Single Opening – Roof Dining Space

1	Continuous Hinge	FM-HD1	Pemko
1	Narrow Stile Lock	2190 x Key on inside	Adams Rite
1	Overhead Stop	6-ADJ Series	Rixson
1	Surface Closer	4040XP REG / EDA / SCUSH.SRI	LCN
1	Threshold	1/2" High	NGP

Notes: Coordinate gasketing, and/or astragal with Aluminum Entrances and Storefronts Section
Provide spacer, blade stop, drop plate as required for door closer

END OF SECTION

SECTION 08 80 00

GLAZING

(PART OF TRADE-BID SECTION 08 00 01 – GLASS AND GLAZING)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Doors.
   2. Glazed curtain walls. (NOT PART OF TRADE BID)
   3. Glazed entrances. (NOT PART OF TRADE BID)
   4. Interior borrowed lites.
   5. Glazing sealants and accessories.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.
      a. Coated glass.
      b. Laminated glass.
      c. Insulating glass.
   3. Glazing Accessory Samples: For sealants, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

4. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
5. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Informational Submittals:
1. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, and sealant testing agency.
2. Product Certificates: For glass.
3. Product Test Reports: For coated glass, insulating glass, and glazing sealants, for tests performed by a qualified testing agency.
   a. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
4. Preconstruction adhesion and compatibility test report.
5. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
1. Install glazing in mockups specified in Section 08 41 13 - Aluminum-Framed Entrances and Storefronts and Section 08 44 13 - Glazed Aluminum Curtain Walls to match glazing systems required for Project, including glazing methods.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
   1. Obtain coated glass from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 - Quality Requirements, to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300.
   1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE 7, based on heights above grade indicated on Drawings.
      a. Wind Design Data: As indicated on Drawings.
   2. Design Snow Loads: As indicated on Drawings.
   3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
   4. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
   5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
   6. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
   2. For laminated-glass lites, properties are based on products of construction indicated.
   3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
   5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual".
   2. IGMA Publication for Insulating Glass: IGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
   1. Minimum Glass Thickness for Exterior Lites: 1/4-inch (6 mm).
   2. Minimum Glass Thickness for Interior Lites up to 48-inches tall: 1/4-inch (6 mm).
   3. Minimum Glass Thickness for Interior Lites up to 96-inches tall: 3/8-inch (10 mm).
      a. Provide load charts or calculation to determine maximum allowable width of each lite.
   4. Minimum Glass Thickness for Lites 96 to 120-inches tall: 1/2-inch (12 mm).
      a. Provide load charts or calculation to determine maximum allowable width of each lite.
   5. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Primary Float Glass (**GL-1 FL**)
   1. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
   2. Minimum Thickness: 6 mm.
      a. Products:
         1) AGC, clear float glass.
         2) Guardian, clear glass.
         3) Pilkington Libbey-Owens-Ford (LOF), clear glass
         4) Vitro Architectural Glass, clear glass.

B. Heat-Treated Clear Float Glass (**GL-1 HS, and GL-1 FT**)
   1. Heat Treated Float Glass: ASTM C1048, Condition A (uncoated); Quality-Q3 and as follows:
      a. Class: 1 (clear).
      b. Minimum Thickness: 6 mm.
      c. Kind: HS (heat strengthened).
      d. Kind: FT (fully tempered).
   2. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   3. For clear or low-iron glass 1/4 to 3/8-inch thick without ceramic frit or ink, maximum + or – 100 mD (millidiopter) over 95 percent of the glass surface.
   4. Maximum peak to valley rollerwave 0.003” (0.08mm) in the central area and 0.008-inches (0.20mm) within 10.5-inches (267mm) of the leading and trailing edge

2.5 COATED GLAZING

A. Clear Low-Emissivity (Low E) Glass: Provide low "e" glass complying with ASTM C1376 pyrolytically (magnetic sputter vacuum) coated low-emissivity glass, and resulting in a stable, uniform, nearly invisible coating which imparts average maintained insulating performance of at least R = 2.5, tempered in doors and adjacent lites and heat strengthened where shown on Drawings or required by codes.
   1. Edge Deletions: Provide accurate and straight edge deletions of coatings at areas of insulating glass assemblies where Low “E” coatings, metallic coating or other decorative coatings are applied to surfaces scheduled to be in contact with the primary seal of insulating glass units.
   2. Manufacturers:
      a. Pilkington North America
      b. Vitro Architectural Glass
      c. Zeledyne
      d. Guardian, .

e. AFGD
f. Viracon

3. Basis of Design: Vitro Solarban 60.

2.6 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

B. Laminated Glass (**GL-1 LM**):
   1. Overall Unit Thickness: Nominal 5/16 inch (7.8 mm).
   2. Outer Lite: Class 1 (clear) heat strengthened glass.
      a. Thickness: Minimum 3.0 mm.
   3. Plastic Interlayer:
      a. Thickness: 0.060 inch (1.52 mm), but not less than that required to comply as a Type II safety glass material.
      b. Interlayer Color: Clear.
   4. Inner Lite: Class 1 (clear) heat strengthened glass.
      a. Thickness: Minimum 3.0 mm.

2.7 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190.
   1. Sealing System: Dual seal, with manufacturer's standard primary and silicone sealant complying with ASTM C1249 for secondary seal.
   2. Sealed Insulating Glass Units to be double sealed with a primary seal of polyisobutylene and a secondary seal of silicone complying with ASTM C1249.
      a. Minimum thickness of the secondary seal shall be 1/16-inch (1.59mm).
      b. Target width of the primary seal shall be 5/32-inch (3.97mm).
      c. No voids or skips in the primary seal allowed.
      d. Up to a maximum of 3/32-inch of the air spacer may be visible above the primary polyisobutylene sealant.
      e. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16-inch (1.59mm) by maximum length of 2-inches (51mm) with gaps separated by at least 18-inches (457mm). Continuous contact between the primary seal and the secondary seal is desired.
   3. Spacer: Stainless steel .
      a. Color: Black.
   4. Desiccant: Molecular sieve or silica gel, or a blend of both.

B. Basis of Design Products:
   1. Glass (**Type GL-3 LE 2**): Low-e-coated, tripple glazed, clear insulating glass.
      a. Overall Unit Thickness: 1 3/4-inch (44. mm).
      b. Thickness of Outer Glass Lite: 1/4-inch (6.0 mm).

1) Outdoor Lite: Clear, heat strengthened float, fully tempered where required or indicated (GL-1 FL or GL-1 HS)
2) Low-E Coating: Magnetic Sputter Vacuum Deposition (MSVD) soft-coat on second surface.
(a) Basis of Design: Vitro; Solarban 60.

c. Interspace Content: 90% Argon.
d. Interior Lite: Clear Heat float glass (GL-1).
1) Thickness of Interior Glass Lite: 1/4-inch (6.0 mm).
e. Interspace Content: 90% Argon.
f. Thickness of Indoor Glass Lite: 1/4-inch (6.0 mm).
1) Indoor Lite: Clear Heat strengthened float glass (GL-1 FL or GL-1 HS), fully tempered where required or indicated.
g. Performance Characteristics:
1) Visibile Light Transmittance: 49 percent minimum.
2) Winter Nighttime U-Factor: .28 maximum.
3) Solar Heat Gain Coefficient: 0.29 maximum.
h. Provide safety glazing where required.

2.8 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.

B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.

C. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 5-mm thickness; faced on one surface with a clear glazing film; and complying with 16 CFR 1201, Category II and meeting the hose-stream test.
1. Products:
a. Schott North America, Inc.; Pyran Platinum F.
b. Technical Glass Products; FireLite NT.
c. Vetrotech Saint-Gobain; SGG Keralite FR-F.

2.9 GLAZING SEALANTS

A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Manufacturers:
   a. Dow Corning Corporation.
   b. GE Construction Sealants; Momentive Performance Materials Inc.
   c. May National Associates, Inc.; a subsidiary of Sika Corporation.
   d. Pecora Corporation.
   e. Sika Corporation.
   f. Tremco Incorporated.
2. Applications: Window perimeters or panel to panel joints. To coat over end dams or other internal seals in curtain wall systems.

2.10 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.11 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.12 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
      a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING (INTERIOR USE ONLY)

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant where indicated on Drawings.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
   1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 08 83 00

MIRRORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The following types of silvered flat glass mirrors:
   1. Laminated glass mirrors qualifying as safety glazing.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
   2. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

B. Informational Submittals:
   1. Qualification Data: For Installer.
   2. Product Certificates: For each type of mirror and mirror mastic.
   3. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
   4. Sample Warranty: For special warranty.

C. Closeout Submittals:
   1. Maintenance Data: For mirrors to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.
   1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Avalon Glass and Mirror Company.

B. Binswanger Mirror; a division of Vitro America, Inc.

C. Gardner Glass, Inc.

D. Guardian Industries Corp.; SunGuard.

E. Independent Mirror Industries, Inc.

F. National Glass Industries.

G. Virginia Mirror Company, Inc.

H. Walker Glass Co., Ltd.

I. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

J. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

B. Laminated Mirrors: ASTM C 1172, Type II.
   1. Glass for Outer Lite: Annealed float glass, Mirror Select Quality, clear.
      a. Nominal Thickness for Outer Lite: 6.0 mm unless indicated otherwise.
   2. Glass for Inner Lite: Annealed float glass; ASTM C 1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear).
      a. Nominal Thickness: 6.0 mm unless indicated otherwise.
   3. Interlayer: Mirror manufacturer's standard 0.030-inch- (0.76-mm-) thick, clear polyvinyl-butyral interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.

C. Safety Glazing Products: For laminated mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Laurence, C. R. Co., Inc.
      b. Macco Adhesives.
      c. Pecora Corporation.
      d. Royal Adhesives & Sealants.
   2. Adhesives shall have a VOC content of 70 g/L or less.

2.4 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
   1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
      a. Manufacturers:
         1) Laurence, C. R. Co., Inc.
         2) Stylmark, Inc.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
   a. Manufacturers:
      1) Laurence, C. R. Co., Inc.
      2) Stylmark, Inc.
3. Finish: Clear anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished.
1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
   1. GANA Publications: "Laminated Glazing Reference Manual," "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Provide a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
   1. Aluminum J-Channels: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
   2. Install mastic as follows:
      a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
      b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
      c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

SECTION 08 91 21

WIND-DRIVEN-RAIN-RESISTANT LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fixed, extruded-aluminum wind-driven-rain-resistant louvers.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
   2. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
      a. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
      b. Show mullion profiles and locations.
   3. Samples: For each type of metal finish required.
   4. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Informational Submittals:
   1. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
   2. InLineNote: Retain paragraph below if windborne-debris-impact resistance is required.
   3. Windborne-debris-impact-resistance test reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural[and seismic] performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Design earthquake spectral response acceleration, short period (Sds) for Project as indicated on Structural drawings.
   2. Component Importance Factor: 1.5.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Wind-Driven-Rain-Resistant Louver:

1. Manufacturers:
   a. Air Balance Inc.; a Mestek company.
   b. All-Lite Architectural Products.
   c. Construction Specialties, Inc.
   d. Greenheck Fan Corporation.
   e. Industrial Louvers, Inc.
   f. Nystrom, Inc.
   g. Ruskin Company; Tomkins PLC.
   h. Basis of Design Product: Storm Resistant Fixed Horizontal Louver Model RS-7705 by Construction Specialties, Inc. (C/S).

B. Basis of Design Product: Storm Resistant Fixed Horizontal Louver Model RS-4700 by Construction Specialties, Inc. (C/S).
   1. Louver Depth: 4 inches (175 mm).
   2. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
   3. Louver Performance Ratings:
      a. Free Area: Not less than 8.0 sq. ft. (0.74 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
         1) Percent Free Air: Not less than 50 percent.
      b. Air Performance: Not more than 0.21-inch wg (52.5-Pa) static pressure drop at 900-fpm (4.6-m/s) free-area intake velocity.
      c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches (75 mm) per hour and a wind speed of 29 mph (13 m/s) at a core-area intake velocity of 600 fpm (3.0 m/s).
   4. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
   2. Finish: Same finish as louver frames to which louver screens are attached.
   3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:
   1. Bird Screening: Aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.60-mm) wire.

2.5 BLANK-OFF PANELS

A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.

1. Aluminum sheet for aluminum louvers, not less than 0.050-inch (1.27-mm) nominal thickness.
2. Panel Finish: Same finish type applied to louvers, but black color.
3. Attach blank-off panels with clips or sheet metal screws.

B. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
1. Thickness: 1 inch (25 mm).
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.81-mm) nominal thickness.
3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch (2.03-mm) nominal thickness, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same type of finish applied to louvers, but black color.
7. Attach blank-off panels with clips or sheet metal screws.

2.6 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
4. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

G. Provide subsills made of same material as louvers or extended sills for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Color and Gloss: Match Curtain Wall, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 - Joint Sealants for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

SECTION 09 00 00

PAINTING (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
2. The following shall appear on the upper left hand of the envelope:
   a. Name of Sub-Bidder: Print Name of Sub-bidder
   b. Project: Insert project name
   c. Sub-Bid for Section: xxxx - Trade
3. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
4. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
1. 01-GENERAL Series.
2. 03-LANDSCAPE Series
3. 05-ARCHITECTURAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Painting Work of Section 01 43 39 MOCKUP REQUIREMENTS
2. All Work of Section 09 61 16 CONCRETE FLOOR SEALING
3. All Work of Section 09 91 13 EXTERIOR PAINTING.
4. All Work of Section 09 91 23 INTERIOR PAINTING
5. All Work of Section 09 96 00 HIGH PERFORMANCE COATINGS
6. All Work of Section 09 96 13.13 Decorative High-Performance Coatings

END OF SECTION

SECTION 09 00 01

TILE (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
2. The following shall appear on the upper left hand of the envelope:
   a. Name of Sub-Bidder: Print Name of Sub-bidder
   b. Project: Insert project name
   c. Sub-Bid for Section: xxxx - Trade
3. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
4. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
   1. 01-GENERAL Series.
   2. 05-ARCHITECTURAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. All Work of Section 09 30 13 TILING.

END OF SECTION

SECTION 09 00 02

ACOUSTICAL TILE (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
2. The following shall appear on the upper left hand of the envelope:
   a. Name of Sub-Bidder: Print Name of Sub-bidder
   b. Project: Insert project name
   c. Sub-Bid for Section: xxxx - Trade
3. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
4. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.4 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
   1. 01-GENERAL Series.
   2. 05-ARCHITECTURAL Series.

1.5 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. All Work of Section 09 51 13 ACOUSTICAL PANEL CEILINGS.
   2. All Work of Section 09 54 26 LINEAR WOOD CEILINGS.

END OF SECTION

SECTION 09 00 03

RESILIENT FLOORS (TRADE-BID)

(FILED SUB-BID REQUIRED)

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors".
2. The following shall appear on the upper left hand of the envelope:
   a. Name of Sub-Bidder: Print Name of Sub-bidder
   b. Project: Insert project name
   c. Sub-Bid for Section: xxxx - Trade
3. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Purchasing Department, City Hall, 455 Main Street, Worcester, MA 01605 person, or by written request.
4. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.2 ADDITIONAL REQUIREMENTS:

A. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

B. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein

1.3 DRAWINGS

A. Reference Drawings: The Work of this Trade-Bid is shown on the following Contract Drawings:
   1. 01-GENERAL Series.
   2. 05-ARCHITECTURAL Series.

1.4 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. All Work of Section 09 65 13 RESILIENT BASE AND ACCESSORIES.
   2. All Work of Section 09 65 19 RESILIENT TILE FLOORING
   3. All Work of Section 09 65 36 STATIC-CONTROL RESILIENT FLOORING
   4. All Work of Section 09 65 66 RESILIENT ATHLETIC FLOORING
   5. All Work of Section 09 05 61.13 MOISTURE VAPOR EMISSION CONTROL for areas within flooring listed in #1-4 above.

END OF SECTION

SECTION 09 05 61.13

MOISTURE VAPOR EMISSION CONTROL

(PART OF TRADE-BID SECTION 09 00 03 - RESILIENT FLOORS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied, resin-based, membrane-forming systems that control the moisture-vapor-emission rate of high-moisture, interior concrete to prepare it for floor covering installation.

1.2 UNIT PRICES

A. Work of this Section is affected by Moisture Vapor Emission Control Unit Price and will be applied under the following conditions:
   1. In the event that the results of pre-construction testing determine or reveal that relative humidity, vapor emission levels, or alkalinity-pH of concrete floor slabs fall within adhesive and finish flooring system manufacturer's recommended maximum levels, Owner may elect to omit system.

1.3 DEFINITIONS

A. MVE: Moisture vapor emission.

B. MVER: Moisture vapor emission rate.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.

B. Informational Submittals:
   1. Qualification Data: For Installer and manufacturer.
   2. Product Test Reports: For each MVE-control system, for tests performed by manufacturer and witnessed by a qualified testing agency.
   3. Preinstallation testing reports.
   4. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Employs factory-trained personnel who are available for consultation and Project-site inspection.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with MVE-control system manufacturer's written instructions for substrate and ambient temperatures, humidity, ventilation, and other conditions affecting system installation.
   1. Store system components in a temperature-controlled environment and protected from weather and at ambient temperature of not less than 65 deg F (18 deg C) and not more than 85 deg F (29.4 deg C) at least 48 hours before use.
   2. Maintain ambient temperature and relative humidity in installation areas within range recommended in writing by MVE-control system manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29.4 deg C) and not less than 40 or more than 60 percent relative humidity, for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.
   3. Install MVE-control systems where concrete surface temperatures will remain a minimum of 5 deg F (3 deg C) higher than the dew point for ambient temperature and relative humidity conditions in installation areas for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.

1.8 WARRANTY

A. Warranty: Manufacturer to warrant control system products and components to maintain adhesion to all types of concrete substrates, concrete silicates and treatments, tolerant to moisture, alkalinity-pH and relative humidity during a 15 year period. Warranty includes repair and replacement of flooring products, coatings, primers and finishes applied over the control system surface and labor costs in the event of system failure during warranty period.
   1. Warranty shall commence from Date of Substantial Completion.

B. Warranty shall not exclude foreign salts, admixtures, resin and silicate surface treatments or surface due to normal concrete movement. Installation deems acceptance of on-site conditions.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete that exhibits the following conditions:
   1. MVER: Maximum 15 lb of water/1000 sq. ft. (6.80 kg of water/92.9 sq. m) when tested according to ASTM F1869.

2. Relative Humidity: Maximum 100 percent when tested according to ASTM F2170 using in situ probes.

B. Water-Vapor Transmission: Through MVE-control system, maximum 0.10 perm (5.75 ng/Pa x s x sq. m) when tested according to ASTM E96/E96M.

C. Tensile Bond Strength: For MVE-control system, greater than 200 psi (1.38 MPa) with failure in the concrete according to ASTM D7234.

2.2 MVE-CONTROL SYSTEM

A. Manufacturers:
1. Ardex Engineered Cements
   a. Product: Ardex MC Rapid.
2. Koster American Corp.
   a. Product: VAP I 2000.
3. Sika Corporation
   a. Product: Sika MB.
4. Stauf USA, LLC.
   a. Product: ERP-270 Perma-Seal.
5. Substitutions: None accepted.

B. MVE-Control System: ASTM F3010 qualified, fluid-applied, two-component, epoxy-resin, membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.
1. Substrate Primer: Provide MVE-control system manufacturer's concrete-substrate primer if required for system indicated by substrate conditions.
2. Cementitious Underlayment Primer: If required for subsequent installation of cementitious underlayment products, provide MVE-control system manufacturer's primer to ensure adhesion of products to MVE-control system.

2.3 ACCESSORIES

A. Patching and Leveling Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of 3000-psi (20.68-MPa) compressive strength after 28 days when tested according to ASTM C109/C109M.

B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.

C. Cementitious Underlayment: If required to maintain manufacturer's warranty, provide MVE-control system manufacturer's hydraulic cement-based underlayment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of system indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Preinstallation Testing:
   1. Alkalinity Testing: Perform pH testing according to ASTM F710. Install MVE-control system in areas where pH readings are less than 7.0 and in areas where pH readings are greater than 8.5.
   2. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F1869. Install MVE-control system in locations where concrete substrate MVER exceeds 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Internal Relative Humidity Test: Using in situ probes, ASTM F2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.
   3. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. (9.29-sq. m) area of MVE-control system to prepared concrete substrate and test according to ASTM D7234.
      a. Proceed with installation only where tensile bond strength is greater than 200 psi (1.38 MPa) with failure in the concrete.

B. Concrete Substrates: Prepare and clean substrates according to MVE-control system manufacturer's written instructions to ensure adhesion of system to concrete.
   1. Remove coatings and other substances that are incompatible with MVE-control system and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by MVE-control system manufacturer. Do not use solvents.
   2. Provide concrete surface profile complying with ICRI 310.2R CSP 3 by shot blasting using apparatus that abrades the concrete surface with shot, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
   3. After shot blasting, repair damaged and deteriorated concrete according to MVE-control system manufacturer's written instructions.
   4. Protect substrate voids and joints to prevent resins from flowing into or leaking through them.
   5. Fill surface depressions and irregularities with patching and leveling material.
   6. Fill surface cracks, grooves, control joints, and other nonmoving joints with crack-filling material.

7. Allow concrete to dry, undisturbed, for period recommended in writing by MVE-control system manufacturer after surface preparation, but not less than 24 hours.
8. Before installing MVE-control systems, broom sweep and vacuum prepared concrete.

C. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.

3.3 INSTALLATION

A. Install MVE-control system according to ASTM F3010 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes, and voids.
1. Install primers as required to comply with manufacturer's written instructions.

B. Do not apply MVE-control system across substrate expansion, isolation, and other moving joints.

C. Apply system, including component coats if any, in thickness recommended in writing by MVE-control system manufacturer for MVER indicated by preinstallation testing.

D. Cure MVE-control system components according to manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.

E. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.

F. Install cementitious underlayment over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform installation inspections.

B. Installation Inspections: Inspect substrate preparation and installation of system components to ensure compliance with manufacturer's written instructions and to ensure that a complete MVE-control system is installed without deficiencies.
1. Verify that surface preparation meets requirements.
2. Verify that component coats and complete MVE-control-system film thicknesses comply with manufacturer's written instructions.
3. Verify that MVE-control-system components and installation areas that evidence deficiencies are repaired according to manufacturer's written instructions.

C. MVE-control system will be considered defective if it does not pass inspections.

3.5 PROTECTION

A. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.

B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-structural metal framing, including the following:
   1. Non-load bearing interior light gauge steel studs and furring.
   2. Ceiling and soffit suspension systems for interior gypsum board assemblies.
   3. Backing plates not provided by other trades for support of items attached to metal framing system.
   4. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

1.2 DEFINITIONS

A. CASRN: Chemical Abstract Service Registration Number.

B. CSR: corporate sustainability report.

C. EPDs: Environmental Product Declarations.

1.3 DELEGATED DESIGN PERFORMANCE REQUIREMENTS

A. Design, engineer, fabricate, assemble and install non-structural metal framing work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections; to satisfy applicable governing codes and regulations; and to provide structurally sound assemblies.
   1. Where non-structural metal framing work shown in the Drawings complies with manufacturer's published structural performance (span charts) or standard details, these manufacturer standard documents shall be considered an acceptable substitute for the engineering analysis, calculations and shop drawings described below.

B. Drawings of non-structural metal framing assemblies are diagrammatic and show design intent of finished profiles, shapes, and forms; relationships between elements; location, identification, dimension and size of components, assemblies, and accessories; and details and diagrams of connections.

C. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

D. Determine the size, thickness, and spacing, when not shown on the Drawings, of members, their connections to one another, and anchors to building structure using the following criteria:

1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
2. Performance Requirements: Unless otherwise indicated on the Drawings, engineer assemblies to withstand the loads prescribed by the authorities having jurisdiction, within the specified deflection limits.
    a. Lateral loading:
        1) 5 psf for interior partitions; as prescribed for exterior walls.
        2) 10 psf at elevator shafts, pressurized areas, loading dock areas and where identified in the Drawings; as prescribed for exterior walls.
    b. Limit metal framing systems deflection under load to the following:
        1) L/240 where supporting gypsum board only.
        2) L/360 where supporting tile.
3. Sound Transmission Characteristics: Provide materials and construction as indicated in the assembly, tested in accordance with ASTM E 90 and classified according to ASTM E413 by a qualified independent testing agency.
    a. Provide assemblies designed and pretested to achieve the minimum ratings as indicated on the Drawings.

E. If required by authorities having jurisdiction, prepare and submit to authorities having jurisdiction: reviewed shop drawings, specifications, load and deflection tables and any other supporting data required by authorities having jurisdiction for their review and approval; and pay fees incurred, prior to beginning installation.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Include a list of proposed products and materials to be provided for complete assemblies, along with manufacturer's product data, specifications, typical installation details and other data for each material listed to prove compliance with the specified requirements.
2. Shop Drawings: large scale, dimensioned shop drawings for Contractor-engineered assemblies.
    a. Show framing member size, thicknesses, number, type, location, and spacing.
    b. Indicate component details, framing layout, framed openings, anchorage to structure, bracing, type and location of fasteners and welds, and accessories required for related work.
    c. Show metal thicknesses, spacing of members and span dimensions.
    d. Show layout and details of resillient suspension systems.

B. Informational Submittals:
1. Manufacturer's Design Data: Submit complete load and deflection tables properly annotated for the indicated framing sizes, spacing, span limits and thicknesses to be used.
2. Certificates:
    a. Mill certificates and galvanizing certificates: Signed by framing member/accessory manufacturer certifying compliance with material requirements.

b. Welder certificates: Submit certificates verifying welders to be employed in this work have satisfactorily passed AWS qualification tests. If re-certification of welders is required, retesting will be Contractor's responsibility.

3. Manufacturer's Installation Instructions: Submit manufacturer-prepared instructions concerning the proper preparation and installation framing members and framing accessories.

1.5 QUALITY ASSURANCE

A. Installer's Qualifications: Firm and individuals with a minimum of 3 consecutive years experience in the installation of specified products on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

B. Qualifications for Welding Work: Use qualified welders experienced in welding lightgage steel and comply with AWS D1.1/D1.1M and AWS D1.3/D1.3M.

C. Regulatory Requirements: Where fire-resistive construction is indicated, provide materials, accessories, and application procedures listed by UL, or tested according to ASTM E119 for the type of construction shown, and approved by the authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store off ground, either in a dry, ventilated, enclosed space or protected with suitable waterproof coverings.

C. Handling: Protect metal framing units from rusting and damage.

1.7 SEQUENCING

A. Coordinate placement of concealed internal wall reinforcement, such as backing plates, for items to be attached to metal support systems.

B. Coordinate installation of ceiling and soffit suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorage to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

C. Furnish concrete inserts, and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide metal framing members from one of the following:

1. MarinoWARE.
2. SCAFCO Corporation.
3. Clarkwestern Dietrich Building Systems LLC.
4. Telling Industries.
5. MBA Metal Framing.

2.2 STUDS, RUNNERS, AND FURRING

A. Framing Members - General: Comply with ASTM C754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
   2. Protective Coating: ASTM A653/A653M, G40.

B. Smooth Steel Studs: ASTM C645, punched web complying with the following:
   1. Protective coating: ASTM A653/A653M, G40 galvanized coating.
   2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.
   3. Uncoated Metal Thickness: Minimum 0.018-inch, refer to the Drawings.

C. Dimpled Steel Studs and Runners:
   1. Protective coating: ASTM A653/A653M, G40 galvanized coating.
   2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.
   3. Uncoated Metal Thickness: Minimum 0.015-inch.

D. Top and Bottom Tracks: As recommended by the manufacturer of each stud type and of the same thicknesses as the studs in same wall or partition, unless otherwise indicated on the Drawings. Provide unpunched, screwable tracks with 1-1/4-inch flanges.

E. Slip-Type Head Joints: Where indicated, provide one of the following:
   1. Single Long-Leg Runner System: ASTM C645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12-inches of the top of studs to provide lateral bracing.
   2. Double-Runner System: ASTM C645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

F. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs by one of the following:
   1. "The System" by Metal Lite, Inc.
   2. "MaxTrack (SLT)" by Clark Dietrich, Inc.
   3. “Slotted Track”, SCAFCO Steel Stud Company.
   4. Or other Code-compliant assemblies acceptable to the Architect.

G. Furring Channels: Minimum 0.018 inch thick, galvanized, hat-shaped.

H. Acoustic head restraints: Continuous angle bracket with closed cell EPDM rubber strip. shore 40-60A. Depth 1-inch greater than deflection gap.

I. Horizontal stiffener, runner channels and bridging: Complying with ASTM A1003/A1003M, minimum 0.053-inch metal thick, channels fabricated of cold-rolled steel with flanges not less than 7/16-inch wide. Minimum weights as follows:

Channel Size	Flange Width	Pounds/1000 linear foot
3/4-inch	7/16-inch	300
1-1/2-inch	7/16-inch	475
2-inch	19/32-inch	590

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, minimum 0.062 inch diameter wire, or double strand of minimum 0.048-inch diameter wire.

B. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper:
1. Hanger Wire: Minimum 0.12 inch diameter, unless otherwise indicated.
2. Diagonal Bracing Wire: 0.08 inch diameter, unless otherwise indicated.
3. Tie wire: 0.05 inch diameter, single-strand annealed steel or 0.04 inch diameter, galvanized, double-strand annealed steel.

C. Flat Hangers: Steel sheet, minimum 1 by 3/16 inch by length as required by conditions of the installation.

D. Metal Channels Supporting Suspended Ceilings (Carrying Channels): Provide metal channels complying with ASTM C 641, galvanized in compliance with ASTM A 924, G60 coating designation, for framing, furring and stiffening, as follows:

Size	Type	Pounds per 1,000 linear feet
3/4 inch	Cold-rolled	300
1 inch	Hot-rolled	410
1-1/2 inches	Hot-rolled	475
2 inches	Cold-rolled	590

E. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum ½ inch wide flanges, 3/4-inch deep.
2. Steel Studs and Runners: ASTM A645/A645M.
   a. Minimum Base-Metal Thickness: minimum 0.033-inch.
   b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM A645/A645M, 7/8-inch deep.
   a. Minimum Base-Metal Thickness: Minimum 0.033 inch thickness.
4. Resilient Furring Channels: 1/2-inch deep members designed to reduce sound transmission.
   a. Configuration: Asymmetrical.

F. Direct Hung Suspension System (Alternate Method):
1. Cross Tees: 1-1/2-inch high double web .020-inch thick electro-galvanized steel with 15/16-inch wide capped flange face.

2. Wall Track: 1-1/2-inch to 1-5/8-inch inside dimensions .020-inch thick electro-galvanized steel with 15/16-inch to 1-inch wide top and bottom flange faces.
3. Acceptable Products:
   a. "Drywall Suspension System" (USG Corp.).
   b. "System 640" (Rockwool International).
   c. "Drywall Grid System" (Armstrong World Industries, Inc.).

G. Resilient suspension:
1. Architectural acoustical combined-type spring hanger with neoprene element: Mason Industries - 30n
2. Ac-hang2 ceiling component double deflection neoprene architectural acoustical hanger - double deflection neoprene: only Mason Industries - HD
3. Kinetics SCSH or Kinetics ICC

H. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.

2.4 FASTENERS AND ACCESSORIES

A. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates; length and thickness required by Code, or recommended by the metal framing manufacturer when not prescribed by Code.

B. Shot pins: 0.140-inch diameter low velocity powder-actuated drive pins equivalent to Ramset/Red Head No. 1508, or other as approved by Architect, with 7/8-inch minimum penetration into concrete.

C. Anchor bolts: ASTM A307, non-headed type.

D. Expansion shields: FS FF-S-325, except do not use lead, fiber and plastic shields.

E. Welding electrodes: ASTM A 233, as recommended by AWS for the conditions of use and the metals to be welded.

F. For low walls: stud reinforcement "Floor Anchor" (Pinquist Tool & Die Co., Inc.), at every stud.

G. Isolation Strip at Exterior Walls - Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

H. Extruded Aluminum Partition Closures: Pre-assembled and spring loaded to provide a tight fit for vertical junctures of partitions and window walls. Finished to match mullions in a spray applied water-borne cross-linked baked acrylic finish or Acrylic-Polyester hybrid powder coat paint finish. Sound tested to a composite STC of 38 with acoustical batts for sound attenuation. Basis of Design: Mullion Mate 3 (Series 40 Plus.)

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
   2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.
   1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
   2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
   3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
   4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 WALL INSTALLATION

A. General:
1. Erect metal framing systems in compliance with their manufacturer's recommendations, the referenced standards, the Drawings and these Specifications.
2. Use minimum 0.039-inch thick studs at the following locations:
   a. Each side of door openings.
   b. Where studs support backing plates, plumbing fixtures and wall-supported cabinets.
3. Do not attach metal framing to ducts, conduits or pipes. Do not allow metal framing and suspension wires to contact pipes.
4. Cut framing components squarely for a tight fit against abutting members. Erect framing plumb and level to provide solid backing for finish materials. Install steel studs in a wall/partition so that their flanges point in the same direction.
5. Do not exceed a 1/8-inch in 10-foot deviation (non-cumulative) from true lines and levels, nor 1/4-inch from true position. Perform necessary remedial work on framing to achieve specified tolerances.

B. Wall/Partition Framing:
1. Layout partitions and permanently mark on slabs.
2. Align and securely anchor ceiling and floor tracks to building construction. Space anchors within 6-inches of ends of each track segment and at 24-inches o.c. maximum. Do not drive fasteners closer than 2-inches to slab or curb edge.
3. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Frame openings in stud walls. Provide double studs, closer spacing, and additional reinforcement as detailed or required at doorframes, interior windows and recesses for equipment.
7. Frame both sides of control joints in gypsum board surfaces with separate studs and a discontinuous runner; do not bridge the joint with system components or accessories.
8. Assemble corners using a minimum of 3 studs.
9. Install studs in single length, without joints, extending from floor to underside of floor or roof structure above, except where indicated on the Drawings to stop at or above suspended ceilings. Splicing studs is not permitted without the Architect's approval.
10. Where studs stop at or above suspended ceilings, unless otherwise indicated, brace every fourth stud (maximum) with opposite stud bracing at 45 deg angles securely anchored to the floor or roof above.
11. Attaching studs to runner: Attach studs to tracks by friction fit for single stud gypsum board partitions.

12. Attach the following studs to runner tracks with screws or with a crimping tool in compliance with the stud manufacturer's instructions, except where indicated to be welded.
    a. Studs with gypsum board on only one side.
    b. Studs on each side of doors.
    c. Studs supporting wall hung plumbing fixtures.
    d. Studs supporting wall hung urinal screens, toilet compartments, cabinets and equipment.
    e. Attach corner studs, partition intersections, studs on each side of doorjambs, and other openings in walls/partitions as specified above.
13. Unless otherwise indicated, provide horizontal stiffeners consisting of 3/4-inch channels spaced at not more than 54-inches o.c. maximum in partitions/walls supporting wall supported cabinets. Attach stiffeners to each stud.
    a. Provide an additional 3/4-inch channel 6-inches above door head and extend 2 stud spaces beyond jamb studs.
    b. Install channels in longest possible lengths, lap 12-inches and wire-tie at joints. Do not tie channels on opposite sides of staggered and double stud partitions together.
14. Double studs (face to face to form a tube) at locations adjacent to doors and openings. Extend studs at door openings to slab or deck above and anchor securely to bottom track (as specified in subparagraph 12.b. above) and to top slab or deck with clip angles.
    a. Locate additional studs not more than 2-inches from door and window frames, abutting partitions, partition corners, and other construction.
    b. Install a section of track over door and window frames with a clip angle at each end and attach securely to the adjacent vertical studs.
    c. Install cut-to-length studs at the location of vertical joints and at standard spacing over the doorframe header extending to the ceiling track.
15. Install studs 2-inches away from abutting concrete, steel columns or other structural elements. Extend the horizontal stiffeners and attach it to the structural element.
16. Provide additional framing, as required, for attachment of electrical boxes, fire extinguisher cabinets and similar items located in stud walls.

C. Furring:
    1. Provide furring attached to concrete and metal framing to conceal utilities, furred soffits, and other furring as indicated.
    2. Furring to receive gypsum board shall be screw-on channels directly attached to backing material, or applied over runner channels as applicable.
    3. Furring to receive plaster shall be 3/4-inch cold-rolled channels wire tied to 1-1/2-inch runner channels.
    4. Space furring as indicated for studs.

D. Install extra stud, furring members and angle runners at terminations of gypsum board work, and at openings and where required for support of other work occurring in the gypsum board work.

1. Install sheet metal strapping, studs, hat-shaped channels or stud runners in walls where shown on the Drawings or as required by the conditions of the installation, minimum same thickness as stud framing, for the support and attachment of other work. Attach to stud framing with not less than three screws per stud.

E. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

3.5 INSTALLING CEILING & SOFFIT SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Do not attach wires to, or bend around, interfering material such as ductwork, pipes and conduits
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Space main runners not over 4 feet O.C. in any dimension so that hanger wires do not support more than 12 square foot of ceiling.

H. Hang suspended framing independent of walls, columns, pipes, ducts, and conduits, and their insulation.

I. Space runner channels not more than 6 inches from parallel walls or beams.
   1. Align runner channels accurately relative to indicated ceiling height and saddle-tie with hanger wires.
   2. Lap channels 12-inches at splices and tie at each end of lap.

J. Attach furring channels to runner channels at right angles to carrying channels with clips or with 0.05 inch diameter tie wire with triple wrap and triple twist.
   1. Space at not over 12-inches O.C. for lath/plaster assemblies, and 16 inches O.C. for gypsum board.
   2. Locate approximately 2-inches from parallel walls.
   3. Lap channels 12-inches at splices and wire-tie at each end of lap.
   4. Assemble and install metal grillage so that it is rigid, square, and free of movement, and level within the tolerances specified.
   5. At control joints, provide discontinuous lap in main runners occurring over joints.
      a. Do not bridge joints with cross furring where joints run perpendicular to furring.
      b. Where joints run parallel to furring, provide furring to support each side of joint.

K. Resilient Suspension Systems: Install resilient suspension components according to Manufacturer’s instructions, at spacings designed by the Manufacturer for loads suspended

L. Provide recesses and openings where indicated for lighting fixtures, registers, access panels and other items to be installed in ceilings. Provide additional furring channels where required by opening condition.

M. Installation Tolerances: Install suspension systems that are level to within 1/8-inch in 12-feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 INSTALLATION OF DIRECT HUNG CEILING SYSTEM (ALTERNATE METHOD)

A. Install direct hung ceiling (interior) system in accordance with the manufacturer's printed instructions and as specified herein. Comply with ANSI A97.2 and as further specified. Furnish and install hanger devices in coordination with other work.

B. Interconnect main furring runners with furring tees at 24-inches o.c. Install furring tees on all sides around recessed lighting fixtures and other openings in ceiling.

C. Install additional hangers around light fixtures as required to support additional weights of light fixtures. Verify weights of light fixtures prior to installation of suspension system and hangers. Wrap hanger wires tightly at least three full turns.

3.7 WELDING

A. Perform welding in compliance with AWS recommendations with welders qualified to weld lightgage metal. Provide stitch plates where studs are burned-through.

B. Backing Plates:
   1. Backing plates may be omitted if anchorage for wall-hung items is directly into steel studs of 0.053-inch (1.34 mm) thick or heavier, or items are furnished with equal mounting devices.
   2. Wall-mounted and wall-hung items that require backing plates include, without limitation, the following:
      a. Grab bars.
      b. Toilet compartments and screens.
      c. Toilet room accessories.
      d. Wall and base cabinets.
      e. Plumbing fixtures.
      f. Ladders.
      g. Wall mounted door stops.
   3. Unless otherwise indicated, plates not provided with fixtures and equipment shall be long enough to span, as a minimum, across 3 studs and may be one of the following:
      a. 0.053-inch (1.34 mm) thick minimum steel plate by 4 inches wide.
      b. 3-5/8-inch (92 mm) unpunched wide flange steel stud of 0.053-inch (1.34 mm) thickness. Notch studs so that backing plate will be flush with exterior face of stud.
      c. Optional Backing Clip System:
         1) Material: ASTM A653/A653M cold formed steel.
         2) Coating: G60 hot-dipped galvanized.
         3) Thickness: Minimum of 0.033 inches (0.84 mm).
         4) Acceptable Products:
            (a) ClarkDietrich Danback Flexible Wood Backing.
            (b) Mantisgrip Backing Clips.
   4. Weld plates continuously along contact surfaces at each stud crossing, or secure with 2 countersunk machine screws at each stud.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior gypsum board.

B. Specialty gypsum board.

C. Tile backing panels.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's technical data for each type of gypsum board product, including related accessories. Furnish a material list with technical data documenting the location and primary function, quality, and performance of each material component or system to be used in the Work, or other such primary characteristics as required by the Drawings or Specifications.
      a. Submit manufacturer's technical data for each gypsum drywall partition and each ceiling system.
   2. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockups for the following:
      a. Each level of gypsum board finish indicated for use in exposed locations.
   2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
   3. Simulate finished lighting conditions for review of mockups.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
   1. Conform to applicable code for fire rated assemblies. Construct assemblies to achieve fire resistance ratings indicated on Drawings in accordance with UL, GA, or other acceptable tested approved assemblies. Where no test number is referenced, utilize and submit a tested approved assembly that achieves the fire rating required by the Drawings, including the Life Safety Plan.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

C. Verify ceiling and wall materials comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers:
   1. American Gypsum.
   2. CertainTeed Corporation.
   3. Georgia-Pacific Building Products.
   4. National Gypsum Company.
   5. USG (EcoSmart gypsum board products are acceptable).

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

C. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.
1. Manufacturers:
   a. American Gypsum; M-Bloc Abuse.
   b. CertainTeed Corporation; Extreme Abuse Resistant.
   c. Georgia-Pacific Building Products; DensArmor Plus, Abuse- Resistant.
   d. National Gypsum Company; Gold Bond Hi-Abuse.
   e. USG; Mold Tough AR.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
6. Long Edges: Tapered.
7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 SPECIALTY GYPSUM BOARD

A. Glass-Mat Interior Gypsum Board: ASTM C1658/C1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
1. Manufacturers:
   a. Georgia-Pacific Gypsum LLC; DensArmour Plus.
   b. National Gypsum Company, eXP Interior Extreme.
   c. USG Corporation; Sheetrock Glass-Mat Panels Mold Tough.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

B. Acoustically Enhanced Gypsum Board: ASTM C1766. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
1. Manufacturers:
   a. CertainTeed; SilentFX.
   b. National Gypsum Company; Sound Break.
   c. Quiet Solution; QuietRock.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.

2.5 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
1. Manufacturers:
   a. CertainTeed Corp.; Diamondback GlasRoc Tile Backer.
   b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
   c. National Gypsum; eXP Tile Backer.
   d. USG Corporation; Durock Glass-Mat Tile Backer Boards.

2. Core: 5/8 inch (15.9 mm), Type X.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.
   1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
   2. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.
      g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
   1. Manufacturers:
      a. Fry Reglet Corporation.
      b. Gordon, Inc.
      c. Pittcon Industries.
      d. Schlueter Systems.
   2. Profile: As indicated on Drawings.
   3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221 (ASTM B221M), Alloy 6063-T5.
      a. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
   4. Stainless Steel Sheet, Strip, and Plate: ASTM ASTM A240/A240M or ASTM A666, Type 304.
      a. Finish: #4 directional polish, unless otherwise indicated.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.8 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Electrical Box Pads: Putty Pads: Moldable non-curing one component, intumescent, fire-rated material for through-penetration fire stop systems and sound attenuation systems; self-adhering; 1/8-inch-thick minimum.
1. Acceptable Products:
a. CP 617 as manufactured by Hilti Incorporated.
b. Lowry Pads as distributed by Lowry’s Specialty Distribution.
c. Firestop Putty as manufactured by Specified Technologies, Inc. (STI)
d. 3M Fire Barrier as manufactured by 3M Fire Protection Products.

E. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
3. Thickness / STC Rating: As scheduled on Drawings.
4. Manufacturers:
a. CertainTeed; Sound Control Batts or Fire Batts.
b. Johns Manville Sound Control Batts or Fire Batts.
c. Knauf Insulation; EcoBatt with ECOSE Technology
d. Owens Corning Company, SAB.
e. Rockwool; Acoustical Fire Batts.
f. Thermafiber, Inc.; an Owens Corning Company, SAFB.

F. Acoustical Sealant: As specified in Section 07 92 13 - Acoustical Joint Sealants.
1. Verify sealant has a VOC content of 250 g/L or less.

2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Thermal Insulation: As specified in Section 07 21 00 - Thermal Insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated and Smoke Rated: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
   1. Install electrical box pads after gypsum panels have been installed on one side. Comply with manufacturer instructions.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: Vertical surfaces unless otherwise indicated.
   2. Flexible Type: Apply in double layer at curved assemblies where indicated on drawings.
   3. Ceiling Type: Ceiling surfaces, except at fire rated ceilings, then use Type X.
   4. Abuse-Resistant Type:
      a. At the following locations:
         1) _____.
         2) As indicated on Drawings.
   5. Glass-Mat Interior Type:
      a. Interior side (face) of exterior walls.
      b. Interior partitions where Contractor desires to install gypsum board prior to building dry-in.
      c. On tile walls, unless noted otherwise.
      d. At locations where FRP is being install as a wall finish.
      e. At urinal and toilet fixtures as indicated on Drawings.
   6. Acoustically Enhanced Type:
      a. At the following locations:
         1) As indicated on Drawings.
   7. Tile Backer-Glass-Mat Type:
      a. Walls in toilet room with shower.
      b. Tiled walls in showers and bathtubs.
      c. Tiled walls in restrooms and kitchens.
      d. Behind prefabricated shower or bathtub units.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 INSTALLATION OF GYPSUM PANELS FOR CEILINGS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 INSTALLATION OF TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
   1. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.
   2. Do not install screws within 6 inches of the shower wall base so as to not penetrate shower pan waterproofing.

3.6 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect, unless otherwise indicated.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners unless otherwise indicated.
   2. Bullnose Bead: Use at outside corners.
   3. LC-Bead: Use at exposed panel edges.
   4. L-Bead: Use where indicated.
   5. U-Bead: Use at exposed panel edges.
   6. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Panels that are substrate for tile.
   3. Level 3: Mechanical Rooms, Electrical Rooms, and similar spaces.
   4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 09 91 23 - Interior Painting.
   5. Level 5:

a. At exposed locations utilizing glass mat interior gypsum board products and where required by another specification Section as preparation of wall.
b. At all exposed drywall surfaces within main entrance hallways, elevator corridors, and areas scheduled to receive accent lighting or semi-gloss finishes, refer to room finish schedules for locations.
c. At panel surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting.
d. Where indicated on Drawings.
e. Primer and its application to surfaces are specified in Section 09 91 23 - Interior Painting.

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.8 PARTITION IDENTIFICATION

A. Wall Identification: Permanently label all fire-rated walls and smoke partition assemblies with the partition identification as defined below using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
2. Partition Identification Text: Apply the following according to partition ratings on Drawings, and as acceptable to authorities having jurisdiction:
a. 1-HOUR SMOKE BARRIER – PROTECT ALL OPENINGS.
b. 1-HOUR FIRE PARTITION – PROTECT ALL OPENINGS.
c. 1-HOUR FIRE BARRIER – PROTECT ALL OPENINGS.
d. 2-HOUR FIRE BARRIER – PROTECT ALL OPENINGS.
3. Refer to Section 09 91 23 - Interior Painting for painting. Use Semi-Gloss, Low-Odor paint.

3.9 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before installing gypsum board ceilings, conduct an above-ceiling inspection, and report and correct deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

B. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for Contractor’s above-ceiling inspection. Provide Architect with copy of deficiencies report. Architect reserves the
1. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
a. Installation of 80 percent of lighting fixtures, powered for operation.
b. Installation, insulation, and leak and pressure testing of water piping systems.
c. Installation of air-duct systems.
d. Installation of air devices.
e. Installation of mechanical system control-air tubing.
f. Installation of ceiling support framing.
g. Touch-up / patching of spray fire-resistive materials (SFRM).

h. Installation of penetration firestopping in fire- and smoke-rated partitions.
i. Installation of fire-resistant joint sealants in fire-rated partitions.
j. Installation of acoustical sealants at adjacent sound-rated partitions.
k. Application of fire- and smoke-rated partition identification.

3.10 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 13

TILING

(PART OF TRADE-BID SECTION 09 00 01 - TILING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic tile.

B. Porcelain tile.

C. Stone thresholds.

D. Edge Protection / Metal edge strips.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1a, ANSI A108.1b, ANSI A108.1c, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. ISO 13007-2 Standards for Ceramic Tile Grouts and Adhesives.

D. Module Size: Actual tile size plus joint width indicated.

E. Face Size: Actual tile size, excluding spacer lugs.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
   3. Samples:
      a. Full-size units of each type and composition of tile and for each color and finish required.

b. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches (300 mm) square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
c. Stone thresholds in 6-inch (150-mm) lengths.
d. Metal edge strips in 6-inch (150-mm) lengths.

B. Informational Submittals:
1. Qualification Data: For Installer.
2. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
3. Product Certificates: For each type of product.
4. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

C. Maintenance Material Submittals:
1. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
a. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent or 2 cases, whichever is less of amount installed for each type, composition, color, pattern, and size indicated.
b. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer having a minimum of 5 years of experience on projects of comparable size and scope who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction: For tiles installed on walkway surfaces, provide products with the followings values as determined by testing identical products per ANSI A137.1:
   1. Level Surfaces: Minimum > 0.42

2.2 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
   2. Obtain waterproofing membrane and waterproofing/crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
   1. Stone thresholds.
   2. Waterproof membrane.
   3. Waterproofing / crack isolation membrane.
   4. Metal edge strips.

2.3 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
   1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.4 TILE PRODUCTS

A. Manufacturers:
   1. American Olean Tile Company.
   2. Dal-Tile Corporation.
   3. Global Tile Design.
   4. Stone Source.
   5. Tile Bar.
   6. Creative Materials Corporation
   7. Best Tile

B. Basis of Design Products:
   1. CT1 CERAMIC TILE- WALL (4"x16") BEST TILE VILLA HIJAU, GREEN, 4"X16"
   2. CT2 CERAMIC TILE- FLOOR (12"x24") CREATIVE MATERIALS CORP. HYANNIS ANTRACITE MATTE RECTIFIED, 12"X24"
   3. CT3 CERAMIC TILE- WALL (3"x12") CREATIVE MATERIALS CORP. METROPOLIS SUBWAY, WHITE GLOSSY, 3"X12"
   4. CT4 CERAMIC TILE- WALL (2"x6.5") BEST TILE WELLFLEET, EUCALYPTUS GLOSSY, 2"X6.5"

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide as indicated in Interior Finish Legend, unless otherwise indicated.

D. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      a. Base for Thin-Set Mortar Installations: Straight.
      b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
      c. External Corners for Thin-Set Mortar Installations: Surface bullnose.
      d. Internal Corners: Field-butted square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.5 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
   2. Basis of Design Products: Refer to Interior Finish Legend on Drawings.

B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10 according to ASTM C1353/C1353M or ASTM C 241/C 241M and with honed finish.
   1. Description: Uniform, fine- to medium-grained white stone with gray veining.
   2. Description: Match Architect's sample.

2.6 EDGE PROTECTION / METAL EDGE STRIPS

A. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver or stainless-steel, ASTM A666/A666M, 300 Series exposed-edge material.
   1. Manufacturers:
      a. Blanke Corporation.
      b. Ceramic Tool Company, Inc.
      c. Schluter Systems L.P.
   2. Basis of Design Manufacturer: Schluter Systems.
      a. Profiles:
         1) Outside Corner Edge Protection, Tile-to-Tile: QUADEC.
         2) Outside Corner Edge Protection, Tile-to-Gypsum Board: SCHIENE.
         3) Finishing Edge Protection, Tile-to-Gypsum Board: SCHIENE.

B. Metal Edge Protection: Roll-formed Type 304 stainless steel, height as required to accept scheduled tile thickness.
   1. Acceptable Products:
      a. Tile-to-Concrete: "RENO-U", Model AEU as manufactured by Schluter Systems in height as required to accommodate scheduled tile and setting bed thickness.
      b. Tile to Resilient Flooring: "RENO-U", Model AE as manufactured by Schluter Systems in height required to accommodate scheduled products and setting bed thickness.
      c. Tile to Terrazzo: "SCHIENE", Model AE as manufactured by Schluter Systems, in height required to accommodate scheduled products and setting bed thickness.
      d. Tile to Carpet: "SCHIENE", Model AE as manufactured by Schluter Systems, in height required to accommodate scheduled products and setting bed thickness.
      e. Edge Protection at Wall: "JOLLY" for outside corners as manufactured by Schluter Systems, in size as required to accommodate scheduled tile and setting bed thickness.

2.7 SETTING MATERIALS

A. Modified Dry-Set Cement Mortar (Thinset): ANSI A118.4 and ISO 13007-2.
   1. Manufacturers:
      a. Wall Applications, non-large format tile:
         1) Ardex Engineered Cements, "X5".
         2) Custom Building Products, "MegaLite Rapid Set Crack Prevention Mortar."
         3) Laticrete International, Inc., "253 Gold."
         4) MAPEI Corporation, "Ultraflex 2."
      b. Wall Applications, large format tile:
         1) Ardex Engineered Cements, "X77".
         2) Custom Building Products, "ProLite".
         3) Laticrete International, Inc., Laticrete; 255 MultiMax.
         4) MAPEI Corporation, "Ultralite Pro".
         5) TEC; H.B. Fuller Construction Products Inc. "3N1 Performance Mortar.
   2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
   3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4 and ISO 13007-2.

2.8 GROUT MATERIALS (REFERENCE "TILE INSTALLATION SCHEDULE" AT END OF SECTION)

A. Water-Cleanable Epoxy Grout: ANSI A118.3 and ISO 13007; RG, with a VOC content of 65 g/L or less.
   1. Manufacturers:
      a. Ardex Engineered Cements, "WA 100 percent solids epoxy grout".
      b. Custom Building Products, "100 percent Solids Epoxy Grout" or "Fusion".
      c. Laticrete International, Inc., "SpectraLOCK Pro Premium Grout."
      d. MAPEI Corporation, "Kerapoxy CQ" or "Flexcolor CQ".
   2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F (60 and 100 deg C), respectively, and certified by manufacturer for intended use.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
   1. Manufacturers:
      a. Ardex Engineered Cements, Feather Finish or K15.
      b. Laticrete, "L&M Duracrete" or "L&M Durapatch Industrial"
      c. MAPEI, "Mapecem Quickpatch."

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

1. Basis of Design Products, Laticrete, "Stonetech Professional Stone & Tile Cleaner".

2.10 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07 92 00 - Joint Sealants.
   1. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
   2. Colors: Provide colors of exposed sealants to match colors of grout in tile.

2.11 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
   4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable or self-leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1a and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA (HB) installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
      a. Exterior tile floors.
      b. Tile floors in wet areas.
      c. Tile swimming pool decks.
      d. Tile floors in laundries.
      e. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
      f. Tile floors consisting of rib-backed tiles.
   2. Follow procedures in the ANSI A108 Series of tile installation standards for tile layout including but not limited to:
      a. Center and balance areas.
      b. Excess amount of cuts.
      c. Smooth edge cuts.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Wall tile joint maximum 1/8 inch (0.8 mm), adjust to smaller IF the floor calibration allows.
   2. Floor tile joint maximum 3/16 inch (2.4 mm), adjust to smaller IF the wall calibration allows.
   3. Align joints center to center.

H. At inside corners of tile floors, base and walls, provide sealant joint. Joint width to match specified joint widths. Color of exposed sealant to match color of grout in tile.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
   1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in improved modified dry-set mortar (thinset).
   2. Do not extend waterproofing/crack isolation membrane under thresholds set in improved modified dry-set mortar. Fill joints between such thresholds and adjoining tile set on waterproofing/crack isolation membrane with elastomeric sealant.

K. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

L. Metal Edge Strips: Install at locations indicated.
   1. Install metal edge strips in lengths as long as practical without gaps at seams. Do not use multiple strips where one continuous strip can be installed.

M. Grout Sealer: Apply floor sealer to grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Metal Studs or Furring:
   1. Ceramic Tile Installation W248: TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
      a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
      b. Thinset Mortar: Medium-bed, modified dry-set mortar.
      c. Grout: Water-cleanable epoxy grout.
      d. Locations: Wet areas, wall tile over 14 by 14 inches (355 by 355 mm) in size or if one side is over 18-inches (457 mm) long.
   2. Ceramic Tile Installation W248: TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
      a. Ceramic Tile Type: Refer to Interior Finish Legend on Drawings.
      b. Thinset Mortar: Modified dry-set mortar.
      c. Grout: Water-cleanable epoxy grout.
      d. Locations: Kitchens, bathrooms or public restrooms.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

(PART OF TRADE-BID SECTION 09 00 02 - ACOUSTICAL TILE)

PART 1 GENERAL

2.1 SECTION INCLUDES

A. Acoustical panels and exposed suspension systems for interior ceilings.

2.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

2.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.

B. Informational Submittals:
   1. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
      a. Ceiling suspension-system members.
      b. Structural members to which suspension systems will be attached.
      c. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
      d. Size and location of initial access modules for acoustical panels.
      e. Items penetrating finished ceiling and ceiling-mounted items including the following:
         1) Lighting fixtures.
         2) Diffusers.
         3) Grilles.
         4) Speakers.
         5) Sprinklers.
         6) Access panels.
         7) Perimeter moldings.
      f. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
      g. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).
   2. Qualification Data: For testing agency.

3. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
4. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
5. Field quality-control reports.

C. Closeout Submittals:
1. Maintenance Data: For finishes to include in maintenance manuals.

D. Maintenance Material Submittals:
1. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
a. Acoustical Ceiling Units: Full-size panels equal to 2 percent or 1 case of each type installed, whichever is less.
b. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
c. Hold-Down Clips: Equal to 2 percent of quantity installed.
d. Impact Clips: Equal to 2 percent of quantity installed.

2.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

B. Build mockup of typical ceiling area as shown on Drawings.
1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

2.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

2.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 PRODUCTS

3.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

3.2 PERFORMANCE REQUIREMENTS

A. Verify ceiling products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E1264.
   2. Smoke-Developed Index: 50 or less.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL or from the listings of another qualified testing agency.

3.3 ACOUSTICAL PANELS

A. Manufacturers:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corporation; Saint-Gobain North America.
   3. Rockfon (Rockwool International).
   4. USG Corporation.

B. Basis of Design Products:
   1. APC1: USG_Juno High-NRC 18280, square edge, DXT 9/16" grid. Reserve White Finish grid.
   2. APC2: USG_Juno High Nrc 18280, Sq Edge, Dxt 9/16" Reserve White Finish grid.
   3. APC3: USG_Moisture Resistant Tile Type. Reserve White Finish grid.

3.4 METAL SUSPENSION SYSTEM

A. Manufacturers:
   1. Armstrong Ceiling & Wall Solutions.
   2. CertainTeed Corporation; Saint-Gobain North America.
   3. Rockfon (Rockwool International).
   4. USG Corporation.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
   1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.

C. Standard Exposed Tee Ceiling Systems:
   1. Wide-Face (15/16-inch), Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges. Provide fire-resistance rated system where required.
      a. Structural Classification: Intermediate-duty system[, or greater as otherwise required to comply with seismic regulations].
      b. End Condition of Cross Runners: Override (stepped) or butt-edge type.
      c. Face Design: Flat, flush.
      d. Cap Material: Cold-rolled steel.
      e. Cap Finish: Painted white, unless otherwise noted in Interior Finish Legend on Drawings.
   2. Narrow-Face (9/16-inch), Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 9/16-inch- (15-mm-) wide metal caps on flanges.
      a. Structural Classification: Intermediate-duty system[, or greater as otherwise required to comply with seismic regulations].
      b. End Condition of Cross Runners: Override (stepped) or butt-edge type.
      c. Face Design: Flat, flush.
      d. Cap Material: Cold-rolled steel.
      e. Cap Finish: Painted white, unless otherwise noted in Interior Finish Legend on Drawings.
      f. Reveal Finish: Match face finish.

D. High-Humidity Finish Tee Ceiling System:
   1. Wide-Face (15/16-inch), Capped, Double-Web, Hot-Dip Galvanized Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A653/A653M, not less than G60 coating designation. Provide G-90 for areas, which require or use scrubbable ceilings and at all exterior applications, prepainted, with prefinished cold-rolled 15/16-inch-wide steel caps on flanges. Provide fire-resistance rated system where required.
      a. Structural Classification: Heavy-duty system.
      b. Cross Tee/Main Beam Interface: Flush fit.
      c. Face Design: Flat.
      d. Cap Finish: Painted white, unless otherwise noted in Interior Finish Legend on Drawings.
      e. Locations: Indicated on the Drawings.

E. Clean Room Ceiling System:
   1. Face Design: Flat.
      a. Cap Finish: Painted white unless noted otherwise in Interior Finish Legend.

3.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Cast-in-place anchors.
      b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
   2. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
   3. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- (2.69-mm-) diameter wire.

C. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

3.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corporation; Saint-Gobain North America.
   3. Fry Reglet Corporation.
   4. Gordon, Inc.
   5. Rockfon (Rockwool International).
   6. USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

3.7 SPECIAL METAL EDGE MOLDINGS AND TRIM

A. Custom Perimeter Trim: Commercial quality extruded aluminum alloy 6063 trim channel with tee-bar connection clips or hanging clips and galvanized steel finish splice plates.
1. Commercial quality extruded aluminum alloy 6063 Trim Channel and Bottom Drywall Trim, factory finished in custom paint finish color-matched to approved sample.
2. Commercial quality aluminum T-Bar Connection Clip and Hanging Clip with Galvanized steel Splice Plate.
3. Aluminum extrusions formed with distinct architectural detail groove on top and bottom flanges and special bosses to receive the T-bar Connection Clip, Hanging Clip and Splice Plate, to provide positive mechanical lock with no visible fasteners.

B. Factory or field cut, mitered and curved to match drawing requirements.
1. Acceptable Product: Axiom Custom Perimeter Trim, as manufactured by Armstrong World Industries, Inc.
2. Face Width: _____ inches.
3. Field cut or factory miter corner applications.
4. Finish: Factory applied baked polyester paint.
a. Color: Painted white unless noted otherwise in Interior Finish Legend.

3.8 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 07 92 13 - Acoustical Joint Sealants.

PART 3 EXECUTION

4.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

4.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.
   1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

C. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   1. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   2. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

3. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
4. Do not attach hangers to steel deck tabs.
5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
6. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

F. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

G. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Route tegular cut edges to match profiles.
6. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
7. Install hold-down, impact, and seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
8. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

4.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

4.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
   1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
   2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

4.6 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 54 26

LINEAR WOOD CEILINGS

(PART OF TRADE-BID SECTION 09 00 02 - ACOUSTICAL TILE)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured linear wood ceiling and soffit system.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for ceiling materials, ceiling suspension systems, and specified accessories.

C. Shop Drawings: Indicate end joint pattern and termination details.

D. Delegated-Design Submittal: For installed products indicated, to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, within the State of the Project, responsible for their preparation.

E. Samples: Submit two samples 12 x 12 inch (300- x 300 mm) in size illustrating ceiling finish, color, and sheen.

F. Installation Instructions: Indicate standard and special installation procedures.

G. Maintenance Data: Include maintenance procedures.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this Section with minimum three years experience.

B. Basis of Design: Specifications are based on linear wood ceiling systems by specified basis of design manufacturer. Systems manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, finish, weight, and profile are minor, and do not detract substantially from the indicated design intent.

1.4 FIELD CONDITIONS

A. Do not install wood ceiling until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum relative humidity of between 25 percent and 55 percent.

B. Provide heat, light, and ventilation prior to installation.

C. Store materials in area of installation for minimum period of 48 hours prior to installation.

D. Maintain minimum room temperature of between 50 degrees F (14 degrees C) and 85 degrees F (29 degrees C) for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Phenolic wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design phenolic wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, liscensed to practice in the State of Massachusetts, using performance requirements and design criteria indicated.

C. Structural Performance: Provide solid phenolic cladding material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/175 of the span.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 MANUFACTURERS

A. Manufacturers:
   1. Armstrong World Industries, Inc.

2. ASI Architectural.
3. 9Wood.
4. Decoustics.

B. Basis of Design AWC1: 9-wood 2400-tg-linear-solid-wood. exterior and interior use. hemlock species, solid wood.

2.3 CEILING SYSTEM

A. Linear Wood Ceiling:
1. Composition: Fire-retardant particleboard with face-cut veneers complying with ASTM E84; Flame Spread Index 25 or less, Smoke Developed Index 50 or less.
2. Ceiling Classification: Fire Class A.
3. Species: Hemlock.
4. Cut: Manufacturer's standard for specified wood veneer species.
5. Thickness: 5/8 inch (15 mm).
6. Panel Width: 3 inches (75 mm) exposed face.
7. Panel Length: 4’ to 10’ (nominal).
8. Edges: Tongue and groove.
9. Finish: Factory applied, exterior clear finish.
10. Black backing: Manufactgurer's standard back scrim.
11. Black Screen: Black Aluminum Wire Mesh - 18 x 16 Mesh, .011” Diameter Wire

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal T-Grid Suspension System: Provide standard interior Metal Heavy Duty 15/16” suspension T-Grid system using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable seismic codes and ordinances.
1. Attachment Devices: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
2. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.

2.5 ACCESSORIES

A. Perimeter Trim: Manufacturer's standard angle and shadow moldings to suit indicated applications.

2.6 FINISH

A. Factory Finish: Clear, to achieve satin sheen surface; type recommended by ceiling manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that required above-ceiling systems and components are in correct locations.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Apply back screen, at gaps and joints.

C. Apply ceiling in patterns indicated on Drawings. Verify alignment as work progresses.
   1. End Joint Pattern: Staggered and random to produce monolithicfinished appearance.

D. Install perimeter trim at locations indicated, and where ceiling terminates.

3.3 PROTECTION

A. Protect finish until Substantial Completion.

END OF SECTION

SECTION 09 61 16

CONCRETE FLOOR SEALING

(PART OF TRADE-BID SECTION 09 00 00 - PAINTING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sealing of other concrete floor areas not scheduled to receive finish floor covering.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include data to indicate chemical, solvent, and detergent resistance.
      b. Include information for primer, sealants, waterproofing, accessories and other required components.
      c. Include color charts indicating manufacturer's standard colors available.

B. Informational Submittals:
   1. Test Reports: Pre-installation substrate moisture and alkalinity tests.
   2. Certifications specified in Quality Assurance article.
   3. Qualification Data: Manufacturer's and applicator's qualification data.
   4. Manufacturer’s instructions.
   5. Warranty: Submit specified warranty.

C. Closeout Submittals:
   1. Maintenance Data: For fluid-applied floor sealer to include in maintenance manuals. Include the following:
      a. Manufacturer’s instructions on maintenance renewal of applied treatments.
      b. Protocols and product specifications for joint filing, crack repair and/or surface repair.
   2. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum 5 years documented experience.

B. Installer Qualifications: An installer (applicator) who is approved, trained, or certified by fluid-applied floor sealer manufacturer.

C. Source Limitations: Furnish products from one manufacturer for entire Project, unless otherwise acceptable to Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manner to prevent damage to containers and bags.

B. Store materials in accordance with manufacturer's instructions in clean and dry location with temperature between 60 deg F and 90 deg F.

C. Keep products away from fire or open flame.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with floor sealing manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and other conditions affecting floor sealing application.
   1. Do not apply floor sealing until spaces are enclosed and weatherproof; wet work in spaces is complete and dry; and overhead work, including installing mechanical systems, lighting, and athletic equipment, is complete.

B. Conditioning Period: Begins not less than 7 days before floor sealing application, is continuous through application, and continues not less than 3 days after application.
   1. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

C. Ventilate area where sealing is being installed. Post and enforce no smoking and no open flame signs until sealing has cured.

D. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during floor sealer application.

E. Close spaces to traffic during floor sealer application and for not less than 24 hours after application unless manufacturer recommends a longer period.

1.6 SEQUENCING AND SCHEDULING

A. Sequence work under provisions of Section 01 32 00 - Construction Progress Documentation.

1.7 WARRANTY

A. Prepare and submit in accordance with Sections 01 60 00 - Product Requirements and 01 77 00 - Closeout Procedures.

B. Provide written warranty signed by manufacturer warranting work to be free from defective materials and workmanship and agreeing to replace components which fail within 2 years from date of Substantial Completion.
   1. Failed materials and workmanship includes spalling, cracking, and delamination.

PART 2 PRODUCTS

2.1 CONCRETE SEALING

A. Hardening/Dustproofing/Sealing:
   1. Water-based, colorless, odorless solution of specialized reactive chemicals which penetrates concrete surfaces to seal, densify and harden.

B. Manufacturers:
   1. Euco Diamond Hard, Euclid.
   2. Liqui-Hard, WR Meadows.
   3. Seal Hard, Laticrete.

C. Basis of Design: SC: Liqui-Hard, WR Meadows.

D. Accessories:
   1. Joint Sealant Materials: Manufacturer's recommended sealant compatible with sealing system for type of service and joint condition indicated.
   2. Products:
      a. Rezi-Weld Flex, WR Meadows.
      b. RS 88; Metzger/McGuire.
      c. Euco QwikJoint 300; Euclid.
   3. Basis of Design: Rezi-Weld Flex, WR Meadows.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer (Applicator) present, for conditions affecting performance of floor sealing including substrate moisture content.

B. Examine areas to receive sealing for:
   1. Defects in substrate that may affect proper execution of floor sealing work.
   2. Deviations beyond allowable tolerance for concrete slab work.
   3. Surface curing agents or sealers that would inhibit bond.
   4. Surface defects such as cracks that could transfer through to finished floor sealing surface if not corrected.

C. Do not begin sealing work until concrete has cured a minimum of 28 days.

D. Do not begin work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Concrete Substrates: Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners. Remove contaminants using mechanical means.
   2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.

3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   a. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

B. Mechanically abrade or shot-blast existing concrete sealing to remove inappropriate curing agents and to open pores of concrete surfaces to allow penetration of bonding agent. Completely remove cleaning residue. Acid washing is not acceptable.

C. Repair cracks, divots and surface imperfections according to manufacturer's instructions.
   1. Vacuum to remove dust and debris.

D. Protect walls, floor openings, equipment, electrical openings, door frames, and other obstructions during installation. Cover floor and wall areas at mixing stations.

3.3 CONCRETE SEALING APPLICATION

A. General: Mix and apply floor sealing components according to manufacturer's written instructions.

B. Apply a minimum of two coats in accordance with manufacturer’s recommended coverage rates.

C. Curing:
   1. Cure floor sealing materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process.

3.4 CLEANING AND PROTECTION

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage surface or surrounding construction.
   1. Cleaner, Maximum VOC Content: In accordance with applicable codes.

B. Remove temporary covering and clean floor sealing prior to final inspection. Use cleaning materials and procedures recommended by floor sealing manufacturer.

C. Protect finished work in accordance with Section 01 73 00 - Execution.

D. Do not permit traffic over finished sealed floor surfaces.

E. Protect sealed floor materials from damage and wear during construction operation.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

(PART OF TRADE-BID SECTION 09 00 03 - RESILIENT FLOORS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient wall base.

B. Resilient flooring accessories.

C. Resilient stair accessories.

1.2 SUBMITTALS

A. Action Submittals:
1. Product Data: For each type of product.
2. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

B. Informational Submittals:
1. Test Reports: Pre-installation substrate moisture and alkalinity tests.

C. Closeout Submittals:
1. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Provide 12 linear feet (3.657 linear m) of each type of base including an outside corner.
2. Coordinate mockups in this Section with mockups specified in other Sections.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 MANUFACTURERS

A. Manufacturers:
   1. Armstrong World Industries, Inc.
   2. Johnsonite; A Tarkett Company.
   3. Mondo Rubber International, Inc.
   4. Nora Systems, Inc.
   5. R.C.A. Rubber Company (The).Roppe Corporation, USA.
   6. Roppe.

2.3 RESILIENT WALL BASE

A. Rubber Wall Base , as scheduled in Interior Finish Schedule: ASTM F 1861,
   1. Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
      a. Style and Location:
         1) Style B, Cove: Provide in areas with resilient flooring, concrete and epoxy.

B. Basis of Design:

1. RB1 RUBBER BASE (TO BE USED WITH RSF1, RSF2 and SC: ROPPE 669 BATTLESHIP

C. Minimum Thickness: 0.125 inch (3.2 mm) or as indicated in Interior Finish Schedule on Drawings.

D. Height: 4 inches, unless otherwise indicated in Interior Finish Schedule on Drawings.

E. Lengths: Coils in manufacturer's standard length dependent on product scheduled.

F. Inside and Outside Corners:
1. Preformed corners on 4-inch (102 mm) high base.
2. Job-formed mitered corners on base over 4-inches (102 mm) high.

2.4 RESILIENT STAIR ACCESSORIES

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Stair Treads:
1. Rubber Stair Treads as scheduled in Interior Finish Schedule: ASTM F 2169.
a. Type TS (rubber, vulcanized thermoset)
2. Class: As indicated in Interior Finish Schedule on Drawings.
3. Group: As indicated in Interior Finish Schedule on Drawings.
4. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
5. Nosing Height: 1-1/2 inches (38 mm), unless noted otherwise.
6. Thickness: 1/4 inch (6 mm) and tapered to back edge.
7. Size: Lengths and depths to fit each stair tread in one piece.
8. Integral Risers: Smooth, flat; in height that fully covers substrate.

C. Basis of Design:
1. RSF3: STAIR TREADS/RISER NORA, NORAPLAN HAMMERED STAIRTREAD Color as selected by the Architect from manufacturer's full range.

D. Colors and Patterns: As indicated in Interior Finish Schedule on Drawings.

2.5 RESILIENT ACCESSORY

A. Description: Provide resilient accessories at the following locations:
1. Carpet edge for glue-down applications.
2. Reducer strip for resilient floor covering.

B. Material: Rubber as scheduled in Interior Finish Schedule.

C. Profile and Dimensions: Unless otherwise indicated, products listed below are those of Johnsonite and are listed as a minimum standard of quality.
1. Carpet-to-Resilient Flooring: CTA-XX-A.
2. Carpet-to-Sealed Concrete: CTA-XX-J.
3. Resilient Tile-to-Sheet Vinyl: RRS-XX-D.
4. Resilient Tile-to-Concrete: RRS-XX-D.

D. Colors and Patterns: As indicated in Interior Finish Schedule on Drawings.

2.6 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
   1. Verify adhesives have a VOC content of 50 g/L or less and 60 g/L or less for rubber stair treads.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners For 4-inch (102 mm) Base: Install preformed corners before installing straight pieces.

H. Job-Formed Corners For Base Over 4-inches (102 mm) high.:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
      a. Miter and seal corners to minimize open joints.
   2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
      a. Miter and seal corners to minimize open joints.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:
   1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
   2. Tightly adhere to substrates throughout length of each piece.
   3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from surfaces.
   2. Sweep and vacuum horizontal surfaces thoroughly.
   3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

(PART OF TRADE-BID SECTION 09 00 03 - RESILIENT FLOORS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rubber floor tile.

B. Polyurethane / Biobased floor tile.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product specified.
   2. Samples for Verification: Full-size tiles of each different color and pattern of resilient floor tile specified, showing the full range of variations expected in these characteristics.

B. Informational Submittals:
   1. Test Reports: Pre-installation substrate moisture and alkalinity tests.
   2. Qualification Data: For qualified Installer.

C. Closeout Submittals:
   1. Maintenance Data: For resilient floor tile to include in the maintenance manuals specified in Division 01.
   2. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Mockups: Install mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
   1. Locate mockup in location indicated or, if not indicated, in location as determined by Owner or Architect.

2. Notify Owner and Architect seven days in advance of date and time when mockup will be installed.
3. Demonstrate installation of vinyl tile flooring and related accessories.
4. Obtain Architect's approval of mockups before starting work.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Remove unacceptable mockups when directed.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 55 and 85 degrees F.

C. Store tiles on flat surfaces.

D. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install resilient vinyl tile flooring until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

D. Install tiles and accessories after other finishing operations, including painting, have been completed.

E. Where demountable partitions and other items are indicated for installation on top of resilient tile flooring, install tile before these items are installed.

F. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommendations, and field moisture and alkalinity tests.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RUBBER FLOOR TILE

A. Manufacturers:
   1. Altro USA, Inc.
   2. Manington Commercial.
   3. Mondo.
   4. Nora.
   5. Roppe Corporation.
   6. Tarkett.

B. Tile Standard: ASTM F1344.
   1. Class: Class I-A, Homogeneous Rubber Tile, solid color.
   2. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer according to ASTM D2240.
   3. Wearing Surface: Smooth.
   4. Thickness: 3.5 mm (~0.14 in).
   5. Size: 39.53'' x 39.53''.
   6. Basis of Design Product:
      a. RSF1: Nora. Norament Pado, color 5514 Laurel, tile size: ~39.53'' x 39.53'' .

2.3 POLYURETHANE / BIO-BASED RESILIENT FLOOR TILE

A. Manufacturers:
   1. Kahrs.
   2. Matter Surfaces.
   3. Milliken & Company.
   4. Patcraft.
   5. Shaw Contract

B. Description: Heterogeneous bio-polyurethane with glass fiber reinforcement, and paper print and PU top layer.
   1. Tile Standard: Products complying with ASTM F 3404.
   2. Wearing Surface: Smooth.
   3. Thickness: 0.098 inches (2.5 mm).
   4. Size: 9.84 in x 59.05 in.
   5. Basis of Design Product:
      a. RSF4: RESILIENT PLANK FLOORING PATCRAFT I447V, ENRICH, COLOR 730, ASSURANCE-V2

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
   1. Verify adhesives have a VOC content of 50 g/L or less.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints. Refer to Interior Finish Legend on Drawings.

D. Resilient base, floor finish transition strips, and accessories: Refer to Division 09 Section Resilient Base and Accessories.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 TILE INSTALLATION

A. General: Comply with resilient tile manufacturer's written installation instructions.

B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half of a tile at perimeter.
   1. Lay tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles in pattern of colors and sizes indicated on Drawings.

D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on sub-floor. Use chalk or other nonpermanent, non-staining marking device.

G. Install tiles on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.

H. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to comply with tile manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
   1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Hand roll tiles according to tile manufacturer's written instructions.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:
   1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.

2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by flooring manufacturer.
4. Damp-mop floor to remove marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
   1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.
   2. Do not allow foot traffic or rolled traffic for time period after installation recommended in writing by flooring manufacturer, but not less than the following:
      a. Foot traffic: Not less than 24 hours.
      b. Rolled traffic: Not less than 72 hours.
   3. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

END OF SECTION

SECTION 09 65 36

STATIC-CONTROL RESILIENT FLOORING

(PART OF TRADE-BID SECTION 09 00 03 - RESILIENT FLOORS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Static-control, rubber floor tile.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
      a. Examination and preparation of substrates to receive static-control resilient flooring.
      b. Installation techniques required for specified products.
      c. Review concrete substrate requirements for conditions affecting performance of flooring, including results of moisture and alkalinity tests.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
      a. Show details of special patterns.
      b. Show locations of inscribed maintenance floor tiles in conductive, solid vinyl floor tile installation areas.
      c. Show grounding locations of grounding strips and connections.
   3. Samples: For each type of static-control resilient flooring and in each color, pattern, and texture required, of size indicated below:
      a. Floor Tile: Full-size units.
      b. Sheet Floor Covering: 6-by-9-inch (150-by-230-mm) sections of floor covering.
   4. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

B. Informational Submittals:
   1. Qualification Data: For Installer.

2. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.
3. Test Reports: Pre-installation substrate moisture and alkalinity tests.
4. Field quality-control reports.

C. Closeout Submittals:
1. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.
2. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

D. Maintenance Material Submittals:
1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
a. Floor Tile: Furnish one box for every 50 boxes, or fraction thereof, of each type, color, and pattern of floor tile installed.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.

B. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).
1. Floor Tile: Store on flat surfaces.
2. Sheet Floor Covering: Store rolls upright.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), during the following time periods:
1. Period recommended in writing by manufacturer before installation.

B. Until Substantial Completion, maintain ambient temperatures in installation areas within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for period recommended in writing by manufacturer after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 STATIC-CONTROL, RUBBER FLOOR TILE

A. Manufacturers:
   1. Flexco; Roppe Holding Company.
   2. Nora Systems, Inc.
   3. Roppe Corporation; Roppe Holding Company.
   4. StaticStop; a division of SelecTech, Inc.

B. Source Limitations: Obtain floor tile from single source from single manufacturer.

C. Static-Control Properties: As determined by testing identical products in accordance with test method indicated by an independent testing and inspecting agency.
   1. Electrical Resistance:
      a. Material: Point-to-point and point-to-ground resistances between 1,000,000 ohms and 1,000,000,000 ohms when tested in accordance with ASTM F150.
      b. Material in Combination with a Person: Average resistance of 448,000,000 ohms when tested in accordance with ESD STM97.1.
   2. Static Generation:
      a. ESD STM97.2: Less than 20 V when tested at 12 percent relative humidity with static-control footwear.
   3. Static Decay: 5000 to 0 V in less than 0.25 seconds when tested in accordance with FED-STD-101C, Method 4046.1.

D. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested in accordance with ASTM E648 or NFPA 253.

E. Composition: ASTM F1344, Class I-B (homogenous rubber, through-mottled pattern).

F. Surface: Smooth.

G. Thickness: Manufacturer's standard, but not less than 0.08 inch (2.0 mm).

H. Size: 24 by 24 inches (610 by 610 mm).

I. Seaming Method: Heat welded.

J. Colors and Patterns: As indicated in Interior Finish Legend on Drawings or as selected by Architect from manufacturer's full range.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.
   1. Verify adhesives have a VOC content of 50 g/L or less.
   2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with installation or static-control characteristics of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions and with oversight by manufacturer's representative to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare in accordance with ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.
   4. Moisture Testing: Perform test so that each test area does not exceed 1000 sq. ft. (304.8 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
   1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring in accordance with manufacturer's written instructions and with oversight by manufacturer's representative.

B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.
   1. For adhesively installed flooring, embed grounding strips in static-control adhesive.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
   1. Extend static-control resilient flooring below built-in items and permanent, but movable, items that allow for a flexible layout where indicated on Drawings.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings.

E. Extend static-control resilient flooring to center of door openings where flooring or color transitions occur.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

H. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 INSTALLATION OF FLOOR TILE

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
   1. Lay floor tiles square with room axis.

B. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
   1. Lay vinyl composition floor tiles with grain running in one direction.

C. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to test electrical resistance of static-control resilient flooring in accordance with ASTM F150 or ESD STM7.1 for compliance with requirements.
   1. Arrange for testing after the following:
   2. Static-control adhesives have fully cured.
      a. Static-control resilient flooring has stabilized to ambient conditions.
      b. Ground connections are completed.
   3. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:
   1. Remove static-control adhesive from exposed surfaces.
   2. Remove dirt and blemishes from exposed surfaces.
   3. Sweep and vacuum surfaces thoroughly.
   4. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   1. Do not wax static-control resilient flooring.
   2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties. Before polishing, do the following:

a. Ensure that static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
b. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING

(PART OF TRADE-BID SECTION 09 00 03 - RESILIENT FLOORS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rubber floor tile.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product indicated.
   2. Shop Drawings: Show installation details and locations of the following:
      a. Border tiles.
      b. Floor patterns.
      c. Layout, colors, widths, and dimensions of game lines and markers.
      d. Locations of floor inserts for athletic equipment installed through flooring.
      e. Seam locations for sheet flooring.
   3. Samples: For each type, color, and pattern of flooring indicated, 6-inch- (150-mm-) square Samples of same thickness and material indicated for the Work.
      a. Game-Line- and Marker-Paint Samples: Include Sample sets showing game-line- and marker-paint colors applied to flooring.
      b. Seam Samples: For each vinyl sheet flooring color and pattern required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project.

B. Informational Submittals:
   1. Test Reports: Pre-installation substrate moisture and alkalinity tests.
   2. Qualification Data: For qualified sheet vinyl flooring Installer.

C. Closeout Submittals:
   1. Maintenance Data: For flooring to include in maintenance manuals.
   2. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

D. Maintenance Material Submittals:
   1. Furnish extra materials, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

a. Floor Tile: Furnish no fewer than 1 box for each 50 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.

1.3 QUALITY ASSURANCE

A. Sheet Vinyl Flooring Installer Qualifications: An experienced Installer who has completed sheet vinyl flooring installations using seaming methods indicated for this Project and similar in material, design, and extent to that indicated for this Project; who is acceptable to manufacturer; and whose work has resulted in installations with a record of successful in-service performance.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.

B. Store materials to prevent deterioration. Store tiles on flat surfaces.

1.5 FIELD CONDITIONS

A. Adhesively Applied Products:
1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

B. Install flooring after other finishing operations, including painting, have been completed.

1.6 COORDINATION

A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

PART 2 PRODUCTS

2.1 INTERLOCKING, RUBBER FLOOR TILE

A. Manufacturers:
1. Aacer Flooring, LLC.
2. Action Floor Systems, LLC.
3. Amarco Products.

4. American Floor Products Company, Inc.
5. ECORE International.
6. Flexco.
7. Horner Flooring Company, Inc.
8. Johnsonite; a Tarkett company.
9. Mondo America Inc.
10. Musson Rubber Co.
11. nora systems, Inc.
12. Robbins Sports Surfaces.
13. Roppe Corporation.
14. Sport Court; Subsidiary of Connor Sport Court International.
15. Surface America Incorporated.
16. Tuflex Rubber Flooring; a division of Tuflex Rubber Products, Inc.

B. Basis-of-Design Product:
1. RSF2: RUBBER ATHLETIC FLOORING, ECORE ATHLETIC EL/ES 15A STEEL APPEAL 2

C. Description: Athletic flooring consisting of modular rubber tiles with interlocking edges for adhered application.
1. Tile Interlock: Manufacturer's standard.

D. Material: Rubber.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than percent.

E. Traffic-Surface Texture: Smooth.

F. Size: 23" (0.58m) x 23" (0.58m).

G. Thickness: 3/8" (9 mm) thick

H. Weight: Not less than 2.0 lbs./ft2 per square foot

I. Color and Pattern: As indicated by manufacturer's designations.

2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.

B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.

1. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.

B. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
   3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
   1. Do not install flooring until it is the same temperature as space where it is to be installed.

F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOORING INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions.

B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.

C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 FLOOR TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles square with room axis.

B. Discard broken, cracked, chipped, or deformed tiles.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged if so numbered.
   1. Lay tiles with grain running in one direction.

D. Adhered Flooring: Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
   1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTING

A. Perform the following operations immediately after completing flooring installation:
   1. Remove adhesive and other blemishes from flooring surfaces.
   2. Sweep and vacuum flooring thoroughly.
   3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.

B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION

SECTION 09 67 23

RESINOUS FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High-performance resinous flooring systems.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants for sealants installed at joints in resinous flooring systems.

1.3 DEFINITIONS

A. Pit and Pinhole: A pit or pinhole is a defect in the flooring system that has the appearance of a dark depression that may or may not be continuous to the substrate. A pit or pinhole is also any cavity that may capture and retain material or foreign matter despite cleaning resulting in the surface not being cleanable. The size of a pit or pinhole may vary from needlepoint-width or smaller as can be seen with 20/20 vision at a distance of 24-inches from the surface being inspected to the width of a blunt graphite pencil or larger. Resinous Flooring application in a high containment laboratory shall provide an impervious, chemical-resistant and cleanable surface free of pits, pinholes and other surface imperfections such as runs, drips, and spitting. Surface texture required for slip resistance is acceptable and shall not be confused with pits and pinholes. Mockups will be performed as noted in this section to define pits, pinholes, and surface texture for the project. The Architect shall be the final judge and interpreter of pits, pinholes, and other surface imperfections pertaining to the resinous flooring application

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
   2. Samples: For each resinous flooring system required, 24 inches (610 mm) square, applied to a rigid backing by Installer for this Project. Sample shall be divided in a minimum of thirds demonstrating at least three varying levels of surface texture, from light texture to heavy, for review and preliminary approval by the Owner. Final approval of surface texture shall be provided after completion of the Field Mock-Up.
   3. Product Schedule: Use resinous flooring designations and room designations indicated on Drawings in product schedule.

B. Informational Submittals:
   1. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
   2. Material Certificates: For each resinous flooring component, from manufacturer.
   3. Material Test Reports: For each resinous flooring system.
   4. Test Reports: Pre-installation substrate moisture and alkalinity tests.

C. Closeout Submittals:
   1. Maintenance Data: For resinous flooring to include in maintenance manuals.
   2. Record Documents: Showing locations of substrate moisture and alkalinity tests. Provide markups on floor plan indicating the location of each test and the dates tests were performed.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
   1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Installation Responsibility: Assign installation of resinous flooring systems and epoxy wall coating systems in Project to a single qualified installer.

D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Concrete substrate profile (CSP-level or the amount of sandblast/shot-blast) shall be per Manufacturer’s recommendation. A portion of the sand-blasted finish shall be left exposed to serve as a guide and to evaluate sandblasted surfaces on the project.
   2. Application techniques of resinous flooring shall be as agreed upon at the pre-installation conference. Adjust installation technique as required to gain acceptance from Architect.
   3. Provide a minimum 48 inch square section of flooring with 48 inch long section of integral base for review. Separate mockups shall be provided for each type of flooring.
   4. Compatibility: Provide evidence of compatibility with the Special Wall Coating system prior to installation of either system.
   5. Simulate finished lighting conditions for review of in-place field mock-up. Surfaces shall be inspected for pits/pinholes and peaks/sharps to set the standard of acceptance criteria for the project.
   6. After application of the Resinous Flooring, destructive testing will be conducted by an Owner-appointed independent testing agency. The A/E may designate up to four areas on the mock-up that shall be tested to determine resinous flooring thickness and adhesion to substrate.

7. Cleanability testing of resinous flooring shall be performed by the Owner to set the standard of acceptance criteria for surface finish for the project.
8. If field mock-up is unacceptable, make adjustments to comply with requirements and apply additional coats until mock-up is approved. After mock-up is approved, these surfaces including repairs will serve as a guide to evaluate special coating on project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flammability: Self-extinguishing in accordance with ASTM D635.

2.2 MANUFACTURERS

1. Basis of Design: Subject to compliance with the requirements, provied products by Sherwin Williams, or comparable products by one of the following:
   a. Tnemec Company, Inc., 6800 Corporate Drive, Kansas City, MO 64120, Phone: (816) 483-3400, www.tnemec.com
   b. Sherwin Williams (General Polymers)
   c. Dudick
2. Basis of Design: Sherwin Williams, formerly Dur-A-Flex, Inc.
   a. RESUFLOOR DECO QUARTZ
   b. HIBRI-FLEX EQ
   c. RESUFLOOR GARD TOPCOAT: ARMOR TOP GLOSS WITH GRIT

2.3 HIGH-PERFORMANCE RESINOUS FLOORING SYSTEMS

A. Fluid-Applied Flooring Type A: Dur-A-Quartz: Epoxy base coat(s) with embedded quartz aggregate.
   1. Locations: Firematic spaces as indicated on Drawings.

2. Top Coat: Urethane.
3. System Thickness: 1/8 inch (3.18 mm), nominal, when dry.
4. Texture: Slip resistant.
5. Sheen: Satin.
6. Color: As selected by Architect.
7. Aggregate Type: "Q28 Dur-A-Quartz Aggregate" by Dur-A-Flex, Inc.
8. Aggregate Application Method: Double Broadcast.
9. Color additives shall be supplied by the same manufacturer as the epoxy resin components.
10. Products:
    a. RESUFLOOR DECO QUARTZ: Dur-A-Flex, Inc.; Dur-A-Quartz Epoxy Broadcast System with "ARMOR TOP" Urethane Topcoat: www.dur-a-flex.com.
    b. Dur-A-Flex, Inc.: Dur-A-Gard, Epoxy-Based seamless flooring system with "ARMOR TOP" Urethane Topcoat: www.dur-a- flex.com.
        1) Primer; Product "Dur-A-Glaze WB":

Percent Solids	56%
VOC	2 g/L
Bond Strength to Concrete, ASTM D4541	550 psi, substrate fails
Hardness, ASTM D3363	3H
Elongation, ASTM D2370	9%
Flexibility (1/4: Cylindrical mandrel), ASTM D522	Pass
Impact Resistance, MIL D-2794	>160
Abrasion Resistance, ASTM D4060; CS 17 wheel, 1,000 g load	30 mg loss

            (1) Use water-borne system if conditions warrant.
        2) Broadcast Coat, Grout Coat, and any intermediate coats; Product "Dur-A- Glaze #4":

Percent Solids	100%
VOC	3.8 g/L
Compressive Strength, ASTM D695	11,200 psi
Tensile Strength, ASTM D638	2,100 psi
Flexural Strength, ASTM D790	5,100 psi
Abrasion Resistance, ASTM D4060; CS 17 wheel, 1,000 g load, 1,000 cycles	29 mg loss
Flame Spread/NFPA 101, ASTM E84	Class A

Impact Resistance, MIL D-24613	0.0007 inches, no cracking or delamination
Water Absorption, MIL D-24613	Nil
Potlife @ 70 degrees F	20 minutes

3) Topcoat; Product "Armor Top":

Percent Solids	95%
VOC	0 g/L
Tensile Strength, ASTM D2370	7,000 psi
Adhesion, ASTM 4541	Substrate Failure
Hardness, ASTM D3363	4H
60 degree Gloss, ASTMD523	70
Abrasion Resistance, ASTM D4060; CS 17 wheel, 1,000 g load, 1,000 cycles	Gloss Satin 4 8 mg loss with grit 10 12 mg loss w/o grit
Pot Life, 70 degrees F, 50% RH	2 hours
Full Chemical Resistance	7 days

B. Floor Accent Striping – Type: Dur-A-Gard, Epoxy-Based seamless flooring system
   1. Locations: In Apparatus Bay as indicated on Drawings.
   2. System Materials:
      a. Primer: Dur-A-Flex, Inc., Dur-A-Glaze #4 WB resin and hardener
         1) Percent Solids: 56%
         2) Bond Strength to Concrete ASTM D 4541: 550 psi, substrate fails
         3) Hardness, ASTM D 3363: 3H
         4) Impact Resistance, MIL D-2794: >160
      b. Base Coat: Dur-A-Flex, Inc., Dur-A-Gard resin and hardener
         1) Percent Solids: 100%
         2) Compressive Strength, ASTM D 695: 16,000 psi
         3) Tensile Strength, ASTM D 638: 3,800 psi
         4) Flexural Strength, ASTM D 790: 4,000 psi
         5) Abrasion Resistance, ASTM D 4060, C-10 Wheel, 1,000 gm load, 1,000 cycles: 35 mg loss
            (a) Backroll aluminum oxide to provide slip resistance of 0.8 (orange peel)
         6) Impact Resistance MIL D-3134: 0.025 inch Max
         7) Water Absorption MIL D-3134: 0.04%
      c. Topcoat: Dur-A-Flex, Inc., Armor Top resin, hardener and grit.
   3. Patch Materials:
      a. Shallow Fill and Patching: Use Dur-A-Flex, Inc., Dur-A-Glaze Rapid-Patch
   4. Accent Striping Width: 6 inch (152.4 mm) or as indicated on the Drawings.

C. Fluid-Applied Flooring Type B: **Hybri-Flex EC**; (self-leveling chip broadcast), epoxy/aliphatic urethane topcoat seamless flooring system.
   1. Location: Shower and as indicated on Drawings.
   2. System Materials:
      a. Topping: Dur-A-Flex, Inc, Poly-Crete SL resin, hardener and SL aggregate.
      b. The broadcast aggregate shall be Dur-A-Flex, Inc. Macro or Micro chip.
      c. Broadcast: Dur-A-Flex, Inc. Dur-A-Glaze #4, epoxy based two- component resin.
      d. Seal coats: Dur-A-Flex, Inc Dur-A-Glaze #4, epoxy-based, two- component resin.
      e. Top coat: Dur-A-Flex, Inc. Armor Top aliphatic urethane 2 component resin with grit.
   3. Patch Materials:
      a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Poly-Crete SL
      b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Poly-Crete WR.
   4. Thickness: 1/4 inch (6.35 mm) inch, nominal, when dry.
   5. Texture: Slip resistant.
   6. Sheen: Semi-Gloss.
   7. Color: As selected by Architect.
   8. Products:
      a. Topping; Product "Poly-Crete SL":

Percent Reactive	100%
VOC	0 g/L
Bond Strength to Concrete, ASTM D4541	400 psi, substrate fails
Compressive Strength, ASTM C579	7,400 psi
Tensile Strength, ASTM D638	1,800 psi
Impact Resistance @ 125 mils, MIL D- 3134; No visible damage or deterioration	>160 inch lbs

      b. Broadcast Coat: Product "Dur-A-Glaze #4 Resin":

Percent Reactive	100 %
VOC	<4 g/L
Water Absorption, ASTM D 570	0.04%
Tensile Strength, ASTM D 638	4000psi
Coefficient of thermal expansion ASTM D 696	2 x 10-5 in/in/F
Flammability ASTM D-635	Self-Extinguishing
Flame Spread/ NFPA 101 ASTM E-84	Class A

      c. Topcoat: Product "Armor Top":

VOC	0 g/L
60 Degree Gloss ASTM D523	75+/-5

Mixed Viscosity, (Brookfield 25oC)	500 cps
Tensile strength, ASTM D 638	7,000 psi
Abrasion Resistance, ASTM D4060 CS 17 wheel (1,000 g load) 1,000 cycles	Gloss: 4 mg loss with grit, 10 mg loss without grit. Satin: 8 mg loss with grit, 12 mg loss without grit.
Pot life @ 70o F 50% RH	2 hours
Dry properties, 70oF, 50% R.H.	8 hours tack free, 12 hours Dry
Dry properties, 60oF, 30% RH	12 hours tack free, 18 hours Dry
Dry properties, 80oF, 70%RH	4 hours tack free, 6 hours Dry
Flash Point PMCC	186oF
Full Chemical resistance	7 days

D. MOISTURE MITIGATION SYSTEM
   1. Moisture Mitigation – Furnish and install a moisture mitigation/floor system at concrete slabs under all materials to be installed under this Section. The approved system shall be compatible with all of the approved flooring materials and shall maintain all manufacturers warrantees as well as the flooring subcontractor's specified warranty
   2. Where RH is greater than 75%, furnish and install a mitigation system/product as manufactured by one of the following
      a. Dur-A-Flex, Inc., Dur-A-Glaze MVP Primer, Basis of Design.

2.4 ACCESSORIES

A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
   1. Subfloor Filler for Shallow Fill and Patching: Thixotropic thermosetting epoxy; type recommended by flooring material manufacturer.
   2. Subfloor Filler for Deep Fill and Sloping Material (over 1/4 inch): Heavy-duty, trowel-applied, 100% solids epoxy resin; type recommended by flooring material manufacturer.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated

C. Crack Repair: Two-component flexibilized epoxy crack and joint treatment to be used exclusively for the isolation of dynamic cracks. To be used in conjunction with 10 oz. fiberglass reinforcing fabric as necessary.

D. Transitions:
   1. Manufacturer: Schluter Systems; Schiene trim Stainless Steel
   2. Locations: At room to room transitions of different fluid-applied finishes.

E. Cove-Base Cap Strip: Flexible, pre-molded, angled plastic strip for integral cove base as approved by floor covering manufacturer.
   1. Product: Plastic Termination Strip (PTS) from Republic Supplies, 4498, or equal.
      a. Color: Clear.

b. Angle: 45 degrees.
c. Application: Self-adhering.

2. Contractor may utilize removable/temporary cap strip as an alternative option to the cap strip noted above.
   a. Provide mockup to demonstrate ability to maintain an aesthetically pleasing straight line at top of base.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resinous flooring systems.
   2. Ensure substrates are clean, dry, level, and structurally sound, with no projections from surfaces.
   3. Ensure substrates free from irregularities greater than 1/8 inch.
   4. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
   5. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
   6. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
   7. Verify that required floor-mounted utilities are in correct location.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare and clean substrates in accordance with resinous flooring manufacturer's written instructions for substrate indicated to ensure adhesion.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
   1. Roughen concrete substrates as follows:
      a. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete Surface Profile of 3 or greater in accordance with ICRI Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.
      b. Prepare all concrete surfaces scheduled to receive fluid-applied flooring by the "blast track" method. "Blast track" cleaning shall be provided by mechanics experienced in this operation Profile concrete according to International Concrete Repair Institute Guideline 03732, having a **minimum profile of CSP 4-5**.

c. Mechanically abrade floor areas inaccessible to the mobile blast machines to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, scarifiers, rotary impact tools, or other suitable equipment.
d. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

2. Repair damaged and deteriorated concrete in accordance with resinous flooring manufacturer's written instructions.
   a. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
   b. Filling of bug holes and surface defects: Pre-detail concrete surface with 100% solids epoxy mortar as manufactured by the floor system Manufacturer.
3. Monitor Moisture Content of Slabs:
   a. Monitor moisture content of new concrete floor slabs to receive fluid-applied floor finishes to verify that moisture control procedures are sufficient to dry slabs sufficiently to permit floor finishes to be installed.
   b. Continuously monitor relative humidity and moisture content of floor slabs starting after curing of concrete is complete. Perform the following procedure at least once every two weeks, increase frequency to once per week for the month prior to floor finish installation.
   c. The accepted method of testing will be per the ASTM F2170 using in-situ probes
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
5. For slabs on grade and below-grade, include a test location within 3 feet of each exterior wall.
   a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
   b. Determine the appropriate depth for probe holes from ASTM F2170, Section 10 – Procedure. Use Procedure A – Drilled Holes only. Procedure B – Cast Holes will not be permitted.
   c. Report – Provide a report which will include all informational data detailed in ASTM F2170, Section 11 – Report. This report will include a plan of all probe locations and the relative humidity of each probe to the nearest percent relative humidity. Utilize F2170 Example Report Form or Architect accepted facsimile thereof.
6. Alkalinity and Adhesion Testing: Perform tests recommended in writing by resinous flooring manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer,

C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates in accordance with manufacturer's written instructions.
   1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring in accordance with manufacturer's written instructions.

D. Resinous Materials: Mix components and prepare materials in accordance with resinous flooring manufacturer's written instructions.

E. Vacuum clean substrate.

3.3 INSTALLATION GENERAL

A. Do not contaminate adjacent surfaces, finishes, etc.Dry surfaces prior to application of any system component. Remove any remaining dust or loose particles using a vacuum or clean, dry, oil-free compressed air.

B. Remove all existing thresholds and terminate flooring finish so that the thresholdwill cover the termination. Replace thresholds at completion.

C. Cut key slots a minimum of 1/2 inch by 1/2 inch wherever a free edge will occur, including but not limited to all drains, other fittings set into the floor surface, across all termination lines not covered by thresholds, transitions to other floor systems, doorways, wall perimeters, expansion joints, columns, and equipment pads. Cut key slot at all Apparatus Bay doors lined up with bottom door seal at interior side.

D. Chisel or chip-out and repair cracks and joints (non-moving) greater than 1/2 inch wide in accordance with manufacturer’s recommendations.

E. Moisture mitigation systems shall be installed in accordance with manufacturers recommendations and requirements.

F. Apply primer by using a flat squeegee and back-roll with a 3/8" nap roller cover.

G. Power sand floor to remove any high spots and re-prime.

H. Mix, handle, and add components in a safe manner to achieve the desired results in accordance with the manufacturer's recommendations.

I. Apply each coat to minimum thickness required by manufacturer.

J. Follow the contour of the substrate unless pitching or other leveling work in indicated otherwise in the contract documents.

K. Finish to smooth level surface. Provide a neat finish with well-defined boundaries and straight edges.

L. Install flooring in recessed type floor access covers.

M. Fillet and cove at vertical surfaces.

N. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

O. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

P. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
   1. Integral Cove Base: As indicated on Drawings

Q. Apply self-leveling slurry body coats in thickness indicated for flooring system.
   1. Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

R. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.4 INSTALLATION – EPOXY AND SHOP EPOXY TYPE FLOORING

A. Apply basecoat after prime coat has sufficiently cured, as outlined by manufacturer. The base coat shall be mixed with color additive and sufficiently blended to ensure a thoroughly homogenized material. Do not introduce air bubbles or other contaminants during mixing. Apply mixed material at the rate of 80 square feet per gallon to a thickness of approximately 20 mils.

B. First Broadcast – broadcast quartz aggregate evenly to saturation.

C. For Areas Designated as Double Broadcast
   1. Intermediate Coat – intermediate coat shall be as base coat, resin to be water clear.
   2. Second Broadcast – broadcast colored quartz aggregate evenly to saturation.
   3. Top Coat – top coat shall be applied at a rate of approximately 100 square feet per gallon using a high quality 3/8” nap roller to give a uniform thickness and even appearance. (Standard textured finish.)
   4. Total base coat plus aggregate plus lock coat shall total approximately 125 mils (min. 120 mils).

3.5 INSTALLATION – URETHANE TYPE FLOORING

A. The system shall be applied in two distinct steps as listed below:
   1. Substrate preparation
   2. Topping application

B. Wherever a free edge will occur, including doorways, wall perimeters, expansion joints, columns and equipment pads, a ¼ inch by ¼ inch keyway shall be cut in. At edges such as doorways, drains and transitions to other floor systems a ½ inch by ½ inch keyway shall be cut in.

C. Cracks and joints (non-moving) greater than 1/2 inch wide are to be chiseled or chipped-out and repaired per manufacturer’s recommendations.

D. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.

E. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.

F. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.

G. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

H. Topping:
1. The topping shall be a trowel applied as specified. The topping shall be applied in one lift with a nominal thickness of 1/4 inch.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. HF Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using a screed box, trowels or other systems approved by the Manufacturer.

I. Install cove base of the same material, to a height indicated, located as indicated on the drawing(s). Cove at a minimum radius of ½”.

3.6 CLEANING

A. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

B. Clean up all debris and dirt resulting from work, dispose of according to requirements of Section 01 74 19 "Construction Waste Management and Disposal.

3.7 FIELD QUALITY CONTROL

A. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.

B. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.
1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.8 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

B. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

C. Prohibit traffic on floor finish for 48 hours after installation.

D. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 75 23

SOLID-SURFACING WALL FACING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes solid-surfacing paneling on interior walls.

1.2 ACTION SUBMITTALS

A. Product Data: For each variety of solid-surfacing, solid-surfacing accessory, and manufactured product.

B. Shop Drawings: Show fabrication and installation details for solid-surfacing paneling system, including dimensions and profiles of solid-surfacing units.
   1. Show locations and details of joints both within solid-surfacing paneling system and between solid-surfacing paneling system and other finish materials.
   2. Show direction of veining, grain, or other directional pattern.

C. Samples for Verification:
   1. For each solid-surfacing type indicated. Samples shall show the full range of variations in appearance characteristics in completed Work.
   2. For each color of sealant required.

1.3 INFORMATIONAL SUBMITTALS

A. Material Test Reports:
   1. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage solid-surfacing. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

B. Qualification Data: for Fabricator and installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid-surfacing paneling to include in maintenance manuals. Include product data for solid-surfacing-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Shop is a certified participant in AWI's Quality Certification Program.
2. Shop or individual is certified, licensed, or otherwise qualified by solid-surfacing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements

B. Installer Qualifications: Fabricator of products.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Sealant Adhesion and Compatibility Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 07 92 00 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and handle solid-surfacing and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
1. Store components indoors prior to installation.
2. Handle materials to prevent damage to finished surfaces.
a. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

B. Mark solid-surfacing units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual solid-surfacing units. Orient markings on vertical panels so that they are right side up when units are installed.

C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install solid surfacing paneling until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Verify dimensions of construction to receive solid-surfacing paneling by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Time delivery and installation of solid-surfacing paneling to avoid extended on-site storage and to coordinate with work adjacent to solid-surfacing paneling.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke developed: 450 or less.

2.2 MANUFACTURERS

A. Solid Surface Material:
   1. SS2: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1. Color: Corian; Designer White
   2. SS3: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1. Color: Corian; Light medium Grey, leather finish.
   3. SS4: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1. Color: Corian;Dark Charcole/Black Color.
   4. Manufacturer: Subject to compliance with requirements, provide products by the following:
      a. Avonite Surfaces.
      b. E. I. du Pont de Nemours and Company.
      c. LivingStone Surfaces.
      d. Samsung Chemical USA, Inc.
      e. Wilsonart International.
   5. Type: Provide Standard Type unless Special Purpose Type is indicated.
   6. Thickness: 1/4 inch (6.35 mm), unless otherwise indicated.
   7. Edge treatment: As indicated.

2.3 ADHESIVES

A. Panel adhesive:
   1. Manufacturer recommended 100% silicone sealant.

2.4 SEALANTS

A. Joint Sealants: Manufacturer's standard sealants that comply with applicable requirements in Section 07 92 00 "Joint Sealants" and will not stain the solid-surfacing they are applied to.
   1. Manufacturer’s standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.
   2. Colors: Provide colors of exposed sealants to match other joints in solid-surfacing adjoining sealed joints unless otherwise indicated.

2.5 SOLID-SURFACING ACCESSORIES

A. Temporary Setting Shims: Rigid plastic shims, nonstaining to solid-surfacing, sized to suit joint thickness.

B. Cleaner: Solid-surfacing cleaner specifically formulated for solid-surfacing types, finishes, and applications indicated, as recommended by solid-surfacing producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

2.6 SOLID-SURFACING FABRICATION, GENERAL

A. Fabricate solid-surfacing paneling according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Grade: Premium.

B. Finish exposed faces and edges of solid-surfacing to comply with requirements indicated for finish of each solid-surfacing type required and to match approved Samples and mockups.

C. Carefully inspect finished solid-surfacing units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

2.7 SOLID-SURFACING PANELING ON WALLS

A. Nominal Thickness: 1/4 inch (6.35 mm) unless otherwise indicated.

B. Substrate for applications: See Section 09 29 00 Gypsum Board for substrate materials.
   1. Dry applications: Glass-Mat Interior Gypsum Board.
   2. Toilet Room interior exposed wall applications: Glass-Mat, Water-Resistant Backing Board.
   3. Shower and toilet room exterior exposed wall applications: Cementitious Backer Units.
      a. Waterproofing membrane – See Section 09 30 13 Ceramic Tiling.

C. Pattern Arrangement: Fabricate and arrange panels with veining and other natural markings to comply with the following requirements:
   1. As indicated on the Drawings, or is not indicated, as approved by the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive solid-surfacing paneling and conditions under which solid-surfacing paneling will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of solid-surfacing paneling.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of solid-surfacing paneling.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING SOLID-SURFACING, WALL FACING GENERAL

A. Before setting solid-surfacing, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean solid-surfacing by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

B. Do necessary field cutting as solid-surfacing is set. Use power saws with blades recommended by the solid-surfacing manufacturer to cut solid-surfacing. Cut lines straight and true, with edges eased slightly to prevent snipping. Finish cut edges the same as shop fabricated edges.

C. Contiguous Work: Provide reveals and openings as required to accommodate contiguous work.

D. Erect solid-surfacing units level, plumb, and true with uniform joint widths. Use temporary shims to maintain joint width.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
   1. Sealing of expansion and other joints is specified in Section 07 92 00 "Joint Sealants."
   2. Keep expansion joints free of adhesive, and other rigid materials.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/8 inch (3.18 mm) in 96 inches (2438.4 mm), 1/4 inch (6.35 mm) maximum.

B. Variation from Level: For lintels, sills, chair rails, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), 3/8 inch (9.52 mm) maximum.

C. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed 1/8 inch (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), 3/8 inch (9.52 mm) maximum.

D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/8 inch (3.18 mm).

E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/16 inch (1.59 mm) or one-fourth of nominal joint width, whichever is less.

F. Variation in Plane between Adjacent Solid-surfacing Units (Lipping): Do not exceed 1/32-inch (0.8-mm) difference between planes of adjacent units.

3.4 INSTALLATION OF SOLID-SURFACING WALL FACING

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   1. Exposed joints/seams shall not be allowed.

2. Cut and finish component edges with clean, sharp returns.
3. Carefully dress joints smooth, remove surface scratches and clean entire surface.

3.5 JOINT-SEALANT INSTALLATION

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants." Remove temporary shims before applying sealants.

3.6 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean solid-surfacing paneling as work progresses. Remove adhesive, and sealant smears immediately.

B. Remove and replace solid-surfacing paneling of the following description:
1. Broken, chipped, stained, or otherwise damaged solid-surfacing. Solid-surfacing may be repaired if methods and results are approved by Architect.
2. Defective solid-surfacing paneling.
3. Defective joints, including misaligned joints.
4. Solid-surfacing paneling and joints not matching approved Samples and mockups.
5. Solid-surfacing paneling not complying with other requirements indicated.

C. Replace in a manner that results in solid-surfacing paneling that matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.

D. Clean solid-surfacing paneling, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage solid-surfacing.

E. PROTECTION

F. Protect solid-surfacing surfaces, edges, and corners from construction damage. Use securely fastened untreated wood, plywood, or heavy cardboard to prevent damage.

G. Before inspection for Substantial Completion, remove protective coverings and clean surfaces.

END OF SECTION

SECTION 09 77 13

STRETCHED-FABRIC WALL SYSTEMS

(PART OF TRADE-BID SECTION 09 00 02 - ACOUSTICAL TILE)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site-upholstered wall systems.

1.2 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

B. SAA: Sound Absorption Average.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include fabric facing, frame edge, trim, core material, and mounting indicated.
   2. Shop Drawings: For each stretched-fabric system.
      a. Include plans, elevations, sections, and installation and system details.
      b. Include details at head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate frame-edge profile and core materials.
      c. Include details at cutouts and penetrations for other work.
      d. Include direction of fabric weave and pattern matching.
      e. Show sewn-seam locations, types, and methods.
   3. Samples: For the following products:
      a. Fabric: Full-width by approximately 36-inch- (900-mm-) long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.

B. Informational Submittals:
   1. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Electrical outlets, switches, and thermostats.
b. Items penetrating or covered by stretched-fabric systems including the following:
1) Lighting fixtures.
2) Air outlets and inlets.
3) Speakers.
4) Alarms.
5) Sprinklers.
6) Access panels.
7) Other wall mounted equipment.
c. Show operation of hinged and sliding components covered by or adjacent to stretched-fabric systems.

2. Qualification Data: For Installer.
3. Product Certificates: For each type of stretched-fabric system.
4. Sample Warranty: For special warranty.

C. Closout Submittals:
1. Maintenance Data: For stretched-fabric systems to include in maintenance manuals. Include fabric manufacturer's written cleaning, stain-removal, restretching, and reupholstering instructions.

D. Maintenance Material Submittals:
1. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
a. Fabric: For each fabric, color, and pattern installed, furnish length equal to 10 percent of amount installed, but no fewer than 10 sq. yd. (9 sq. m), full width of bolt.
b. Framing and Related Installation Items: Furnish manufacturer's full-length units equal to 5 percent of amount installed, but no fewer than five units, including unopened adhesives.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
1. Build mockup of typical wall area 48 inches (1200 mm) wide by full height. Include intersection of wall and ceiling, corners, and perimeters.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and stretched-fabric system manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install stretched-fabric systems until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install stretched-fabric systems until a permanent level of lighting is provided on surfaces to receive stretched-fabric systems.

C. Air-Quality Limitations: Protect stretched-fabric systems from exposure to airborne odors such as tobacco smoke, and install systems under conditions free from odor contamination of ambient air.

1.8 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace components of stretched-fabric systems that fail in performance, materials, or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Acoustical performance.
      b. Fabric sagging, distorting, or releasing from panel edge.
      c. Warping of core.
   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain stretched-fabric wall systems specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Verify wall materials comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Fire-Test-Response Characteristics: Stretched-fabric wall systems shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency on systems prepared according to ASTM E2573. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.3 STRETCHED-FABRIC WALL SYSTEMS

A. Stretched-Fabric Wall System FWP1: Manufacturer's standard system consisting of facing material stretched tightly over a frame and core material and secured in the frame.
   1. Manufacturers:
      a. Novawall Systems, Inc.
      b. Stretchwall Installations, Inc.
      c. Whisper Walls.
   2. Basis of Design: Stretchwall; Snaplock.
   3. Core: Glass-fiber board.
      a. Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density board.
      b. Nominal Core Thickness: As indicated on Drawings.
   4. Frame Edge: Square profile.
      a. Fabric-Insertion Point: Bottom load, or Top load as indicated on the Drawings.
      b. Nominal Frame Thickness: Match nominal core thickness.
   5. Frame Color: Natural.
   6. Reveals between Panels: Flush reveals as indicated on Drawings.
   7. Facing Material: XOREL; WINDSOR 6131 - COLOR 36 UNBACKED
   8. Acoustical Performance: Sound absorption NRC or SAA of 0.50 to 0.90 according to ASTM C423 for Type A mounting according to ASTM E795.
   9. Nominal Overall System Thickness: As indicated on Drawings.

2.4 MATERIALS

A. Sustainable Design Requirements:
   1. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

B. Core Materials:

1. Glass-Fiber Board: ASTM C612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft. (96 to 112 kg/cu. m), unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2. Tackable, Impact-Resistant, High-Density Board for Face Layer: 1/8-inch- (3.2-mm-) thick layer of compressed molded glass-fiber board with a nominal density of 16 to 18 lb/cu. ft. (256 to 288 kg/cu. m) laminated to face of core.

C. Frame Construction: Manufacturer's standard, continuous, extruded plastic frame (track).

2.5 INSTALLATION MATERIALS

A. Installation Products: Concealed on back of system, recommended by stretched-fabric system manufacturer to support weight of system, fabric tension, and as follows:
1. Verify adhesives have a VOC content of 70 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Fasteners: Manufacturer's standard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine fabric, materials, substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of stretched-fabric systems.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each area and establish layout of panels and joints of uniform size with balanced borders at opposite edges within a given area.

B. Before installation, allow fabric to adjust and become stable in spaces where it will be installed according to stretched-fabric system manufacturer's written instructions. Acclimatize fabric for minimum of 24 hours at ambient temperature and humidity conditions indicated for spaces when occupied for their intended use.

3.3 INSTALLATION

A. Install stretched-fabric systems according to system manufacturer's written instructions.
1. Provide continuous perimeter frames of each profile indicated, designed to be inconspicuous when covered by fabric facing, with smooth edges, and with surface finish that will not telegraph through fabric facing.

2. Install framing around penetrations.
3. Tightly fit framing to adjacent construction and securely attach to substrate.
4. Install core material with full coverage, flush with face of stretched-fabric system frame.
5. Attach frame and core to substrate with adhesive or fasteners or both to support system and prevent deformation of components.
6. Install stretched-fabric systems level and plumb unless otherwise indicated, true in plane, and with fabric square to the grain.
7. Install jointed panels with butt joints and reveals as indicated.
8. Provide wood or plywood nailing strips and blocking as indicated on Drawings.

B. Fabric Installation: Apply fabric monolithically in continuous run over area, without joints or reveals, except where panel joints or midspan frames are indicated.
1. Fabric Direction: Run fabric as indicated.
2. Fabric Sequence: Maintain sequence of fabric drops; match and level fabric pattern and grain.
3. Fabric Alignment: Install fabric with patterns or directional weaves so pattern or weave aligns with adjacent panels.
4. Fabric Seams: Sewn seams are not permitted.
5. Stretch and secure fabric to frame edges and so frame and frame attachment method are concealed by fabric unless otherwise indicated.
6. Stretch fabric tightly and square without puckers, ripples, or distortions. Acclimatize and restretch if recommended by stretched-fabric system manufacturer. Repair distortions, wrinkles, and sagging.

3.4 INSTALLATION TOLERANCES

A. Edge Straightness: Plus or minus 1/16 inch (1.6 mm) in 48 inches (1200 mm).

B. Variation from Level and Plumb: Plus or minus 1/16 inch (1.6 mm) in 48 inches (1200 mm), noncumulative.

C. Variation of Joint Width: Not more than 1/16 inch (1.6 mm) in 48 inches (1200 mm) from hairline, noncumulative.

3.5 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

SECTION 09 91 13

EXTERIOR PAINTING

(PART OF TRADE-BID SECTION 09 00 00 - PAINTING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and the application of paint systems on exterior substrates.

1.2 DEFINITIONS

A. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

C. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

D. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of Paint System, submit product data cut sheets, including preparation requirements and application instructions.
      a. Formulate product data cut sheets into sets for each Paint System required.
   2. Samples: For each type of paint system and each color and gloss of topcoat.
      a. Step coats on Samples to show each coat required for system.
      b. Label each Sample with Paint System designation.
      c. Label each Sample for location and application area.
      d. Dry samples a minimum of 7-days before submitting.
      e. Submit Samples on the following substrates for the Architect's review of color and texture only:
         1) Painted Wood: Provide two 12-inch-(300-mm-) square samples of each color and material on hardboard.
         2) Ferrous / Galvanized Metal: Provide two 4-inch-(100-mm-) square samples of flat metal and two 8-inch-(200-mm-) long samples of solid metal for each color and finish.
   3. Product List: For each product indicated, include the following:
      a. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
      b. VOC content.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply exterior paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

B. Manufacturers: The following manufacturers are referred to in the paint schedules by use of name or shortened versions of their names, which are shown in parentheses:
   1. Benjamin Moore. (B-M)
   2. PPG Paints (PPG)
   3. Sherwin-Williams (S-W)

2.2 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   1. Nonflat Paints and Coatings: 50 g/L.
   2. Primers, Sealers, and Undercoaters: 100 g/L.
   3. Rust-Preventive Coatings: 100 g/L.
   4. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
   5. Pretreatment Wash Primers: 420 g/L.

C. Low-Emitting Materials: For field applications that are inside the weatherproofing system, verify 90 percent of paints and coatings comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Wood: 15 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" or more stringent instructions listed below applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel (Ferrous Metal) Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 3, "Power Tool Cleaning."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized and Galvannealed Metal Substrates: Remove soluble and insoluble contaminants and corrosion. Remove any storage stains per Section 6.2 of ASTM D 6386. Chemically treat with one of the following products in accordance with manufacturer’s written instructions:
   1. Henkel Galvaprep 5.
   2. Great Lakes Laboratories Clean & Etch.

G. Aluminum Substrates: Remove loose surface oxidation.

H. Wood Substrates:
   1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:
   1. Remove cracked and deteriorated sealants and calking.
   2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
   3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
   4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
   5. Remove mildew as specified above.

6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, provide test results and recommendations from paint manufacturer to Architect.
7. Apply specified primer to surfaces scheduled to receive coatings.

B. Metal:
1. Remove rust from surfaces to bare metal in accordance with SP3 "Power Tool Cleaning."
2. Exercise care not to remove galvanizing.
3. Complete preparation as specified for new work.

C. Wood:
1. Fill cracks, crevices and nail holes with putty or wood filler.
2. Apply primer over bare surfaces and filler material.

3.4 APPLICATION

A. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
1. Painting includes identifying fire-rated wall assemblies with stenciled lettering above ceiling. Provide stenciled block letters in red to identify each rated wall assembly. Refer to Section 09 29 00 - Gypsum Board.
2. Stairs: Paint exposed surfaces including underside.

B. Exterior metal items to be painted include, but are not limited to,
1. Lintels.
2. Bollards.
3. Architectural steel.
4. Galvanized metal flashings.
5. Miscellaneous exposed steel.
6. Steel doors and frames.
7. Stairs.
8. Handrails and railings.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Finished metal surfaces include the following:
    a. Anodized aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper.
    e. Bronze and brass.

D. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items, equipment, furniture, etc. the same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items, equipment, furniture, etc with prime coat only.
3. Paint both sides and edges of doors and entire exposed surface of door frames.
4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
7. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material required. Confirm use of spray equipment is acceptable to building owner in occupied areas.

E. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

F. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

G. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

3.5 FIELD QUALITY CONTROL

A. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

B. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 EXTERIOR PAINTING SCHEDULES

A. Steel, Unprimed (Su) Substrates:
1. Paint System Su-A5: Semigloss, Exterior Acrylic-Enamel Finish: Primer is not required on shop-primed items; touch up shop primer where provided.
a. B-M:
1) First Coat: UltraSpec HP Acrylic Metal Primer, HP04
2) Second Coat: Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 DFT 1.8-2.5 mils
b. PPG:
1) First Coat: 90-712 Pitt-Tech Int/Ext Primer/Finish DTM, 2.5 mils DFT
2) Second Coat: PPG Pitt-Tech Plus EP Semi-Gloss DTM 90-1610 Series, 1.5 – 4.0 mils DFT.
c. S-W:
1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series, 2.0 – 4.0 DFT.
2) Second Coat: Sher-Cryl HPA Semi-Gloss, B66-350 Series, 2.5 – 4.0 DFT.

B. Steel, Zinc-Coated (Galvanized) (Sg):
1. Paint System Sg-A5: Semigloss, Exterior Acrylic-Enamel Finish:
a. B-M:
1) First Coat: Corotech Acrylic Metal Primer, V110
2) Second Coat: Corotech Acrylic DTM Enamel V331, Semi-Gloss DFT 1.9-2.3 mils
3) Third Coat: Same as second
b. PPG:
1) First Coat: 90-712 Pitt-Tech Int/Ext Primer/Finish DTM, 2.5 mils DFT
(a) or
(1) Pitt-Tech Plus Primer/Finish 4020PF, 2.5 mils DFT.
2) Second Coat: PPG Pitt-Tech Plus EP Satin DTM 90-1710 Series, 2.5 mils DFT
3) or
(1) PPG Pitt-Tech Plus EP Semi-Gloss DTM 90-1610, 1.5-4.0 mils DFT.

4) Third Coat: Same as second coat.
c. S-W:
1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series, 2.0 -4.0 DFT.
2) Second Coat: Sher-Cryl HPA Semi-Gloss, B66-350 Series, 2.5 – 4.0 DFT.
3) Third Coat: Same as second.

C. Steel, Factory-Primed (Sp) Substrates:
1. Paint System Sp-L5: Semigloss, Exterior Acrylic-Enamel Finish:
a. B-M:
1) First Coat: Corotech Acrylic Metal Primer, V110
2) Second Coat: Corotech Acrylic DTM Enamel V331, Semi-Gloss DFT 1.9-2.3 mils.
3) Third Coat: Same as second.
b. PPG:
1) First Coat: Pitt-Tech Int/Ext Primer/Finish DTM 90-712
(a) or
(1) Pitt-Tech Plus Primer/Finish 4020PF Series, 2.5 mils DFT.
2) Second Coat: PPG Pitt-Tech Plus EP Semi-Gloss DTM 90-1610, 2.0 – 4.0 mils DFT.
3) Third Coat: Same as second coat.
c. SW:
1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series, 2.0 -4.0 DFT.
2) Second Coat: Sher-Cryl HPA Semi-Gloss, B66-350 Series, 2.5 – 4.0 DFT.
3) Third Coat: Same as second coat.

D. Wood and Exterior Architectural Woodwork (Ww) Substrates:
1. Paint System Ww-A3: Eggshell, Exterior Acrylic Finish:
a. B-M:
1) First Coat: Insl-x Aqua Lock Plus Acrylic Primer-Sealer AQ-04xx
2) Second Coat: Ultra Spec Ext N455 DFT 1.3 mils
3) Third Coat: Same as second
b. PPG:
1) First Coat: Seal Grip Interior/Exterior Universal Primer/ Sealer 17-921XI, 1.6 mils DFT.
2) Second Coat: Speedhide Satin 6-2045XI, 1.4 mils DFT.
3) Third Coat: Same as second coat.
c. S-W:
1) First Coat: Exterior Latex Wood Primer, B42W8041.
2) Second Coat: A-100 Exterior Latex Satin, A82-Series 1.2 – 1.5 mils DFT.
3) Third Coat: Same as second.

E. Aluminum (Au) Substrates Moderate Environment:
1. Paint System Au-P6 Aliphatic Polyurethane, over primer, Semi-Gloss Finish:
a. B-M:

1) First Coat: Corotech Waterborne Bonding Primer V175
2) Second Coat: Corotech Aliphatic Acrylic Urethane Semi-Gloss V510; 2.0-2.8 mils DFT

b. PPG:
1) First Coat: Spectracron Wash Primer 701/702, 0.4 – 0.5 mils DFT.
2) Second Coat: PITTHANE Ultra LS, 95-8800, 2.0-5.0 DFT.

c. S-W:
1) First Coat: DTM Wash Primer, B71Y00001, 0.7 to 1.5 mils DFT.
2) Second Coat: Hi-Solids Polyurethane 250, B65 Series Semi-Gloss, 2.0-3.0 DFT.

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

(PART OF TRADE-BID SECTION 09 00 00 - PAINTING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and the application of paint systems on interior substrates.

1.2 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523 (traditional matte finish - flat).

B. Gloss Level 2: 5 to 10 units at 60 degrees and 10 to 25 units at 85 degrees, according to ASTM D523 (a high side sheen flat -"velvet-like" finish).

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523 (traditional "eggshell-like" finish).

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523 ("satin-like" finish).

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523 (traditional semi-gloss).

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523 (traditional gloss).

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523 (high gloss).

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of Paint System, submit product data cut sheets, including preparation requirements and application instructions.
      a. Formulate product data cut sheets into sets for each Paint System required.
   2. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
      a. Step coats on Samples to show each coat required for system.
      b. Label each Sample with Paint System designation.
      c. Label each Sample for location and application area.
      d. Dry samples a minimum of 7-days before submitting.
      e. Submit Samples on the following substrates for the Architect's review of color and texture only:

1) Concrete: Provide two 4-inch- (100-mm-) square samples for each color and finish.
2) Painted Wood: Provide two 12-inch-(300-mm-) square samples of each color and material on hardboard.
3) Stained or Natural Wood: Provide two 4-by-8-inch (100-by-200-mm) samples of natural- or stained-wood finish on actual wood surfaces.
4) Ferrous / Galvanized Metal: Provide two 4-inch-(100-mm-) square samples of flat metal and two 8-inch-(200-mm-) long samples of solid metal for each color and finish.
5) Gypsum Board / Plaster: Provide two 8-inches (200-mm) square samples on rigid backing.

3. Product List: For each product indicated, include the following:
   a. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   b. VOC content.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

B. Manufacturers: The following manufacturers are referred to in the paint schedules by use of name or shortened versions of their names, which are shown in parenthesis:
1. Benjamin Moore (B-M).
2. PPG Paints (PPG)
3. Sherwin-Williams (S-W)

2.2 PAINT, GENERAL

A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Rust-Preventive Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
7. Pretreatment Wash Primers: 420 g/L.

C. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that the finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" or "MPI Maintenance Repainting Manual" or more stringent instructions listed below applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair the bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel (Ferrous Metal) Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 3, "Power Tool Cleaning."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized and Galvannealed Metal Substrates: Remove soluble and insoluble contaminants and corrosion. Remove any storage stains per Section 6.2 of ASTM D6386. Chemically treat with one of the following products in accordance with manufacturer's written instructions:
   1. Henkel Galvaprep 5.
   2. Great Lakes Laboratories Clean & Etch.

H. Wood Substrates:
   1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:
1. Remove cracked and deteriorated sealants and calking.
2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
3. Wash surfaces with solution of Trisodium phospate (TSP) to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
5. Remove mildew as specified above.
6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, provide test results and recommendations from paint manufacturer to Architect.
7. Apply specified primer to surfaces scheduled to receive coatings.

B. Gypsum Board:
1. Fill cracks and voids with spackling compound.
2. Apply primer over bare surfaces and newly applied texture coatings.

C. Metal:
1. Remove rust from surfaces to bare metal in accordance with SP3 "Power Tool Cleaning."
2. Exercise care not to remove galvanizing.
3. Complete preparation as specified for new work.

D. Wood:
1. Fill cracks, crevices and nail holes with putty or wood filler.
2. Apply primer over bare surfaces and filler material.

3.4 APPLICATION

A. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
1. Painting includes identifying fire-rated wall assemblies with stenciled lettering above the ceiling. Provide stenciled block letters in red to identify each rated wall assembly. Refer to Section 09 29 00 - Gypsum Board.
2. Stairs: Paint exposed surfaces including underside.

B. Paint Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in equipment rooms:
a. Uninsulated metal piping.
b. Uninsulated plastic piping.

c. Pipe hangers and supports.
d. Metal conduit and junction boxes.
e. Plastic conduit and junction boves.
f. Tanks that do not have factory-applied final finishes.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:
a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit and junction boves.
f. Plastic conduit and junction boves.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Unfinished and primed louvers and grilles, covers,
i. Exposed and insulated pipes.
j. Factory primed equipment.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
a. Architectural woodwork and casework.
b. Metal lockers.
c. Elevator entrance doors and frames.
d. Elevator equipment.
e. Finished mechanical and electrical equipment.
f. Light fixtures.
g. Panelboards and switch gear

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
a. Furred areas.
b. Ceiling plenums.
c. Utility tunnels.
d. Pipe spaces.
e. Duct shafts.
f. Elevator shafts.

3. Finished metal surfaces include the following:
a. Anodized aluminum.
b. Stainless steel.
c. Chromium plate.
d. Copper.
e. Bronze and brass.

D. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items, equipment, furniture, etc. the same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items, equipment, furniture, etc with prime coat only.
3. Paint both sides and edges of doors and entire exposed surface of door frames.
4. Paint the front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
7. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material required. Confirm use of spray equipment is acceptable to building owner in occupied areas.

E. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

F. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

G. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

H. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.

3.5 FIELD QUALITY CONTROL

A. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

B. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINT SCHEDULES

A. Concrete (Co) Substrates, Nontraffic Surfaces:
   1. Paint System Co-L3: Latex, Eggshell Finish:
      a. B-M:
         1) First Coat: Ultra Spec Masonry Int/Ext Acrylic Sealer 608
         2) Second Coat: Ultra Spec 500 Interior Zero VOC Eggshell 538
         3) Third Coat: Same as second
      b. PPG:
         1) First Coat: Perma Crete Alkali Resistant Primer 4-603XI.
         2) Second Coat: Speedhide Interior ZERO Eggshell 6-5310.
         3) Third Coat: Same as second.
      c. S-W:
         1) First Coat: Loxon Concrete & Masonry Primer, LX02W0050.
         2) Second Coat: ProMar 200 Zero VOC Eg-Shel B20-2600 Series.
         3) Third Coat: Same as second.
   2. Paint System Co-X5: Waterborne Epoxy, Semigloss Finish:
      a. B-M:
         1) First Coat: Corotech Acrylic Primer V110
         2) Second Coat: Corotech Pre-Catalyzed WB Epoxy Semi-Gloss V341
         3) Third Coat: Same as second
      b. PPG:
         1) First Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne, ZERO VOC Epoxy Semi-Gloss, 16-1510 Series.
         2) Second Coat: Same as first.
         3) Third Coat: Same as second.
      c. S-W:

1) First Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-1150 Series.
2) Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-1150 Series.

3. Paint System Co-X6: Waterborn 2-part Epoxy, Semigloss Finish: Provide for Composite Trim Shelves and where indicated.
   a. S-W:
      1) Prime coat: Loxon Block Surfacer
      2) Intermediate Coat: Water-based Epoxy matching topcoat.
      3) Topcoat: Pro Industrial™ Zero VOC Catalyzed Acrylic Epoxy, B73-300 Series

B. Steel, Unprimed (Su) Substrates
   1. Paint System Su-L5: Latex, Semigloss Finish:
      a. B-M:
         1) First Coat: Corotech Acrylic Metal Primer V110
         2) Second Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331
         3) Third Coat: Same as second.
      b. PPG:
         1) First Coat: Pitt-Tech Plus 4020 PF Interior/Exterior Primer/Finish, 4020PF Series.
         2) Second Coat: PPG Pitt-Tech Plus EP Semi-Gloss DTM 90-1610 Series.
         3) Third Coat: Same as second.
      c. S-W:
         1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
         2) Second Coat: Pro Industrial Acrylic Semi-Gloss, B66-650.
         3) Third Coat: Same as second.
   2. Paint System Su-L3: Latex, Eggshell Finish:
      a. B-M:
         1) First Coat: Ultra Spec HP DTM Metal Primer HP04
         2) Second Coat: Ultra Spec 500 Interior Low Sheen N537
         3) Third Coat: Same as second.
      b. PPG:
         1) First Coat: Pitt Tech Plus 4020 PF Interior/Exterior Primer/Finish, 4020PF Series.
         2) Second Coat: PPG Pitt-Tech Plus EP Satin DTM 90-1710 Series.
         3) Third Coat: Same as second.
      c. S-W:
         1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
         2) Second Coat: Pro Industrial Acrylic Eg-Shel, B66-660 Series.
         3) Third Coat: Same as second.
   3. Paint System Su-D1: Water-Based Dry-Fall, Flat Finish:
      a. B-M:
         1) First Coat: Corotech Acrylic Metal Primer V110
         2) Second Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110
         3) Third Coat: Same as second.
      b. PPG:
         1) First Coat: Pitt Tech Plus 4020 PF Interior/Exterior Primer/Finish, 4020PF Series

2) Second Coat: Speedhide Super Tech Dry Fall 6-725XI
3) Third Coat: Same as second.

c. S-W:
1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
2) Second Coat: Pro Industrial Waterborne Acrylic Dry Fall Flat, B42W1181.
3) Third Coat: Same as second.

4. Paint System Su-X5: Waterborne Epoxy, Semigloss Finish:
a. B-M:
1) First Coat: Corotech Acrylic Metal Primer V110.
2) Second Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112.
3) Third Coat: Same as second.

b. PPG:
1) First Coat: Pitt Tech Plus 4020 PF Interior/Exterior Primer/Finish, 4020PF Series
2) Second Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne ZERO VOC Epoxy Semi-Gloss, 16-1510 Series.
3) Third Coat: Same as second.

c. S-W:
1) First Coat: Pro Industrial Pro-Cryl® Universal Primer, B66-1300 Series.
2) Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-1150 Series.
3) Third Coat: Same as second.

5. Paint System Co-X6: Waterborn 2-part Epoxy, Semigloss Finish:
a. S-W:
1) Prime coat: Pro Industrial Pro-Cryl® Universal Primer, B66-1300 Series.
2) Intermediate Coat: Water-based Epoxy matching topcoat.
3) Topcoat: Pro Industrial™ Zero VOC Catalyzed Acrylic Epoxy, B73-300 Series

C. Steel, Factory-Primed (Sp) Substrates
1. Paint System Sp-L5: Latex, Semigloss Finish:
a. B-M:
1) First Coat: Touch-up primer if compatible or provide barrier coat.
2) Second Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331.
3) Third Coat: Same as second.

b. PPG:
1) First Coat: Touch-up primer if compatible or provide barrier coat.
2) Second Coat: PPG Pitt-Tech Plus EP Semi-Gloss DTM 90-1610
3) Third Coat: Same as second.

c. S-W:
1) First Coat: Touch-up primer if compatible or provide barrier coat.
2) Second Coat: Pro Industrial Acrylic Semi-Gloss, B66-650.
3) Third Coat: Same as second.

2. Paint System Sp-L2: Latex, Eggshell Finish:

a. B-M:
   1) First Coat: Touch-up primer if compatible or provide barrier coat.
   2) Second Coat: Moore Ultra Spec 500 Interior Low Sheen N537.
   3) Third Coat: Same as second.
b. PPG:
   1) First Coat: Touch-up primer if compatible or provide barrier coat.
   2) Second Coat: PPG Pitt-Tech Plus EP Satin DTM 90-1710 Series.
   3) Third Coat: Same as second.
c. S-W:
   1) First Coat: Touch-up primer if compatible or provide barrier coat.
   2) Second Coat: Pro Industrial Acrylic Eg-Shel, B66-660 Series.
   3) Third Coat: Same as second.

3. Paint System Sp-D1: Water-Based Dry-Fall, Flat Finish:
   a. B-M:
      1) First Coat: Touch-up primer if compatible or provide barrier coat.
      2) Second Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110
      3) Same as second.
   b. PPG:
      1) First Coat: Touch-up primer if compatible or provide barrier coat.
      2) Second Coat: Speedhide Super Tech Dry Fall 6-725XI.
      3) Third Coat: Same as second.
   c. S-W:
      1) First Coat: First Coat: Touch-up primer if compatible or provide barrier coat.
      2) Second Coat: Pro Industrial Waterborne Acrylic Dry Fall Flat, B42W1181.
      3) Third Coat: Same as second.
4. Paint System Sp-X5: Waterborne Epoxy, Semigloss Finish:
   a. B-M:
      1) First Coat: Touch-up primer if compatible or provide barrier coat.
      2) Second Coat: Corotech Mastic Coating Semi-Gloss V160.
      3) Third Coat: Same as second.
   b. PPG:
      1) First Coat: Touch-up primer if compatible or provide barrier coat.
      2) Second Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne ZERO VOC Epoxy Semi-Gloss, 16-1510 Series.
      3) Third Coat: Same as second.
   c. S-W:
      1) First Coat: Touch-up primer if compatible or provide barrier coat.
      2) Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-1150 Series.
      3) Third Coat: Same as second.
5. Paint System Co-X6: Waterborn 2-part Epoxy, Semigloss Finish:
   a. S-W:
      1) Prime coat: Touch-up primer if compatible or provide barrier coat
      2) Intermediate Coat: Water-based Epoxy matching topcoat.
      3) Topcoat: Pro Industrial™ Zero VOC Catalyzed Acrylic Epoxy, B73-300 Series

D. Steel, Galvanized (Sg) Substrates
   1. Paint System Sg-L5: Latex, Semigloss Finish:
      a. B-M:
         1) First Coat: Ultra Spec HP Acrylic Metal Primer HP04
         2) Second Coat: Ultra Spec HP DTM Acrylic Semi-Gloss HP29
         3) Third Coat: Same as second
      b. PPG:
         1) First Coat: Pitt Tech Plus Acrylic Primer 90-912
         2) Second Coat: PPG Pitt-Tech Plus EP Semi-Gloss DTM 90-1610
         3) Third Coat: Same as second.
      c. S-W:
         1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
         2) Second Coat: Pro Industrial Acrylic Semi-Gloss, B66-650.
         3) Third Coat: Same as second.
   2. Paint System Sg-L3: Latex, Eggshell Finish:
      a. B-M:
         1) First Coat: Ultra Spec HP Acrylic Metal Primer HP04
         2) Second Coat: Ultra Spec HP DTM Acrylic Low Lustre HP25
         3) Third Coat: Same as second
      b. PPG:
         1) First Coat: Pitt Tech Plus 4020 PF Interior/ Exterior Primer/ Finish, 4020PF Series
         2) Second Coat: PPG Pitt-Tech Plus EP Satin DTM 90-1710 Series.
         3) Third Coat: Same as second.
      c. S-W:
         1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
         2) Second Coat: Pro Industrial Acrylic Eg-Shel, B66-660 Series.
         3) Third Coat: Same as second.
   3. Paint System Sg-D1: Water-Based Dry-Fall, Flat Finish:
      a. B-M:
         1) First Coat: Ultra Spec HP Acrylic Metal Primer HP04
         2) Second Coat: Benjamin Moore Latex Dry Fall Flat 395
         3) Third Coat: Same as second
      b. PPG:
         1) First Coat: Pitt Tech Plus 4020 PF Interior/ Exterior Primer/ Finish, 4020PF Series
         2) Second Coat: Speedhide Super Tech Dry Fall 6-725XI
         3) Third Coat: Same as second.
      c. S-W:
         1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
         2) Second Coat: Waterborne Acrylic Dry Fall, B42W1.
         3) Third Coat: Same as second.
   4. Paint System Sg-X5: Waterborne Epoxy, Semigloss Finish:
      a. PPG:
         1) First Coat: Pitt Tech Plus 4020 PF Interior/ Exterior Primer/ Finish, 4020PF Series
         2) Second Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne ZERO VOC Epoxy Semi-Gloss, 16-1510 Series.

3) Third Coat: Same as second.
b. S-W:
1) First Coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
2) Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-1150 Series.
3) Third Coat: Same as second.

5. Paint System Co-X6: Waterborn 2-part Epoxy, Semigloss Finish:
a. S-W:
1) Prime coat: Pro Industrial Pro-Cryl Universal Primer, B66-1300 Series.
2) Intermediate Coat: Water-based Epoxy matching topcoat.
3) Topcoat: Pro Industrial™ Zero VOC Catalyzed Acrylic Epoxy, B73-300 Series

E. Architectural Woodwork (Ww) Substrates
1. Paint System Ww-L5: Latex, Semigloss Finish:
a. B-M:
1) First Coat: Insl-x Prime Lock Plus Primer PS-8100
2) Second Coat: Ultra Spec 500 Interior Zero VOC Latex Semi-Gloss 546
3) Third Coat: Same as second
b. PPG:
1) First Coat: Seal Grip Latex Primer/Finish 17-951.
2) Second Coat: Speedhide Zero Interior Semi-Gloss, 6-5510 Series.
3) Third Coat: Same as second.
c. S-W:
1) First Coat: Multi-Purpose Acrylic-Alkyd Interior Primer, B79W00450.
2) Second Coat: ProMar 200 Zero VOC Semi-Gloss Acrylic, B31-2600 Series.
3) Third Coat: Same as second.

2. Paint System Ww-L3: Latex, Eggshell Finish:
a. B-M:
1) First Coat: Insl-x Prime Lock Plus Primer PS-8100
2) Second Coat: Ultra Spec 500 Interior Zero Latex Eggshell 538
3) Third Coat: Same as second
b. PPG:
1) First Coat: Seal Grip Latex Primer/Finish 17-951.
2) Second Coat: Speedhide Zero Interior Latex Eggshell 6-5310 Series.
3) Third Coat: Same as second.
c. S-W:
1) First Coat: Multi-Purpose Acrylic-Alkyd Interior Primer, B79W00450.
2) Second Coat: ProMar 200 Zero VOC Eg-Shel B20-2600 Series.
3) Third Coat: Same as second.

3. Paint System Ww-X5: Waterborne Epoxy, Semigloss Finish:
a. B-M:
1) First Coat: Insl-x Prime Lock Plus Primer PS-8100
2) Second Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341
3) Third Coat: Same as second

b. PPG:
1) First Coat: Seal Grip Latex Primer/Finish 17-951.
2) Second Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne ZERO VOC Epoxy Semi-Gloss, 16-1510 Series.
3) Third Coat: Same as second.
c. S-W:
1) First Coat: Multi-Purpose Acrylic-Alkyd Interior Primer, B79W00450.
2) Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-1150 Series.
3) Third Coat: Same as second.

4. Paint System Ww-V4: Stain and Varnish, Satin Finish:
a. PPG:
1) First Coat: Deft Wood Stain Interior – VARATHANE Oil Stain, RUS12780.
2) Second Coat: VARATHANE Interior WaterBorne Satin, FLE20023.
3) Third Coat: Same as second.
b. S-W:
1) First Coat: Minwax Performance Series Tintable Wood Stain
(a) 250 VOC Formula.
2) Second Coat: Minwax Water Based Oil-Modified Polyurethane.
3) Third Coat: Same as second.

F. Structural Wood (Sw) Substrates (Wood Deck)
1. Stain Ssytem Sw-S1: Stain/sealer.
a. B-M:
1) Single coat: Woodluxe,
b. PPG: - Equal product.
c. S-W: - Equal product.

G. Gypsum Board (Gb) Substrates
1. Paint System Gb-L2: Latex, Eggshell Finish:
a. B-M:
1) First Coat: Ultra Spec 500 Zero VOC Interior Zero VOC Latex Primer N534
2) Second Coat: Ultra Spec 500 Zero VOC Latex Eggshell N538
3) Third Coat: Same as second.
b. PPG:
1) First Coat: Speedhide Zero Interior Sealer, 6-4900XI.
2) Second Coat: Speedhide Zero Interior Eggshell, 6-5310 Series.
3) Third Coat: Same as second.
c. S-W:
1) First Coat: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2) Second Coat: ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series.
3) Third Coat: Same as second.
2. Paint System Gb-L1: Latex, Flat Finish:
a. B-M:
1) First Coat: Ultra Spec 500 Zero VOC Interior Zero VOC Latex Primer N534.

2) Second Coat: Ultra Spec 500 Zero VOC Interior Latex Flat N536.
3) Third Coat: Same as second.

b. PPG:
1) First Coat: Speedhide Zero Interior Sealer, 6-4900XI.
2) Second Coat: Speedhide Zero Interior Flat, 6-5110 Series.
3) Third Coat: Same as second.

c. S-W:
1) First Coat: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2) Second Coat: ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series.
3) Third Coat: Same as second.

3. Paint System Gb-X5: Waterborne Epoxy System, Semigloss Finish:

a. B-M:
1) First Coat: Ultra Spec 500 Interior Zero VOC Latex Primer N534
2) Second Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341
3) Third Coat: Same as second.

b. PPG:
1) First Coat: Speedhide Zero Interior Sealer, 6-4900XI.
2) Second Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne ZERO VOC Epoxy Semi-Gloss, 16-1510 Series.
3) Third Coat: Same as second.

c. S-W:
1) First Coat: ProMar 200 Zero VOC Interior Latex Primer,
(a) B28W2600.
2) Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-1150 Series.
3) Third Coat: Same as second.

H. Gypsum Board, Moisture-Resistant (Gm) Substrates:

1. Paint System Gm-X5: Waterborn Epoxy, Semigloss Finish:

a. B-M:
1) First Coat: Insl-x High Build Latex Primer HB-2100
2) Second Coat: Second Coat: Corotech Pre-Catalyzed Waterborne Epoxy (V341)
3) Third Coat: Same as second

b. PPG:
1) First Coat: Speedhide Zero Interior Sealer, 6-4900XI.
2) Second Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne ZERO VOC Epoxy Semi-Gloss, 16-1510 Series.
3) Third Coat: Same as second.

c. S-W:
1) First Coat: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
2) Second Coat: Pro Industrial Pre-Catalyzed Waterbased Epoxy
(a) Semi-Gloss, K46-1150 Series.
3) Third Coat: Same as second.

2. Paint System Gm-L2: Latex, Eggshell Finish:

a. B-M:
   1) First Coat: Ultra Spec 500 Interior Zero VOC Latex Primer N534
   2) Second Coat: Corotech Pre-Catalyzed Waterborne Epoxy V342
   3) Third Coat: Same as second
b. PPG:
   1) First Coat: Speedhide Zero Interior Sealer, 6-4900XI.
   2) Second Coat: Pitt-Glaze WB1 Interior High Performance Pre-Catalyzed Waterborne ZERO VOC Epoxy Eggshell, 16-1310 Series.
   3) Third Coat: Same as second.
c. S-W:
   1) First Coat: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
   2) Second Coat: Pro Industrial Pre-Catalyzed Waterbased Epoxy
      (a) Eg-Shel, K45-1150 Series.
   3) Third Coat: Same as second.

END OF SECTION

SECTION 09 96 00

HIGH-PERFORMANCE COATINGS

(PART OF TRADE-BID SECTION 09 00 00 - PAINTING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and application of high-performance coating systems on the following:

B. Exterior substrates:
   1. Steel.
   2. Galvanized metal.

1.2 DEFINITIONS

A. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

B. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

C. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of Paint System, submit product data cut sheets, including preparation requirements and application instructions.
      a. Formulate product data cut sheets into sets for each Paint System required.
   2. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
      a. Step coats on Samples to show each coat required for system.
      b. Label each Sample with Paint System designation.
      c. Label each Sample for location and application area.
      d. Dry samples a minimum of 7-days before submitting.
      e. Submit Samples on the following substrates for the Architect's review of color and texture only:
         1) Ferrous / Galvanized Metal: Provide two 4-inch-(100-mm-) square samples of flat metal and two 8-inch-(200-mm-) long samples of solid metal for each color and finish.
   3. Product List: For each product indicated, include the following:
      a. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
      b. VOC content.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when relative humidity exceeds 85 percent. The surface should be dry and at least 5 degrees above the dew point and rising.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

B. Manufacturers: The following manufacturers are referred to in the paint schedules by name:
   1. Carboline Company.
   2. PPG Paints
   3. Sherwin Williams
   4. Tnemec Company, Inc.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
1. Nonflat Paints and Coatings: 50 g/L.
2. Primers, Sealers, and Undercoaters: 100 g/L.
3. Rust-Preventive Coatings: 100 g/L.
4. Zinc-Rich Industrial Maintenance Primers: 100 g/L..
5. Pre-Treatment Wash Primers: 420 g/L.

C. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" or more stringent instructions listed below applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
   1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metals, Stainless Steel and Non-Ferrous Metals including Aluminum Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings. Clean using methods recommended in writing by coating manufacturer, but not less than the following:
   1. SSPC-SP 16 "Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals".

3.3 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:
   1. Remove cracked and deteriorated sealants and calking.
   2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
   3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
   4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
   5. Remove mildew as specified above.
   6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, provide test results and recommendations from paint manufacturer to Architect.
   7. Apply specified primer to surfaces scheduled to receive coatings.

B. Metal:
   1. Remove rust from surfaces to bare metal in accordance with SP3 "Power Tool Cleaning."
   2. Exercise care not to remove galvanizing.
   3. Complete preparation as specified for new work.

3.4 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for coating and substrate indicated.
   2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Exterior metal items to be coated include, but are not limited to,
1. Lintels.
2. Pipe bollards.
3. Architectural steel.
4. Mechanical Piping.
5. Miscellaneous exposed steel.
6. Steel doors and frames.

C. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

D. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

E. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.5 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.7 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel, Zinc-Coated (Galvanized and Galvannealed) (Sg) Moderate Environment:
   1. Paint System Sg-P5: Aliphatic Polyurethane Enamel over Epoxy primer, Semi-gloss Finish:
      a. Carboline:
         1) First Coat: Carboguard 60 4.0 to 6.0 mils DFT.
         2) Second Coat: Carbothane 134HG 2.0 to 5.0 DFT.
      b. PPG:
         1) First Coat: Amercoat 385 2-Component Polyamide Epoxy 3.0 to 8.0 mils DFT.
         2) Second Coat: Pitthane 95-8800 Acrylic Aliphatic Urethane 2.0 to 5.0 DFT.
      c. Sherwin Williams:
         1) First Coat: MacroPoxy 646-100 Fast Cure Epoxy, B58-600 Series. 5.0 to 10.0 mils DFT.
         2) Second Coat: Hi-Solids Polyurethane 250, B65 Series Semi-Gloss, 2.0-3.0 DFT.
      d. Tnemec:
         1) First Coat: Series N69 Hi-Build Epoxoline II Polyamidoamine Epoxy. 4.0 to 6.0 mils DFT.
         2) Second Coat: Series 1075 Endura-Shield II 2.0 to 5.0 DFT.

B. Steel, Unprimed (Su) Substrates Moderate Environment:
   1. Paint System Su-P7: Acrylic Aliphatic Polyurethane Enamel over Zinc-Rich or Manufacturer's Recommend Epoxy Primer, High-Gloss Finish:
      a. Carboline:
         1) First Coat: Carbo Zinc 11 HS - 3.0 DFT.
         2) Second Coat: Carboline 893 - 3.0 DFT.
         3) Third Coat: Carbothane 134 HS - 2.0 DFT.
      b. Sherwin Williams:
         1) First Coat: Corothane I Galvapac 2K Zinc Primer -3.0 DFT.
         2) Second Coat: MacroPoxy 646-100 Fast Cure Epoxy, B58-600 Series. 5.0 to 10.0 mils DFT.
         3) Third Coat: Hi-Solids Polyurethane 250, B65 Series Gloss, 2.0-3.0 DFT.
      c. Tnemec:
         1) First Coat: Tneme-Zinc 90-97 - 3.0 DFT
         2) Second Coat: Series N69 Hi-Build Epoxoline II Polyamidoamine Epoxy - 3.0 DFT.
         3) Third Coat: Series 1074 Endura-Shield II. - 2.0 to 3.0 DFT.

3.8 INTERIOR HIGH-PERFORMANCE COATING SYSTEMS

A. Steel: Unprimed Substrates and Factory-Primed Substrates:
   1. Paint System: WB Alkyd Urethane Enamel over primer, Semi-gloss Finish:
      a. Sherwin Williams:
         1) First Coat: PrepRite® ProBlock® Interior-Exterior Latex Primer-Sealer B51-600 Series.

2) Second Coat: Pro Industrial™ Acrolon™ 100 Waterbased Urethane Eg-Shel B65–420 Series (Part A), B65V00620 (Part B).
3) Third Coat: Same as second.

b. Tnemec:
1) Series V69 Hi-Build Epoxoline II Polyamidoamine Epoxy – 4.0 to 6.0 DFT.
2) Series 1081 Endura-Shield II. - 2.0 to 3.0 DFT.

END OF SECTION

SECTION 09 96 13.13

DECORATIVE HIGH-PERFORMANCE COATINGS

(PART OF TRADE-BID SECTION 09 00 00 - PAINTING)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and application of decorative coating systems:
   1. Water-based polyurethane/acrylic paint finish system.

1.2 DEFINITIONS

A. Gloss Level 2: 5 to 10 units at 60 degrees and 10 to 25 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of Paint System, submit product data cut sheets, including preparation requirements and application instructions.
      a. Formulate product data cut sheets into sets for each Paint System required.
   2. Samples: For each type of paint system and in each color and gloss of topcoat.
      a. Step coats on Samples to show each coat required for system.
      b. Label each Sample with Paint System designation.
      c. Label each Sample for location and application area.
      d. Dry samples a minimum of 7-days before submitting.
      e. Submit Samples on the following substrates for the Architect's review of color and texture only:
         1) Gypsum board: Provide two 8 inches (200 mm) square samples on rigid backing.
   3. Product List: For each product indicated, include the following:
      a. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
      b. VOC content.

B. Maintenance Material Submittals:
   1. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      a. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
      a. Wall Surfaces: Provide samples of at least 10-feet by 10 feet, 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when relative humidity exceeds 85 percent. The surface should be dry and at least 5 degrees above the dew point and rising.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Master Coating Technologies (Scuffmaster)

B. PPG Paints

C. Sherwin Williams

D. Tnemec Company, Inc.

2.2 DECORATIVE FINISHES, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 100 g/L.

C. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
a. Gypsum Board: 12 percent.

B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" [or “MPI Maintenance Repainting Manual”] or more stringent instructions listed below applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

3.3 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:
   1. Remove cracked and deteriorated sealants and calking.
   2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
   3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
   4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
   5. Remove mildew as specified above.
   6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, provide test results and recommendations from paint manufacturer to Architect.
   7. Apply specified primer to surfaces scheduled to receive coatings.

B. Gypsum Board:
   1. Fill cracks and voids with spackling compound.
   2. Apply primer over bare surfaces and newly applied texture coatings.

3.4 APPLICATION

A. Apply Decorative Coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for coating and substrate indicated.
   2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.5 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. Contractor shall touch up and restore coated surfaces damaged by testing.
   2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.7 DECORATIVE COATING SYSTEMS

A. Gypsum Board (Gb) Substrates, Special Coating:
   1. Metallic Finish System: Waterbased two-component polyurethane fortified coating, Metallic Finish:
      a. MCT Scuffmaster:
         1) First Coat: MCT Scuffmaster Primemaster Primer/Sealer - 2.0 DFT.
         2) Second Coat: MCT Scuffmaster MC2000 - 2.0 to 3.0 DFT.
         3) Third Coat: MCT Scuffmaster Ultra-Clear Flat", Scuffmaster Ultra-Clear Satin, or Scuffmaster Ultra-Clear Gloss - 2.0 to 3.0 DFT.
   2. Finish System: Waterbased two-component polyurethane fortified coating, Eggshell Finish:
      a. MCT Scuffmaster:
         1) First Coat: MCT Scuffmaster Primemaster Primer/Sealer - 2.0 DFT.
         2) Second Coat: MCT Scuffmaster ScrubTough - 2.0 to 3.0 DFT.
   3. Finish System: Waterbased two-component polyurethane fortified coating, Textured Finish:
      a. MCT Scuffmaster:

1) First Coat: MCT Scuffmaster Primemaster Primer/Sealer - 2.0 DFT.
2) Second Coat: MCT Scuffmaster Burnished metallic Basecoat - 2.0 to 3.0 DFT.
3) Third Coat: MCT Scuffmaster Burnished metallic Topcoat - 2.0 to 3.0 DFT.

END OF SECTION

SECTION 09 96 40

FIRE-RETARDANT COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water-based, thin film, one-component latex fire barrier coating for interior wood and other surfaces.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Indicate VOC content.
   2. Samples for Verification: For each type of coating system and each color and gloss of coating finish indicated.
      a. Submit Samples on actual substrate, not less than 8 inches (200 mm) square.
      b. Apply coats on Samples in steps to show each coat required for system.
      c. Label each coat of each Sample.
      d. Label each Sample for location and application area.

B. Informational Submittals:
   1. Material Test Reports: For each coating.

1.3 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
      a. Wood Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply waterborne fire-retardant (intumescent) coating only when temperatures of surfaces to be painted and ambient air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Allow wet surfaces to dry thoroughly and to attain temperature and conditions specified before starting or continuing coating operation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics of Fire-Retardant Systems: As tested according to ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Coating shall provide the equivalent rating of 1-hour.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Contego International Inc.
2. FireFree Coatings, Inc.
3. Insl-X Products; Benjamin Moore & Co.
4. Quantum Chemical.

2.3 FIRE-RETARDANT COATING

A. Prime Coat: As recommend by manufacturer.

B. Intermediate Coat: Fire-retardant coating applied at spreading rate as indicated in the various tests provided. Two coats, each coat at 20 mils wet.

C. Material Compatibility:
1. Materials for use within each coating system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each material or coat, products and spreading rates shall be as recommended in writing by fire-retardant coating (intumescent) manufacturer for use on substrate indicated. Comply with requirements for fire-retardant coating classification and surface-burning characteristics indicated.

D. Colors and Gloss: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with manufacturer's requirements for surface treatments, shop-primed surfaces, maximum moisture content, and other conditions affecting performance of the Work.

B. Begin coating only when moisture content of wood substrate is 15 percent or less when measured with an electronic moisture meter.

C. Begin coating no sooner than 28 days after substrate is constructed and is visually dry on both sides.

D. Verify suitability of substrates, including surface conditions, and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.
   1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants. Do not coat surfaces if surface moisture content or alkalinity exceeds that permitted in manufacturer's written instructions.
   1. Remove incompatible primers, and reprime substrate with compatible primers as required to produce coating systems indicated.
   2. Perform cleaning and coating application so dust and other contaminants from cleaning process do not fall on wet, newly coated surfaces.

3.3 INSTALLATION

A. Apply fire-retardant (intumescent) coating according to manufacturer's written instructions and to comply with requirements for listing and labeling for surface-burning characteristics specified.
   1. Use equipment and techniques best suited for substrate and type of material being applied.
   2. Coat surfaces behind movable items the same as similar exposed surfaces.
   3. Apply each coat separately according to manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION

SECTION 09 96 56

EPOXY WALL COATING

PART 1 GENERAL

1.1 SUMMARY

A. Epoxy wall coating system as shown on the drawings.

1.2 SYSTEM DESCRIPTION

A. The work shall consist of preparation of the substrate, the furnishing and application of an epoxy-based wall coating system, with decorative colored chips and urethane topcoats. The system shall have the color and texture as specified by the Owner with a nominal thickness of 55 - 60 mils (1.524 mm). It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

1.3 SUBMITTALS

A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Step coats on Samples to show each coat required for system.
   2. Label each Sample with Paint System designation.
   3. Label each Sample for location and application area.
   4. Dry samples a minimum of 7-days before submitting.
   5. Submit Samples on the following substrates for the Architect's review of color and texture only:
      a. Concrete: Provide two 4-inch- (100-mm-) square samples for each color and finish.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.

B. The Applicator shall have experience in installation of the wall coating system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.

C. Installation Responsibility: Assign installation of resinous flooring systems and epoxy wall coating systems in Project to a single qualified installer.

D. A pre-installation conference shall be held between Applicator and General Contractor to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping
   1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. Storage and Protection
   1. The Applicator shall be provided with a storage area for all
      a. components. The area shall be between 60 degrees Fahrenheit (15.56 degrees Celsius) and 90 degrees Fahrenheit (32.22 degrees Celsius), dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
   2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Architect or other personnel.

1.6 WASTE DISPOSAL

A. The Applicator shall comply with Section 01 74 19 Construction Waste Management and Disposal for non- hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS

A. Site Requirements
   1. Application may proceed while air, material and substrate temperatures are between 60 degrees Fahrenheit (15.56 degrees Celsius) and 90 degrees Fahrenheit (32.22 degrees Celsius) providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
   2. The relative humidity in the specific location of the application shall be less than 80 % and the surface temperature shall be at least 5 F above the dew point.
   3. The Applicator shall ensure that adequate ventilation is available for the work area.
   4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of substrate to be coated with epoxy material.
   1. Block wall mortar joints have cured no less than 7 days under good conditions.
   2. Sealers and curing agents should not to be used.

C. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
2. "No Smoking" signs shall be posted at the entrances to the work area.
3. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

A. Manufacturer warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to manufacturer's published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.

B. Manufacturer liability with respect to this warranty is strictly limited to the value of the material purchase.

PART 2 PRODUCTS

2.1 COATING

A. LOW-EMITTING MATERIALS
1. Paints and Coatings: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   a. Flat Paints and Coatings: 50 g/L.
   b. Nonflat Paints and Coatings: 50 g/L.
   c. Primers, Sealers, and Undercoaters: 100 g/L.

B. MANUFACTURERS
1. Basis of Design: Subject to compliance with the requirements, provied products by Sherwin W or comparable products by one of the following:
   a. Tnemec Company, Inc.,
   b. Sherwin Williams (General Polymers).
   c. Dudick.

C. Sherwin Williams Resuwall™ VC, (Dur-A-Wall VC), epoxy-based, urethane topcoat, chip seamless wall system.
1. System Materials:
   a. 1st Broadcast Coat: Dur-A-Flex, Inc, Dur-A-Gard No Sag resin and hardener.
   b. 2nd Broadcast Coat: Dur-A-Flex, Inc, Dur-A-Glaze # 4 Water Clear resin and hardener.
   c. Chips: Dur-A-Flex, Inc, decorative chips (Micro or Macro)
   d. Grout Coat: Dur-A-Flex, Inc, Dur-A-Glaze #4 Water Clear resin and hardener.
   e. Topcoats: Dur-A-Flex, Inc. Armor Top resin and hardener
2. Patch Materials
   a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze #4 Cove Rez.

2.2 PRODUCTS

A. First Broadcast Coat: Dur-A-Gard No Sag
1. Percent Solids: 100 % 2.
2. VOC: 3.45 g/L
3. Compressive Strength, ASTM D 695: 16,000 psi (110316.16 kPa)
4. Tensile Strength, ASTM D 638: 3,800 psi (26200.09 kPa)
5. Flexural Strength, ASTM D 790: 4,000 psi (27579.04 kPa)
6. Abrasion Resistance, ASTM D 4060
   a. C-10 Wheel, 1,000 gm load, 1,000 cycles: 35 mg loss
7. Flame Spread/NFPA-101, ASTM E 84: Class A
8. Flammability, ASTM D 635: Self Extinguishing
9. Impact Resistance MIL D-3134: 0.025 inch (0.64 mm) Max
10. Water Absorption. MIL D-3134: 0.04 %
11. Potlife @ 70 deg. F: 20-25 minutes
12. Percent Solids: 100 %
13. VOC: 3.8 g/L
14. Compressive Strength, ASTM D 695: 11,200 psi (77221.31 kPa)
15. Tensile Strength, ASTM D 638: 2,100 psi (14479.00 kPa)
16. Flexural Strength, ASTM D 790: 5,100 psi (35163.28 kPa)
17. Abrasion Resistance, ASTM D 4060
   a. C-10 Wheel, 1,000 gm load, 1,000 cycles: 29 mg loss
18. Flame Spread/NFPA-101, ASTM E 84: Class A
19. Impact Resistance MIL D-24613: 0.0007 inches (0.02 mm), no cracking or delamination
20. Water Absorption. MIL D-24613: Nil
21. Potlife @ 70 deg. F: 20 minutes

B. Topcoats: Armor Top
1. VOC: 0 g/L
2. 60 Degree Gloss ASTM D523: 75+/-5
3. Mixed Viscosity, (Brookfield 25 deg. C): 500 cps
4. Tensile strength, ASTM D 638: 7,000 psi (48263.32 kPa)
5. Abrasion Resistance, ASTM D4060
   a. CS 17 wheel (1,000 g load) 1,000 cycles
      1) Gloss, loss with grit: 4 mg
      2) Gloss, loss without grit: 10 mg
      3) Satin, loss with grit: 8 mg
      4) Satin, loss without grit: 12 mg
6. Pot life @ 70 deg. F 50% RH: 2 hours
7. Dry properties
   a. 70 deg. F, 50% R.H: 8 hours tack free, 12 hours Dry
   b. 60 deg. F, 30% RH: 12 hours tack free, 18 hours Dry
   c. 80 deg. F, 70% RH: 4 hours tack free, 6 hours Dry
8. Flash Point PMCC: 186 deg. F
9. Full Chemical resistance: 7 days

2.3 ACCESSORIES

A. Primers
1. Concrete block primer: DUR-A-FLEX, DUR-A-WALL HP Block Filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting coating performance.

B. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.2 PREPARATION

A. General
1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, and dirt.
2. There shall be no visible moisture present on the surface at the time of application of the system.
3. Remove loose mortar spatter, joint compounds etc.
4. Masonry block shall be clean, dry and coated with a high solids block filler.

3.3 APPLICATION

A. General

B. The system shall be applied in six distinct steps as listed below:
1. Substrate preparation
2. Priming
3. Broadcast coats application with chip broadcast
4. Second broadcast coat application with chip broadcast
5. Grout coat application
6. Topcoat applications

C. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.

D. The system shall follow the contour of the substrate.

E. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

F. Priming
1. DUR-A-FLEX DUR-A-WALL HP BLOCK FILLER is recommended to fill any pores in the substrate when applying over concrete or concrete block walls.

G. 1st Broadcast Coat
   1. The broadcast coat shall be comprised of the specified two components, a resin, and hardener.
   2. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
   3. The base coat shall be applied by a roller at the rate of 200 sf/gal to yield a dry film thickness of 8 mils (0.2032 mm).
   4. The chip will be broadcast into the wet resin at the rate of 0.1-0.12 lb/SF.

H. 2nd Broadcast Coat
   1. A second broadcast coat will be applied as the first.

I. Grout Coat
   1. The grout coat shall be comprised of the specified two components, a resin, and hardener.
   2. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
   3. The grout coat shall be applied using a roller at the rate of 200 sf/gal to yield a dry film thickness of 8 mils (0.2032 mm).

J. Topcoats
   1. The topcoat of Armor Top is typically applied using the dip and roll method at the rate of 500 sf/gal. Armor Top should not be applied more than 3 mils (0.0762 mm) wet.
   2. The topcoat shall be comprised of a liquid resin and hardener that is mixed at the ratio per the manufacturer's instructions.
   3. Repeat steps 1 and 2.
   4. The finish coating will have a nominal thickness of 55- 60 mils (1.524 mm).

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection
   1. The following tests shall be conducted by the Applicator:
      a. Temperature
         1) Air, substrate temperatures and, if applicable, dew point.
      b. Coverage Rates
         1) Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

A. Cure material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning to leave cleanable surface for subsequent work of other sections.

END OF SECTION

SECTION 09 97 13

INSULATING STEEL COATINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and application of insulating steel coating systems on the following substrates:
   1. Exterior/interior Steel Substrates.

1.2 RELATED REQUIREMENTS

A. Related Section Requirements:
   1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
   2. Division 09 painting Sections for general field painting.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product indicated.
   2. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
      a. Submit Samples on rigid backing, 8 inches square.
      b. Step coats on Samples to show each coat required for system.
      c. Label each coat of each Sample.
      d. Label each Sample for location and application area.
   3. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

A. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

B. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each type of coating and substrate.
      a. Beam at exterior/interior interface: Provide samples of at least one beam.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 INSULATING STEEL COATINGS

A. Laboratory Test Reports: For paints, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Material Compatibility:
   1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. Provide products of same manufacturer for each coat in a coating system.

2.2 METAL PRIMERS

A. Primer for shop application: Zink-Rich Aromatic Urethane primer applied at spreading rate recommended by manufacturer.
   1. Tnemec: Series 94-H2O Hydro-Zinc applied at 2.5-3.5 mils DFT.

2.3 FLUID-APPLIED ACRYLIC INSULATION COATING

A. Acrylic insulation coating: Fluid-applied, thermal insulating coating utilizing aerogel particles that imparts exceptional insulative properties to a variety of substrates. Ideal for insulating pipes, valves, tanks, structural steel, or other substrates where thermal improvement or personnel protection is desired. Part of a durable, corrosion-resistant coating system that bonds to the substrate, greatly reducing the issues associated with corrosion under insulation (CUI) applied at spreading rate recommended by manufacturer.
   1. Tnemec: Aerolon Acrylic; Series 971.
   2. Color: As selected by the Architect.

3. Finish: Matte.
4. Special Qualifications: Thermal Conductivity (ASTM C518 at 77°F): 0.0356 W/m-°K or 0.2468 BTU-in/ft²-hr-°F (R value at one inch equals 4.1)
5. Flame Spread: (ASTM E84): Class A.
6. Smoke Developed: (ASTM E84): Class A.
7. Tested in accordance with NORSOK M-501/ISO 20340.
8. DFT: 50 Microns per coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
   1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   3. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
   1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.

D. Steel Substrates: Remove rust and loose mill scale.
   1. Clean using methods recommended in writing by coating manufacturer.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions.
   1. Use applicators and techniques suited for coating and substrate indicated.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:
   1. Owner will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will perform tests for compliance with specified requirements.
   3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 INSULATING STEEL COATING SCHEDULE

A. Exterior/interior Steel Substrates:
   1. Insulation coating System:
      a. Prime Coat: Zink rich primer.
      b. Insulation coating: Two coats totaling 120 mils DFT.
      c. Applications: Steel beams exposed to exterior temperature conditions.

1) Application area: Each beam that penetrates the thermal envelope, coat from interior wall sheathing, extending into the exterior for a distance of 36 inches from the interior sheathing, unless otherwise indicated on the Drawings.

END OF SECTION

SECTION 10 11 00

VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Porcelain-enamel markerboard panels.

B. Tackboard panels.

1.2 SUBMITTALS

A. Action Submittals:
1. Product Data: For each type of product.
   a. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
2. Shop Drawings: For visual display units.
   a. Include plans, elevations, sections, details, and attachment to other work.
   b. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.]
   c. Show locations and layout of special-purpose graphics.
   d. Include sections of typical trim members.
3. Samples: For each type of visual display unit indicated.
   a. Visual Display Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.

B. Informational Submittals:
1. Qualification Data: For Installer.
2. Product Test Reports: For each visual display unit, for tests performed by manufacturer and witnessed by a qualified testing agency.
3. Sample Warranties: For manufacturer's special warranties.

C. Closeout Submittals:
1. Maintenance Data: For visual display units to include in maintenance manuals.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.5 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces exhibit crazing, cracking, or flaking.
   2. Warranty Period: 25 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

2.2 PORCELAIN-ENAMEL MARKERBOARD PANELS

A. Manufacturers:
   1. A-1 Visual Systems.
   2. AJW Architectural Products.
   3. Claridge Products and Equipment, Inc.
   4. Ghent Manufacturing, Inc.
   5. Marsh Industries, Inc.
   6. Peter Pepper Products, Inc.
   7. PolyVision Corporation.

B. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
   1. Face Sheet Thickness: 0.013 inch (0.33 mm) minimum uncoated base metal thickness.
   2. Manufacturer's Standard Core: Minimum 1/4 inch (6 mm) thick, with manufacturer's standard moisture-barrier backing.
   3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

4. Color: White.
5. Field or factory fabricated.
6. Corners: Square.
7. Width: As indicated on Drawings.
8. Height: As indicated on Drawings.
9. Mounting Method: Direct to wall.

C. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.
1. Aluminum Finish: Clear anodic finish.
a. Color: Light bronze.

D. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

E. Marker Tray: Manufacturer's standard; continuous.
1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
2. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

F. Display Rail: Manufacturer's standard, extruded-aluminum display rail with insert, end stops, and continuous paper holder, designed to hold accessories.
1. Size: 1 inch (25 mm) high by full length of visual display unit.
2. Aluminum Color: Match finish of visual display assembly trim.

G. Special-Purpose Graphics: Fuse or paint semivisible writing guidelines graphic onto surface of visual display unit, in locations indicated.

2.3 TACKBOARD PANELS

A. Manufacturers:
1. A-1 Visual Systems.
2. AJW Architectural Products.
3. Claridge Products and Equipment, Inc.
4. Ghent Manufacturing, Inc.
5. Marsh Industries, Inc.
6. Peter Pepper Products, Inc.
7. PolyVision Corporation.

B. Tackboard Panel: Linoleum tackboard panel on manufacturer’s standard core.
1. Color and Pattern: As indicated by manufacturer's designations.
2. Facing: 1/4-inch- (6-mm-) thick, linoleum tack surface.
3. Field or factory fabricated.
4. Corners: Square.
5. Width: As indicated on Drawings.
6. Height: As indicated on Drawings.
7. Mounting Method: Direct to wall.

C. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.
1. Aluminum Finish: Clear anodic finish.

D. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

2.4 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish; with surface-burning characteristics indicated.

C. Linoleum Tack Board: Seamless sheet, Linoleum intended for use as a tack surface, ¼ inch total thickness, laminated to burlap backing. Laminated to manufacturer's standard fiber core material.
1. Forbo; Marmoleum Bulletin Board

D. Extruded Aluminum: ASTM B221 (ASTM B221M), Alloy 6063.

E. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
1. Adhesives shall have a VOC content of 50 g/L or less.

F. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 09 91 23 - Interior Painting and recommended in writing by visual display unit manufacturer for intended substrate.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM AMP 500-06 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

A. General: Install visual display units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Visual Display Board Units: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls.
   1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
   2. Where size of visual display board units or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

C. Visual Display Board Unit Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION

SECTION 10 12 00

DISPLAY CASES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Recessed display cases.

1.2 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.

C. Shop Drawings: Submit complete installation details. Include dimensioned elevations.

D. Samples: Submit samples of material and trim to illustrate finish, color, and texture.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver display cases and materials to the Project site with manufacturer’s protective crate covering and do not open until ready for use.

B. Protect display cases before, during, and after installation. In case of damage, immediately provide necessary repairs and replacements.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify field measurements for recessed application for display cases before preparation of shop drawings and before fabrication to ensure proper installation.

1.7 WARRANTY

A. Provide five year manufacturer warranty against defects and in materials, finish product and workmanship.

PART 2 PRODUCTS

2.1 DISPLAY CASES

A. Manufacturers:
   1. Claridge Products and Equipment, Inc; _____.
   2. MooreCo, Inc; _____.
   3. Nelson Adams NACO; _____.

B. Recessed Display Case: Factory-fabricated wood-framed display case with adjustable glass shelves, finished interior, and aluminum trim on face to cover edge of recessed opening.
   1. Width: As indicated on the Drawings.
   2. Height: As indicated on the Drawings
   3. Depth: As indicated on the Drawings
   4. Components:
      a. Glazed Doors: Sliding.
      b. Side Panels: Stained veneer plywood.
      c. Back Panel: Tackable.
      d. Top Panel: Stained veneer plywood.
      e. Bottom Panel: Laminate-faced substrate.
      f. Lighting: LED.

2.2 COMPONENTS

A. Wood Case Construction: 3/4 inch (19 mm) 7-ply maple veneer plywood with manufacturer's standard stain.

B. Glazed Sliding Doors:
   1. 1/4 inch (6 mm) clear tempered glass with aluminum top and bottom rail.
   2. Door track: Extruded aluminum glass shoe with bottom rollers and top plastic guide.
   3. Lock: Track plunger lock.

C. Glass Shelves:
   1. 1/4 inch (6 mm) clear tempered glass with flat-polished edges.
   2. Shelf Depth: As indicated on drawings.
   3. Shelves per Unit: As indicated on drawings.

D. Cable Display Systems: Sizes and configurations indicated on drawings.
   1. Description:
      a. Tensioned cable display system used to support shelving, panels, artwork, and _____ from walls, ceilings, and _____ with the following components:
         1) Wire Cable: 7x7 construction.

E. Tackable Back Panel: Linoleum-modified cork _____.
   1. Cork Thickness: 1/4 inch (6 mm).
   2. Color, Texture, Weave, and Pattern: As selected from manufacturer's full range.

F. Lighting: Manufacturer's standard LED light fixture housed at top of case with louvered aluminum access door with keyed lock.
   1. Surface Mounted: Under cabinet type fixture.

2.3 MATERIALS

A. Aluminum Extrusions for Framing and Trim: Alloy as recommended by manufacturer for construction and specified finish; nominal 1/8 inch (3.2 mm) wall thickness.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.
   1. Finish: Factory finished; AAMA 2603: Powder coat; _____ color.

C. Plywood: Softwood plywood with veneer core, waterproof glue, 3/4 inch (19 mm) thick.

D. Heat-Strengthened and Fully Tempered Glass: ASTM C1048, Kind FT.

PART 3 EXECUTION

3.1 PREPARATION

A. Finished openings, electrical pre-wiring, and final finishing are by other trades.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide factory trained installers.

C. Locate fastening devices to secure cases securely to back and sides of rough opening.

D. Install recessed display cases plumb and level in wall openings, _____ inches (_____ mm) from finished floor to inside bottom of display case.

E. Refer to Drawings for display case mounting heights.

F. Clean case and glass using manufacturers recommended procedures.

G. Provide mitered and wrapped hairline joints for all trims.

3.3 ADJUSTING AND CLEANING

A. Verify that all accessories are installed as detailed for each unit.

B. At completion of work, clean glass surfaces, back panels and trim in accordance with manufacturer's recommendations leaving units ready for use.

END OF SECTION

SECTION 10 14 19

DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Providing metal letters as shown on the Drawings.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Indicate construction materials, finishes, sizes, quantities, and related hardware requirements.

B. Template: Submit full size template for installation of building letters.

1.3 INFORMATIONAL SUBMITTALS

A. Instructions: Submit manufacturer's latest installation instructions for information only.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in factory packages with factory labels attached.

B. Cover and protect material in transit and at job site. Damaged or defaced material will be rejected and replaced at no cost to the Owner.

1.5 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with requirements, provide products by one of the following:
1. A.R.K. Ramos.
2. ASI Sign Systems, Inc.
3. Gemini Incorporated.

4. Metal Arts; Div. of L&H Mfg.
5. Mills Manufacturing, Inc.
6. Mohawk Sign Systems.

B. Substitutions: Under provisions of Section 01 25 00.

2.2 PRODUCTS

A. Exterior Fabricated Channel Characters with closed back, as indicated, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners; and as follows.
1. Material: Aluminum plate.
2. Material Thickness: Manufacturer's standard for size and design of character.
3. Character Height: As indicated on Drawings.
4. Character Depth: As indicated on Drawings.
5. Aluminum finish: Dull, clear anodized.
6. Mounting: Concealed, black aluminum or stainless-steel back bar or bracket assembly.
7. Typeface: As indicated.
8. Text: As indicated in the Schedule and on the Drawings.

B. Anchors and Inserts: Provide nonferrous metal or hot dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

3.2 INSTALLATION

A. Install sign in accordance with manufacturer's drawings, shop drawings, and specifications.

B. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
   1. Install letters level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

C. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
   1. Projected Mounting: Mount characters at projection distance from wall surface indicated, or, if not indicated, ½-inch maximum.

3.3 FIELD QUALITY CONTROL

A. Verify that sign is installed in accordance with manufacturer's instructions.

B. Tolerances:
   1. Out of level: ± 1/8" for length of text.
   2. Out of plumb: ± 1/16" per letter maximum.
   3. Alignment of adjacent member: None.

3.4 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

SECTION 10 14 24

PANEL SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Panel signs.

1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Panel Signs: Not less than 12 inches (305 mm) square including border.

D. Sign Schedule: Use same designations indicated on Drawings.

E. Qualification Data: For Installer and fabricator.

F. Maintenance Data: For signs to include in maintenance manuals.

G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of metal and polymer finishes beyond normal weathering.
      b. Deterioration of embedded graphic image colors and sign lamination.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. APCO Graphics, Inc.
   2. ASI-Modulex, Inc.
   3. Bunting Graphics, Inc.
   4. Innerface Sign Systems, Inc.
   5. InPro Corporation.
   6. Takeform Architectural Graphics.

2.2 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
   1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.
   2. Material: Acrylic sheet.

B. Code Required Signs: Provide signs as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:

1. Fire Doors
2. Elevator floor identification signs and signs for stair locations and evacuation
3. Stairway floor numbers and identification
4. Signs for area of rescue assistance

C. Graphic Content and Style: Provide sign copy that complies with requirements indicated for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
1. Signs that designate permanent rooms and spaces and signs that provide direction to or information about functional spaces (and other signs required to comply) shall comply with the ADA.

D. Frameless Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
1. Edge Condition: Square edge.
2. Corner Condition: Square.
3. Panel thickness: 1/8 inch.
4. Panel finish: Matte.
5. Letter Style: As selected by Architect.

2.3 MATERIALS

A. Cast-Acrylic Sheet: Cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet; sizes and thicknesses indicated; minimum flexural strength of 16,000 psi when tested according to ASTM D790; minimum allowable continuous service temperature of 176 degrees F.
1. Clear sheet: Colorless transparent sheet, matte finish, with light transmittance of 92 percent when tested per ASTM D1003.
2. Colored opaque acrylic sheet.

B. Colored Coatings for Acrylic Sheet: Use coatings, inks and paints for copy and background colors that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.
1. Custom match background colors indicated on finish legend, or if not indicated, match Architect's samples.
2. For reverse engraved text color, match embedded text color.

C. All interior signs, which require tactile copy and Grade II Braille shall be manufactured utilizing a 1/32-inch, raised engraved lettering.

D. The sign core shall be thermo-set composite polyester based resin, color impregnated of 1/4-inch thickness. The expansion co-efficient of the core and laminate shall be matched to prevent warping and delamination. An acrylic core shall not be acceptable.

E. Tactile lettering shall be precision machined, raised 1/32-inch, matte polycarbonate and (select subsurface colored for scratch resistance or foil stamped for a brushed metal appearance).

F. Signs shall incorporate a metal accent bar. Bars shall be dyed, brushed anodized (select aluminum, brass, bronze or black) .125-inch thick.

2.4 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

B. Adhesive: As recommended by sign manufacturer.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.5 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.
   1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
   2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
   3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

B. Fabrication of signage assemblies shall be in accordance with approved shop drawings and manufacturers' recommendations.

C. All copies must be reproduced accurately and free from distortion. Round positive or negative corners, nicked or ragged edges are not acceptable. Arrows and symbols shall be reproduced exactly by photographic process and be submitted for approval prior to fabrication. The Sign Contractor is responsible for submitting and receiving approvals for any message layouts, which must be altered from specifications because of size constraints.

D. The signage system shall utilize standard, interchangeable components that can be used singly or in combination.

E. Manufacturer shall provide a Word template containing layout, font, color, artwork and trim lines to allow owner to produce inserts on a laser or ink jet printer.

F. The signage system shall incorporate a shim plate. The shim shall raise the sign off the wall allowing for cleaning and/or painting without removal.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Finishes are to meet current Federal ADA and any State requirements.

E. Copy shall be a true, clean, accurate reproduction of typeface(s) specified. Upper and lower case or all caps as indicated in Sign Type drawings and Signage Schedule. Letter spacing to be normal and interline spacing shall be set by manufacturer.

F. Arrows, symbols and logo art: To be provided in style, sizes, colors and spacing as shown in drawings.

G. Grade II Braille utilizing perfectly round, clear raster beads.

H. Primer coats or other surface pre-treatment where recommended shall be included.

I. Sign colors shall match approved samples and shall be exactly as specified in unit descriptions. Sign colors shall be consistent in chroma and value, and shall maintain proper opacity or translucency and shall be free of all imperfections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
   2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
   1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.

2. Shim Plate Mounting: Provide 1/8-inch- (3-mm-) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
3. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

C. Bracket-Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

SECTION 10 22 13

WIRE MESH PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wire mesh systems for walls.

1.2 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Cylinders for locksets.

B. Section 09 91 23 - Interior Painting.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

C. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.

1.4 SUBMITTALS

A. Product Data: Provide data for mesh materials, finishes.

B. Shop Drawings: Indicate plan and vertical dimensions, elevations, component details; head, jamb, and sill details; location of hardware. Provide component details, anchorage, and type and location of fasteners.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
   1. Member firm of the Woven Wire Products Association (WWPA).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wire Mesh Partitions:
   1. Acorn Wire and Iron Works, Inc; _____: www.acornwire.com/#sle.
   2. The G-S Company; Sure Guard Standard Duty: www.g-sco.com/#sle.

3. Miller Wire Works, Inc; _____: www.millerwireworks.com/#sle.
4. SpaceGuard Products: www.spaceguardproducts.com/#sle.

2.2 WIRE MESH PARTITIONS

A. Wire Mesh Partitions: Factory-fabricated modular assemblies of panels, doors, anchors, hardware, and accessories as required to provide a complete system.
   1. Design Criteria:
      a. Design partition system to provide for movement of components without damage, undue stress on fasteners or other detrimental effects, when subject to design loads.
      b. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.3 COMPONENTS

A. Woven Wire Mesh: Standard duty.
   1. Material: ASTM A510/A510M uncoated crimped steel wire.
   2. Wire Size: 10 gauge, 0.135 inch (3.5 mm).

B. Framing and Support Members:
   1. Material: ASTM A36/A36M steel shapes and ASTM A500/A500M cold-formed steel tubing.
   2. Framing, Corner Posts, and Intermediate Support Members: Manufacturer's standard sizes for system specified and as indicated on drawings.
   3. Vertical Stiffeners: As required for partitions greater than 144 inches (3658 mm) in height.

C. Doors: Same material as partitions, fully framed; manufacturer's standard construction and hardware for swing operation.
   1. Locking: Mortise type cylinder locks as specified in Section 08 71 00.

D. Gates: Same material as partitions, fully framed; manufacturer's standard construction and hardware for swing operation.
   1. Latch: Mortise type cylinder locks as specified in Section 08 71 00.

2.4 FASTENERS

A. Bolts, Nuts and Washers: Hot dip galvanized.

B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, unobtrusively located, consistent with design of structure.

2.5 ACCESSORIES

A. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

B. Floor and Ceiling Pilaster Shoe: Manufacturer's standard.

C. Floor Base: Manufacturer's standard.

2.6 FABRICATION

A. Fit and assemble in largest practical sections for delivery to site, ready for installation.

B. Make exposed joints flush or tight.

C. Provide mortised and tenoned joints for framing members.

D. Provide components required for anchorage to adjacent construction.

E. Frame openings made for penetrating mechanical and electrical components.

2.7 FINISHES

A. Painted Finish: Manufacturer's standard powder coat finish.
1. Color: Selected by the Architect from Manufacturer's standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces and required openings are ready to receive work.

3.2 PREPARATION

A. Clean substrate surfaces.

B. Clean partition surfaces of rust, scale, grease, and foreign matter prior to field finishing as specified in Section 09 91 23.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install items plumb and level, accurately fitted, free from distortion or defects.

3.4 TOLERANCES

A. Maximum Variation From Plumb or Level: 1/4 inch (6 mm).

B. Maximum Misalignment From True Position: 1/4 inch (6 mm).

3.5 ADJUSTING

A. Adjust doors to achieve free movement.

3.6 CLEANING

A. Remove temporary protection to prefinished surfaces.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet and bath accessories.

B. Infant-care products.

C. Underlavatory guards.

1.2 RELATED REQUIREMENTS

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
      b. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   2. Samples: Full size, for each exposed product and for each finish specified.
      a. Approved full-size Samples will be returned and may be used in the Work.
   3. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
      a. Identify locations using room designations indicated.
      b. Identify accessories using designations indicated.

B. Informational Submittals:
   1. Sample Warranty: For manufacturer's special warranty.

C. Closeout Submittals:
   1. Maintenance Data: For accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Toilet and Bath Accessories:
      a. American Specialties, Inc.
      b. Bobrick.
      c. Bradley.
      d. GAMCO.
      e. Grab Bar Specialists.
   2. Infant-Care Products:
      a. American Specialties, Inc.
      b. Bobrick.
      c. Bradley.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

2.3 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:
1. Basis-of-Design Product: Insert manufacturer's name; product name or designation.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Paper Towel Dispenser/Receptacle:
1. Material: Stainless steel; 22 gage flange, 18 gage door.
2. Construction: Welded door with continuous stainless steel piano hinge; 2 tumbler locks.
3. Receptacle: Removable, leakproof, inner plastic container; 15 gallon capacity.
4. Mounting: Recessed.
5. Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
6. Basis of Design Products:
   a. Bobrick B-43944.
   b. Bradley 237-11.

B. Paper Towel Dispenser, Countertop, Recessed:
1. Material: Stainless steel; 22 gage.
2. Construction: Welded door with continuous stainless steel piano hinge; 1 tumbler locks.
3. Mounting: Recessed.
4. Dispenser Capacity: 300 C-fold or multi-fold paper towels.
5. Basis of Design Products:
   a. Bobrick, B-526
   b. Bobrick B-359.
   c. Bradley 2441.

C. Sanitary Napkin Disposal, Surface mounted:
1. Material: Stainless steel.
2. Construction: All-welded with continuous stainless steel piano hinge.
3. Door: Push type, self-closing.
4. Mounting: Surface.
5. Receptacle: Leak proof, plastic, removable; capacity 1.2 gallons.
6. Basis of Design Products:
   a. Bobrick B-270.
   b. Bradley 4A10-110000.

D. Toilet Tissue Dispenser, Double Roll, with shelf:
1. Material: Stainless-steel.
2. Capacity: Two standard core tissue rolls up to 6 inches diameter.
3. Mounting: Surface.
4. Basis of Design Products:
   a. Bobrick, B-540
   b. Bradley ,5263-00

E. Grab Bars:
1. Sizes: Refer to Drawings.
2. Material: Stainless Steel, 18 gage, type 304, satin finish.
3. Construction: 1-1/2 inch clearance between grab bar and wall.
4. Mounting: Concealed plates with no exposed fasteners.
5. Basis of Design Products:
   a. Bobrick, B-6806 Series.
   b. Bradley 812.

F. Grab Bar, Two Wall:

1. Size: Refer to Drawings.
2. Material: Stainless steel.
3. Construction: 1-1/2 inch clearance between grab bar and wall.
4. Mounting: Concealed plates with no exposed fasteners.
5. Basis of Design Products:
    a. Bobrick, B-6861
    b. Bradley 8120-059.

G. Mirror, Custom (unframed, full height and width – Refer Drawings for size / mounting): Refer to Section 08 83 00.

H. Shelf / Broom and Mop Holder:
1. Sizes: 34 inches.
2. Material: Stainless steel, type 304, exposed surfaces satin finished.
3. Construction: 3 holders, 4 stainless steel hooks, stainless steel towel rod, brackets welded to shelf.
4. Mounting: Surface.
5. Basis of Design Products:
    a. Bobrick B-239.
    b. Bradley 9933.

I. Baby Changing Unit:
1. Material: Stainless-steel.
2. Construction: Bed secured to back plate with a concealed, full-length stainless steel hinge rod with steel bushings equipped with pneumatic cylinder; smooth concave changing area.
3. Accessories: Nylon safety strap, two hooks for bags and purses, universal instruction graphics.
4. Mounting: Recessed.
5. Basis of Design Products:
    a. ASI, Model #9013
    b. Bobrick (Koala Kare) KB200-00.

J. Towel Bar:
1. Material: Stainless steel, 22 gage, type 304, 3/4 inch tubing, 24 inches long, projects 3-1/4 inches from wall.
2. Construction: Concealed wall plate; no exposed fasteners.
3. Mounting: Surface.
4. Basis of Design Products:
    a. Bobrick B-6747.
    b. Bradley 9066.

K. Shower Rod with Hooks and Curtain
1. Material: Stainless steel, 18 gage, type 304, satin finish.
2. Size: 1 inch diameter, lengths as detailed on Drawings.
3. Hooks: Stainless Steel.
4. Mounting: Surface with concealed mounting.
5. Shower Curtain: ANTI-MICROBIAL SHOWER CURTAIN EZE-MESH 20" AT TOP
6. Basis of Design Rod Products:
    a. Bobrick B-6107.
    b. Bradley 9065.

7. Basis of Design Curtain Products:
    a. Bradley 9537.

L. Soap Dish:
1. Material: Stainless steel, satin finish.
2. Mounting: Recessed.
3. Basis of Design Products:
    a. Bobrick B-6617.
    b. Bradley 9353.

M. Folding Shower Seat:
1. Materials: Plastic and stainless steel.
2. Configuration: Designed for wheelchair access.
3. Seat: Stinless-steel with plastic foam cushion and cover.
4. Basis of Design Products:
    a. GBS, Model # 62-PA2401, Model #62-PA2601

N. Wall Mounted Bench: BENCH 12"D X (CUSTOM LENGTH) (24" ± VIF) WITH (2) WALL MOUNTED BRACKETS PER BENCH
1. Materials: Stainless steel.
2. Configuration: Fixed, wall mounted.
    a. Legs: Fixed, stainless steel.
3. Seat: Stinless-steel.
4. Basis of Design Products:
    a. COLUMBIA - PSISC WALL MOUNTED BENCH

O. Coat Hook Rack:
1. Material: Stainless steel, 18 gage, type 304 with exposed surfaces satin finished.
2. Mounting: Surface.
3. Basis of Design Products:
    a. Bobrick, B-232 x 24

P. Coat Hook:
1. Material: Stainless steel, 18 gage, type 304 with exposed surfaces satin finished.
2. Mounting: Surface.
3. Basis of Design Products:
    a. Bobrick, B-682

Q. Surface Mounted Shelf:
1. Material: 18 gage stainless steel with exposed surfaces satin finish.
2. Construction: All corners heliarc welded and ground smooth.
3. Size: 8 inches wide. Refer to Drawings for lengths.
4. Basis of Design Products:
    a. Basis of Design: Bobrick, B-298

R. Sharps Disposal:
1. Material: 22 gauge stainless steel.
2. Mounting: Recessed.
3. Bsis of Design:
    a. Bobrick, B-35016

3.4 NOTES

A. Locate for accessibility as shown on Drawings.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire-Protection Cabinets.

B. Fire extinguishers.

C. Mounting brackets.

1.2 SUBMITTALS

A. Action Submittals:
1. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
2. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
3. Samples: For each type of exposed finish required.
4. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

B. Closeout Submittals:
1. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.4 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM (AG).

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FIRE-PROTECTION CABINETS

A. Cabinet Type: Suitable for fire extinguisher.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series.
      b. Kidde, a unit of United Technologies Corp. .
      c. Guardian Fire Equipment, Inc. .
      d. Larsens Manufacturing Company .
      e. Potter-Roemer LLC. .

B. Cabinet Construction: Cabinet shall match fire rating of wall construction that cabinet is installed within.
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- (1.09-mm-) thick cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.
   1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet:
   1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
   1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
   2. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.

F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

G. Cabinet Trim Material: Same material and finish as door.

H. Door Material: Steel sheet.

I. Door Style: Vertical duo panel with frame.

J. Door Glazing: Tempered float glass (clear).

K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide manufacturer's standard.
   2. Provide manufacturer's standard hinge permitting door to open 180 degrees.

L. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
   3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
      a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER ."
         1) Location: Applied to cabinet door.
         2) Application Process: Pressure-sensitive vinyl letters.
         3) Lettering Color: Black.
         4) Orientation: Vertical.

M. Materials:
   1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
      a. Finish: Baked enamel or powder coat.
      b. Color: As selected by Architect from full range of industry colors and color densities.
   2. Aluminum: ASTM B221 (ASTM B221M), with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B221 (ASTM B221M) for extruded shapes.
   3. Stainless Steel: ASTM C666/C666M, Type 304.
   4. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 FIRE EXTINGUISHERS

A. Fire extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeld by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Guardian Fire Equipment, Inc.
   b. JL Industries, Inc.; a division of the Activar Construction Products Group.
   c. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
   d. Larsens Manufacturing Company.
   e. Potter Roemer LLC.
2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

C. Multipurpose Dry-Chemical Type in Steel Container : UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.4 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Guardian Fire Equipment, Inc.
      b. JL Industries, Inc.; a division of the Activar Construction Products Group.
      c. Larsens Manufacturing Company.
      d. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
      a. Orientation: Vertical.

2.5 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
   1. Weld joints and grind smooth.
   2. Provide factory-drilled mounting holes.
   3. Prepare doors and frames to receive locks.
   4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
   1. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM AMP 500-06, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION-FIRE PROTECTION CABINETS

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
4. Fire-Rated Cabinets:
   a. Install cabinet with not more than 1/16-inch (1.6-mm) tolerance between pipe OD and knockout OD. Center pipe within knockout.
   b. Seal through penetrations with firestopping sealant as specified in Section 07 84 13 - Penetration Firestopping.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 INSTALLATION-FIRE EXTINGUISHERS

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.5 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.6 SCHEDULE

A. Provide one wall hung fire extinguisher in each electrical room and each storage room over 100 square feet.

B. Provide in corridors at locations indicated and if not, spacing as required by AHJ, but not less than 1 / 3000 SF and not more than 75’ of travel in corridors.

END OF SECTION

SECTION 10 51 29

PHENOLIC LOCKERS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish and install the following, as shown on the Drawings and specified herein:
   1. Phenolic lockers.

1.2 REFERENCE STANDARDS

A. ADA Standards – Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

C. ICC A117.1 – Accessible and Usable Buildings and Facilities 2017.

D. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct at Project site. Attendees: General Contractor, locker supplier, Owner’s Representative and Architect.

B. Coordination: Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that phenolic lockers can be supported and installed as indicated.

1.4 SUBMITTALS

A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

B. Shop Drawings: Indicate locker plan layout, elevations, sections, details, locker trim, locker accessories, numbering plan, and attachments to other work.

C. Samples:
   1. Submit two samples 4 by 4 inches (101.6 mm) in size, of each Standard color of phenolic material.
   2. Submit two samples 4 by 4 inches (101.6 mm) in size, of each Standard color of locker benchtop material.
      a. Submit two samples of each piece of locker hardware and pulls.

D. Manufacturer's Installation Instructions: Indicate component installation assembly.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Identification Plates: Full size; equal to 10 percent of amount installed.
   2. Hooks: Full size; equal to 10 percent of amount installed.
   3. Drawer and door pulls: Full size; equal to 10 percent of amount installed.

F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for installation.

B. Protect locker finish and adjacent surfaces from damage.

1.7 WARRANTY

A. Provide 25-year manufacturer warranty covering defects of manufacturing and workmanship, including, but not limited to, structural failures, faulty latch operation, and other door hardware.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Phenolic Lockers:
   1. ASI Storage Solutions: www.asistorage.com.
   2. Columbia Lockers, a division of PSiSC; Phenolic Lockers: www.psisc.com/#sle.
   3. Summit Lockers: www.summitlockers.com
   4. Scranton Products (Santana/Comtec/Capital); Product "Tufftec Lockers": www.scrantonproducts.com.

B. Basis of Design: Summet Lockers.

2.2 LOCKER APPLICATIONS

A. Shower Lockers: Single tier lockers, wall mounted with matching closed base.
   1. Width: 12 inches (304.8 mm).
   2. Depth: 12 inches (304.8 mm).
   3. Height: 72 inches (1828.8 mm).
   4. Fittings: One double-prong ceiling hook, two single prong wall hooks.
   5. Locking: Built-in digital keypad locks.

6. Provide flat top.
7. Color: As selected by Architect from manufacturer's full line of standard colors.

B. Bunk Lockers: Single tier lockers, wall mounted with matching closed base.
1. Width: 24 inches (_____).
2. Depth: 24 inches (_____).
3. Height: 72 inches (_____).
4. Fittings: Clothes rod, 4 single prong wall hooks.
5. Shelf.
6. Locking: Built-in digital keypad locks.
7. Provide flat top.
8. Color: As selected by Architect from manufacturer's full line of standard colors.

2.3 PHENOLIC LOCKERS

A. Lockers: Factory assembled, made of solid, phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
1. Doors and Drawers: Full overlay, covering full width and height of locker body; square edges.
2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
4. Provide filler strips where indicated, securely attached to lockers.
5. Door and Drawer Color: As selected by Architect; allow for 2 different colors.
6. Body Color: Manufacturer's standard white or light color.
7. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.

B. Component Thicknesses:
1. Doors and Drawers: 1/2 inch (12.7 mm) minimum thickness.
2. Locker Body: One of the following combinations:
a. Tops, bottoms, and shelves 3/8 inch (9.52 mm); sides and backs 5/16 inch (7.94 mm); minimum.
3. End Panels and Filler Panels: 3/8 inch (9.52 mm) minimum thickness.
4. Tops: 1/2 inch (12.7 mm) minimum thickness.
5. Toe Kick Plates: 1/2 inch (12.7 mm) minimum thickness.
6. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, and uniform surface appearance; glued laminated panels not acceptable.
a. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke index of 450 or less; when tested in accordance with ASTM E84.
b. Hinges: Concealed, 5-knuckle stainless steel or heavy-duty extruded aluminum, powder coated to match locker color; minimum of 90 degree opening; continuous with sex bolts.
c. Drawer and Door Pulls: “U” shaped wire pulls, brass with satin chrome finish, 4” centers. Hafele #116.39.464 or sim. www.hafeleonline.com
7. Drawer Slides:
a. Type: Full extension
b. Static Load Capacity: 100 lbs.

c. Mounting: Side mounted
d. Stops: Integral type

8. Systems Screws: Flat head zinc screws #6 x ½ inch; Accuride International, Inc. #3832 or sim. www.accuride.com
9. Coat Hooks: Ball-pointed type, high-impact phenolic; attached with tamperproof screws; two fasteners minimum per each.
10. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with two rivets minimum; near top of door and centered; may be field installed.
11. Locks: Locker manufacturer's digital type with keypad.
12. Locker Closet Rod: Stainless steel or chrome finish steel Manufacturer's standard adjustable support and leveling leg, minimum 1 inch (25.4 mm) adjustment; with hardware for attaching toe kick plates.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

D. Bolt adjoining locker units together to provide rigid installation.

E. Install end panels, filler panels, sloped tops, and miscellaneous panels.

F. Install accessories.

G. Replace components that do not operate smoothly.

3.3 ADJUSTING

A. Lubricate and adjust hardware.

B. Adjust doors and latches to operate easily without binding.

3.4 CLEANING

A. Clean locker interiors and exterior surfaces.

3.5 PROTECTION

A. Protect lockers from damage, abuse, dust, dirt, stain, or paint.

B. Do not permit use during construction.

C. Touch up marred finishes using only materials and procedures recommended or furnished by locker manufacturer. Replace lockers that cannot be restored to factory-finished appearance.

END OF SECTION

SECTION 10 51 43

WIRE MESH STORAGE LOCKERS

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

A. PART A and DIVISION 1 of PART B are hereby made a part of this SECTION.

B. Examine all conditions as they exist at the project prior to submitting a bid for the work of this SECTION.

1.2 SCOPE OF WORK

A. Furnish and install the following, as shown on the Drawings and specified herein:

1. Wire mesh lockers.

2. Free standing tube frame

3. Wall mount tool grid.

4. Backboard rack

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following related work is to be performed under the designated SECTIONS:

1. Wall construction: SECTION 040001-MASONRY and SECTION 092116-GYPSUM WALLBOARD

1.4 REFERENCE STANDARDS

A. ASTM A513 – Minimum properties of Electric-Resistance-Welded Carbon Allow Steel Mechanical Tubing

B. ASTM A510 - Minimum properties of Wire Rods and Coarse Round Wire, Carbon Steel and Alloy Steel

C. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

1.5 SUBMITTALS

A. See SECTION 013300-SUBMITTALS for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Submit manufacturer’s shop drawings for each individual run of lockers. Indicate overall locker plan layout, elevations, sections, details, locker accessories, and attachments to other work.

D. Samples: Submit two samples 4 by 4 inches in size, of **each** Standard color.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

F. Maintenance Data: Manufacturer’s recommendations for care and cleaning.

G. Warranty: Submit manufacturer’s standard warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than fifteen years of documented experience.

B. Installer Qualifications: Installer shall have experience necessary to assure lockers and all accessories and components are installed properly and according to manufacturer’s instructions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver lockers to site in manufacturer’s original, unopened containers with labels identifying product and manufacturer’s name.

B. Storage: Store materials in a clean dry area.

1.8 WARRANTY

A. See SECTION 017700-PROJECT CLOSEOUT for additional warranty requirements.

B. Provide ten-year Manufacturers written warranty stating that failures in materials or workmanship will be repaired or replaced from date of product installation.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Basis of Design:

1. GearGrid Corporation, 670 SW 15th Street, Forest Lake, MN 55025. Toll- free 888-643-6694. Phone 651-464-4468. Fax 651-464-4780. Web site www.geargrid.com. Email sales@geargrid.com.

2.2 WALL MOUNT LOCKER APPLICATIONS

A. Lockers must be fabricated and manufactured in the U.S.A. Products not manufactured in the U.S.A will be rejected at the time of submittals.

B. Model: GEARGRID Wall Mounted Storage System.

C. Locker Sizes: (Please reference project drawings for indicated sizes)

1. Overall dimension- 74.5” high x 36” wide x 24” deep.

2. Overall dimension- 74.5” high x 24” wide x 24” deep

D. Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.

E. Color: As selected by Architect from full line of standard colors.

F. Vertical Dividers:

1. Outer Frames: 1.25” O.D. x 16 gauge wall thickness ASTM A513 steel tubing.

2. Inner Grid: 0.25” diameter ASTM A510 cold drawn steel wire resistance welded to a 3” square pattern.

3. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.

4. Inner Grid wires must run horizontally and vertically creating a square or rectangular grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable.

5. Inner Grid wires shall intersect and cross all perpendicular wires and shall be welded at all intersections.

G. Back Panel:

1. Required on each locker to protect the locker contents and wall substrate, as well as provide an additional panel for accessory attachment.

2. Grid: 0.25" diameter ASTM A510 cold drawn steel wire resistance welded to a 3" square pattern.

3. Back panel must engage and be secured to vertical dividers via horizontal wires which extend into mounting holes pre-drilled in vertical dividers. Back panels are sandwiched between vertical dividers, preventing them from being removed after assembly is complete.

4. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.

5. Inner Grid wires must run horizontally and vertically creating a square or rectangular grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable.

6. Inner Grid wires shall intersect and cross all perpendicular wires and shall be welded at all intersections.

H. Shelves: (1) Upper, (1) Lower. 0.25" diameter ASTM A510 cold drawn steel wire resistance welded and cold formed. Upper shelf shall include an integrated 20 gauge steel bracket to accept a 2" x 16" name placard for all 36" Wide Lockers.

I. Apparel Hooks: (3) per locker opening. 0.192" diameter ASTM A510 cold drawn steel wire resistance welded, cold formed and powder coated. Apparel hooks must securely engage and snap onto side or back grid, to prevent unintentional disengagement of hook.

J. Additional Accessories – 36" Wide Lockers:

1. Hang Bar – Provide One (1) hang bar per 36" wide locker. Hang Bars to be 1.25" O.D. x 16 gauge 304 stainless steel tubing manufactured as such to allow each user to install at their desired height inside the locker.

2. Heavy Hanger – Provide Two (2) Heavy Hangers per 36" wide locker. Heavy Hangers to be 0.25" diameter 304 stainless steel wire cold formed and resistance welded. Includes formed loops to prop open sleeves on jackets to promote better circulation throughout the garment.

3. Secure Box – Provide One (1) Secure Box, Large, measuring 6" x 12" x 11" per 36" wide locker. Color: As selected by Architect from full line of standard colors.

4. Power Bar:

a. Provide continuous GearGrid "Power Bar" across the top of all 36" wide lockers as detailed on the project drawings. Color: Black.

b. Provide a vertical tube, painted black, secured at T&B at the top of both Tubular Frame Power Bars. See Drawings for additional

information.

c. Provide Wiremold Series 3000, color gray, surface mounted across all horizontal runs of all Power Bars. Provide one (1)110v/1-PH outlet, color black, at the center of every locker.

d. Provide a T-shaped Wiremold Series 3000 connector at both Tubular Frame Power Bar locations. Run Wiremold tracking up vertical tubes for power wiring connection at underside of ceiling. See Electrical Drawings for additional information.

K. **Electrical Subcontractor** is responsible for the following:

1. Furnish, install and make electrical connections for all Wiremold Series 3000 components. Install on face of all Power Bars and vertical tubing.

2. Coordinate with General Construction Contractor.

L. Additional Accessories – 24" Wide Lockers:

1. BackBoard Rack – Provide one (1) BackBoard Rack for 24" locker as located on project drawings.

2.3 FREE STANDING TUBULAR FRAME MOUNTED LOCKER APPLICATIONS

A. Tubular frame must be fabricated and manufactured in the U.S.A. Products not manufactured in the U.S.A will be rejected at the time of submittals.

B. Model: GEARGRID Tubular frame wall structure unit.

C. Sizes: (Please reference project drawings for indicated sizes)

D. Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.

E. Tubular Frame Color: As selected by Architect from full line of standard colors.

F. Components:

1. Vertical Posts: 4" x 4", 0.250" wall thickness ASTM A513 steel tube.

2. Floor Mounting Plates: ½" steel plate welded to vertical posts. 3/8" mounting holes as needed. (Mounting plate hole configurations subject to locker layout.

3. Horizontal Frames: 4" x 4" 0.1875" wall thickness ASTM steel tube. Frames mechanically fastened to vertical posts with manufacturer supplied or identified hardware. (Note: If Power Bars are specified as part of the accessories installation, the top horizontal frame will be 6"

high x 4" wide, 0.1875" wall thickness steel tube.)

2.4 WALL MOUNT TOOL GRID

A. Tool Grid must be fabricated and manufactured in the U.S.A. Products not manufactured in the U.S.A will be rejected at the time of submittals.Model: GEARGRID Wall Mount Tool Grid.

B. Sizes: (Please reference project drawings for indicated sizes)

C. Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.

D. Grid Panel:

1. Outer Frame: 1.25" x 16 gauge wall thickness ASTM A513 square steel tubing.

2. Inner Grid: 0.25" diameter ASTM A510 cold drawn steel wire resistance welded to a 3" square pattern.

3. Storage Hooks: Package of various rack and individual hooks included with unit in quantities determined by tool grid size.

E. Color: As selected by Architect from full line of standard colors.

2.5 FINISH

A. General: All system components excluding assembly and mounting hardware and stainless steel components are to receive the standard finish.

B. Standard Finish: Components to be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a durable and UV-stable TGIC powder coating process. Thickness of applied finish shall be 3 – 4 mm for added protection.

C. Color: As selected by Architect from full line of 7 standard color choices for selection.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lockers. Notify Architect immediately if areas are

not acceptable. Do not begin installation until unacceptable conditions have been corrected.

B. Examine areas to receive floor-mounted tubular steel frames. Notify Architect immediately if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

C. In-Slab Radiant Tubing (If Applicable): Coordinate initial radiant floor tubing layout with required trade(s) to assure tubular frame base plate anchors will not damage or puncture the in-slab radiant tubing. Failure to pre-coordinate this task will result in additional field investigation by the tube frame installer to identify the locations of all in-slab radiant heat tubing prior to anchoring tube frame to the concrete slab at no additional cost to Owner.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install all products plumb and square.

C. Use manufacturer’s provided hardware for all assembly.

D. Secure products with anchor devices to suit substrate materials. Minimum Pullout Force: See manufacturer’s installation instructions.

E. Install all specified accessories.

F. Replace components that do not have factory-finished appearance.

3.3 CLEANING

A. Clean all locker and tubular frame surfaces.

3.4 PROTECTION

A. Protect all products from damage, abuse, dust, dirt, stain, or paint.

B. Do not permit use during construction.

C. Touch up marred finishes using only materials and procedures recommended or furnished by locker manufacturer. Replace products or components that cannot be restored to factory-finished appearance.

END OF SECTION

SECTION 10 56 13

METAL STORAGE SHELVING

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

A. PART A and DIVISION 1 of PART B are hereby made a part of this SECTION.

B. Examine all conditions as they exist at the project prior to submitting a bid for the work of this SECTION.

1.2 SCOPE OF WORK

A. Furnish and install the following, as shown on the Drawings and specified herein:

1. Cantilevered shelving.
2. Shelving accessories.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following related work is to be performed under the designated SECTIONS:

1. Blocking in GWB walls for anchoring shelving units: SECTION 062000- ROUGH CARPENTRY
2. Wall construction: SECTION 092116-GYPSUM WALLBOARD and SECTION 040001-MASONRY.

1.4 REFERENCE STANDARDS

1.5 SUBMITTALS

A. See SECTION 013300-SUBMITTALS for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Rated uniform shelf loads.
2. Details of shelving assemblies, including reinforcement.
3. Accessories.
4. Specimen warranty.

C. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.

D. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See SECTION 017700-PROJECT CLOSEOUT, for additional provisions.
2. Extra Shelves: Two of each size with shelf brackets.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged units.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.8 WARRANTY

A. See SECTION 017700-PROJECT CLOSEOUT, for additional warranty requirements.

B. Provide ten-year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Cantilevered Shelving:

1. E-Z Shelving Systems, Inc.; Product "E-Z Shelving System": www.e- zshelving.com

2.2 SHELVING - GENERAL

A. See Drawings for layout and sizes.

2.3 CANTILEVERED SHELVING

A. Cantilevered Shelving: Wall-mounted formed steel uprights with slots for cantilevered shelving brackets, shelving brackets, shelving surfaces, and accessories as specified.

1. Unit Width: 48 inches, center to center of uprights, unless indicated otherwise. See Drawings.
2. Shelf Capacity, 12 inch deep shelf, unless indicated otherwise. See Drawings: Rated uniform load of 200 psf, minimum, tested in accordance with ANSI MH28.1.
3. Loading Capacity for Single Shelf Bracket, 12 inches long unless indicated otherwise. See Drawings: 560 lbs.
4. Loading Capacity for Double Shelf Bracket, 12 inches long unless indicated otherwise. See Drawings: 280 lbs.
5. Adjustability of Shelving: At any height above bottom bracket.
6. Shelf Depth: 12 inches, minimum. See Drawings.

B. Uprights: Formed steel members with slotted tubular face to receive shelf brackets and double flange on backside for attachment to substrate. Flanges punched with 1/4" diameter mounting holes starting 2” from each end.

1. Material: Stainless Steel, ASTM A240, Type 304-2B.
2. Sheet Metal Thickness: 14 gage, minimum.
3. Length: As indicated on Drawings.

C. Shelf Brackets: Combination shelf support and bookend, formed steel; equipped with left or right flanges for shelf support; full depth of shelves and minimum 6 inches height above shelf surface; rounded outer edges and corners for safety.

1. Material: Stainless Steel, ASTM A240, Type 304-2B.
2. Thickness: 14 gage, minimum.
3. Type A Profile: Single, shelf tapered bracket with top flange to support one shelf end.
4. Type B Profile: Double shelf, tapered bracket with top flange to support ends of two adjoining shelves.
5. Connection to Uprights: Clamp assemblies.

6. Clamp Assembly Type: Split unit with profile to match tubular slot extension of upright. Provide with 3/8" diameter bolt and nut for attachment.

   a. Material: Electro-zinc-plated steel, ASTM B633, chromate dipped.

D. Shelves: Formed steel, louvered, finished on all surfaces; front edge bent down and back edge bent up for rigidity; front and back flanges with returns for safety; no unsanitary hems, crevices, or folds.

1. Material: Stainless Steel, ASTM A240, Type 304-2B.
2. Thickness: 18 gage, 0.0478 inch, minimum.
3. Shelf Connections: Pre-punch shelves for bracket attachment; positive bolt connection between shelf and bracket.
4. Size: As indicated on Drawings

2.4 ACCESSORIES

A. Fasteners: Type, size, and spacing as recommended by manufacturer for secure, rigid installation to meet specified performance requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate is level and that clearances are as specified.

B. Verify that walls are suitable for shelving attachment.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.

3.4 ADJUSTING

A. Remove and replace damaged components.

3.5 CLEANING

A. Clean shelving and surrounding area after installation.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 10 71 13

EXTERIOR SUN CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum blade sun screen trellis.

1.2 REFERENCE STANDARDS

A. Architectural Aluminum Manufacturers Association (AAMA):
   1. AAMA 607.1 "Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum"

B. American Society for Testing and Materials (ASTM):
   1. ASTM B209/B209M - Standard Specification for Aluminum And Aluminum-Alloy Sheet and Plate.
   2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire".
   3. ASTM B308/B308M - Standard Specification for Aluminum – Alloy 6061-T6 Standard Structural Profiles.

C. American Welding Society (AWS):
   1. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): SMACNA "Architectural Sheet Metal Manual"

E. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Volume 2, Systems and Specifications".
   1. SSPC-Paint 12 "Cold-Applied Asphalt Mastic (Extra Thick Film)"

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Design, engineer, fabricate, and install work to withstand the effects of loads and stresses from wind and normal thermal movement, without evidencing permanent deformation of screen components including blades, frames, and supports; noise or metal fatigue caused by screen blade rattle or flutter; and permanent damage to fasteners and anchors.

1.4 SUBMITTALS

A. Action Submittals:
   1. General: Submit the following in accordance with Section 01 33 00 - Submittal Procedures.

2. Product Data:
   a. Submit for action. Describe the properties of items to be used in the Work.
3. Shop Drawings: Submit for action. Show fabrication and installation of the Work. Include the following.
   a. Plans, elevations, sections, and details showing profiles, angles, spacing of screen blades; unit dimensions related to wall openings and construction; free areas for each size indicated; and profiles of frames at jambs, heads and sills.
   b. Design Requirements: Include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the structural engineer who was responsible for their preparation.
      1) Submittal will be reviewed by the Architect for general compliance with the contract documents. The Architect will not apply action stamp and will return calculation data for information.
   c. Calculation and shop drawings to be submitted simultaneously.
4. Samples:
   a. Submit for action. Furnish materials to be used with labels indicating colors, finish characteristics, and locations of the Work. Samples will be reviewed for color and appearance only. Furnish the following.
      1) Extrusions: 12-inches long in range of finish selected.
      2) Sheet or Plate: 6-inches square in range of finish selected.
   b. Preconstruction Sealant Compatibility Samples: Provide samples to sealant manufacture for sealant testing. Refer to Division 07 section "Joint Sealers".

B. Closeout Submittals:
1. Closeout Submittals: Submit the following to the Owner.
   a. Record documents.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Contractor: Contractor is responsible for quality control of the Work.
2. Manufacturer: A firm experienced in successfully producing work similar to that indicated for this Project, with a record of successful in-service performance, and with sufficient production capacity to produce required units without causing delay in the Work.
3. Installer: An installer trained in the use of the materials and equipment to be employed in the Work.
4. Welders: Qualify welding processes and welding operators in accordance with AWS D1.2/D1.2M.
5. Engineer: A licensed structural engineer qualified to practice in jurisdiction where project is located. Experienced in providing engineering services of the kind indicated which has resulted in the successful installation of assemblies similar in material, design, and extent to that indicated for this Project.
   a. Licensed in the State where Project is located.

B. Regulatory Requirements: Comply with all applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

C. Single Source Responsibility: Obtain work from a single manufacturer.

D. Pre-Installation Meetings: Contractor to conduct meetings at site with installer prior to start of Work. Familiarize installer with conditions at site and related Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver materials in manufacturer's original packaging with label indicating pertinent information identifying the item. Store materials in accordance with manufacturer's instructions in a protected dry location off ground. Do not open packaging nor remove labels until time of installation.

1.7 PROJECT CONDITIONS OR SITE CONDITIONS

A. Existing Conditions: Field measure at location of the Work prior to preparation of the shop drawings. Include measurements of adjacent construction to which the Work must fit. Coordinate construction to ensure that actual opening dimensions correspond to fabricated dimensions of the Work.
   1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aluminum:
   1. Plate and Sheet: ASTM B209/B209M, 6061-T6
   2. Extruded Bars, Rods, Wire, Shapes, and Tubes: ASTM B221, 6063-T52
   3. Extruded Structural Shapes: ASTM B308/B308M, 6061-T6

B. Miscellaneous:
   1. Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
      a. Use types, gages, and lengths to suit unit installation conditions.
      b. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
   2. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

3. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.2 FABRICATION

A. General:
1. Fabricate screens to comply with requirements indicated for design, dimensions, materials, joinery, and performance.
2. Maintain equal screen blade spacing, including separation between blades and frame to produce uniform appearance.
3. Fabricate frames, including integral connections to fit in openings of size indicated with allowances made for fabrication and installation tolerances of screens, adjoining construction, and perimeter sealant joints.
4. Include supports, anchorages, and accessories required for complete assembly.
5. Join frame members to one another and to fixed screen blades as follows, unless otherwise indicated, or size of screen assembly makes bolted connections between frame members necessary:
   a. With fillet welds, concealed from view.
6. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

B. Aluminum Blade Sun Screen:
1. Frame Profile: Manufacturer custom engineered design.
2. Blade Profile: As indicated on the Drawings.
3. Frame Support: Manufacturer custom engineered design.
4. Manufacturer: Subject to compliance with requirements, provide the following.
   a. Airolite Co.
   b. ASCA Inc.
   c. Skyline Systems Inc..
   d. Manufacturer of Section 08 44 13 Glazed Aluminum Curtainwall.

C. Aluminum Finish:
1. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Color and Gloss: Match Architect's sample.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine and correct conditions of area to receive the Work prior to installation.

3.2 PREPARATION

A. Coordinate and Furnish: Anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of items having integral anchors embedded in construction. Coordinate delivery of such items to the project site.

3.3 INSTALLATION

A. General:
   1. Install system in accordance with manufacturer's printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the Work.
   2. Locate and place screen units plumb, level, and in proper alignment with adjacent work.
   3. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
   4. Form closely fitted joints with exposed connections accurately located and secured.
   5. Protect galvanized and nonferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry, or dissimilar metals.
   6. Coat aluminum in contact with concrete with bituminous paint.
   7. Install concealed gaskets, flashings, joint fillers, and insulation, as screen installation progresses where required to make screen joints weathertight. Comply with Section 07 92 00 - Joint Sealants for sealants applied during installation of screen.

3.4 ADJUSTING

A. Restore screen damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.
   1. Clean and touch-up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.5 CLEANING

A. At the end of each work day, remove unused materials, debris and containers from the site.

B. Periodically clean exposed surfaces of screens, which are not protected by temporary covering, to remove fingerprints and soil during construction period; do not let soil accumulate until final cleaning.

C. Before final inspection, clean exposed surfaces with water and with a mild soap or detergent not harmful to finishes. Rinse thoroughly and dry surface.

3.6 PROTECTION

A. Protect the Work so it will not deteriorate or be damaged. Remove protection at time of Substantial Completion

END OF SECTION

SECTION 10 82 19

EXTERIOR SOUND CONTROL SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Perforated exterior metal acoustical screen system.

1.2 SYSTEM DESCRIPTION

A. Design Criteria:
   1. Manufacturer is responsible for the structural design of all materials, assembly and attachments to resist snow, wind, suction and uplift loading at any point without damage or permanent set.
   2. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's catalog data, detail sheets, specification and other data sufficient to indicate compliance with these specifications.

B. Shop Drawings: Indicate layouts heights, component connection details, and details of interface with adjacent construction. Mark data to indicate:
   1. Rooftop mechanical equipment to be enclosed.

C. Samples:
   1. Samples of Materials: Metal panels.
   2. Color Selection: Submit paint chips with full range of colors available for Architect's selection.

1.4 INFORMATIONAL SUBMITTALS

A. Certification: Manufacturer's Certificate of Compliance certifying that panels supplied meet or exceed requirements specified.

B. Delegated-Design Submittal: For Exterior Sound Control Panel system to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, liscensed to practive within the State of Massachusetts, responsible for their preparation.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documents, issued and executed by manufacturer, countersigned by Contractor.

B. Maintenance Data: To include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of building authorities having jurisdiction in Project location.

B. Manufacturer Qualifications: Minimum five (5) years documented experience producing systems specified in this section.

C. Pre-Installation Meeting:
1. Convene at job site seven (7) calendar days prior to scheduled beginning of construction activities of this section to review requirements of this section.
2. Require attendance by representatives of the installing subcontractor, (who will represent the system manufacturer) and other entities directly affecting, or affected by, construction activities of this section.
3. Notify Architect four (4) calendar days in advance of scheduled meeting date.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

B. Storage and Handling: Protect materials and finishes during handling and installation to prevent damage.

1.8 PROJECT CONDITIONS OR SITE CONDITIONS

A. Field Measurements: Take measurements of actual Roof top unit for fit without gaps. Indicate measurements on shop drawings fully documenting any field condition that may interfere with the screen system installation.

1.9 COORDINATION

A. Installer for work under this Section shall be responsible for coordination of panel and framing sizes and required options with the requirements

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical wall panels that fail in performance, materials, or workmanship within specified warranty period.
1. Failure in performance includes, but is not limited to, acoustical performance and finish.
2. Warranty Period: Ten years from date of Substantial Completion.

B. Panel Finish Warranty: Provide panel finish manufacturer warranty, agreeing to repair finish of metal plate wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Exterior Sound Control Screens shall withstand the effects the following loads.

B. Delegated Design: Design exterior sound control screen assembly, including comprehensive engineering analysis by a qualified professional engineer, liscensed to practice in the State of Massachusetts, using performance requirements and design criteria indicated.
   1. Structural Performance: Provide exterior sound control screen assembly systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
      a. Wind Loads: As indicated on Drawings.
      b. Other Design Loads: As indicated on Drawings.
      c. Seismic Performance: Exterior sound control screen assemblys shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Deflection Limits: For wind loads, no greater than 1/175 of the span.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Acoustical Performance: Provide exterior sound control screen assembly tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
   1. Sound-Transmission Requirements: Assemblys tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
   2. Noise-Reduction Requirements: Assemblys, identical to partition tested for STC and tested for sound-absorption performance according to ASTM C 423, and rated for not less than the NRC indicated.
   3. Acoustical Performance Requirements: Installed exterior sound control screen assemblys, identical to those tested for STC, tested for NIC according to ASTM E 336, determined by ASTM E 413, and rated for 5 dB less than STC value indicated.

2.2 MANUFACTURERS

A. Manufacturers:
   1. Semco Acoustic/Thermal panels.
   2. Alpro perforated metal panels.
   3. Industrial Acoustics Company
   4. Noisebarriers

B. Basis of Design: Noise Barriers “Quiet-Line Barrier Walls”.

2.3 EXTERIOR SOUND CONTROL SCREENS

A. Panel Construction: Manufacturer's standard panel construction consisting of perforated aluminum facing and internal reinforcements welded and riveted together to form a metal sheathed panel with a solid metal septum and filled with a fiberglass core.

B. Nominal Overall Panel Thickness: 4 inches, or as required for STC.

C. NRC: Per ASTM E 795, NRC 0.95 minumum.

D. STC: Per ASTM E 413, STC 35 minimum.

E. Panel Width: As indicated.

F. Panel Height: As indicated.

G. Panel Edge: As indicated on the Drawings.

H. Panel Short Edge Detail: As indicated on the Drawings.

I. Panel joiners: Fabricate from roll formed steel in single full length pieces.

2.4 MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.Thickness: 0.032 inch (0.81 mm).Surface: Smooth, flat finish.
   1. Exterior Finish: Two-coat fluoropolymer.
   2. Color: As indicated by manufacturer's designations.

B. Framing: See Structural Drawings for structural supports.

C. Sub Framing: Aluminum Plate, Shapes and Bar: ASTM B221, alloy 6061-T5 or 6063-T5.

D. Glass-Fiber Board: ASTM C 612, Type IA or Types IA and IB; density as recommended, unfaced, dimensionally stable, molded rigid board, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

E. Threaded Fasteners: All screws, bolts, nut and washers shall be Stainless steel.
   1. Corner assembly fasteners shall be #10-16 x stainless steel TEK screws. Length as required to develop full holding capacity of screw when fastened to Mechanical Equipment.
   2. Provide lock washer or other locking device at all bolted connections.

2.5 FABRICATION

A. Provide factory-formed panel systems with panel connections and indicated or necessary components: Form all components true to shape, accurate in size, square and free from distortion or defects. Cut panels to precise lengths indicated on approved shop drawings.

B. Trim and Closures: Fabricated from 0.040 inch aluminum, finished to match panels, unless shown otherwise on drawings.

C. Fabricate and assemble components in largest practical sizes, for delivery to the site.
   1. Construct corner assemblies to required shape with joints tightly fitted.
   2. Supply components required for anchorage of framing. Fabricate anchors and related components of material and finish as required, or as specifically noted.

2.6 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: Match Architect's sample.

PART 3 EXECUTION

3.1 EXAMINATION

A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed.
   1. Examine structural metal framing.
   2. Submit written notification to Architect and Screen manufacturer if such conditions are unacceptable.
   3. Beginning erection constitutes installer's acceptance of conditions.

3.2 INSTALLATION

A. Install units in accordance with the manufacturer's instructions and approved shop drawings. Keep perimeter lines straight, plumb, and level. Provide brackets, anchors, and accessories necessary for a complete installation.

B. Fasten to structural steel supports.
   1. Provide corner and mid-span assemblies as required by approved shop drawings so that the panels are supported uniformly.

C. Insert panels into structural supports. Butt thermoplastic panels to adjacent panels for uniform fit. Fasten fixed panels in accordance with the shop drawings.

D. Metal Separation: Where aluminum materials would contact dissimilar materials, insert rubber grommets at attachment points, thus eliminating where dissimilar metals would otherwise be in contact.

E. Do not cut or abrade finishes which cannot be restored. Return items with such finishes to shop for required alterations.

3.3 ERECTION TOLERANCES

A. Maximum misalignment from true position: 1/4-inch.

3.4 CLEANING AND PROTECTION

A. Remove all protective masking from material immediately after installation.

B. Protection:
   1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
   2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.

C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.
   1. Clean units in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 11 30 00

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.2 RELATED REQUIREMENTS

A. Division-22 for plumbing and venting requirements

1.3 SUBMITTALS

A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

B. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.5 WARRANTY

A. Provide manufacturer's standard 2 year warranty and 10 year warranty on parts.

PART 2 PRODUCTS

2.1 KITCHEN APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Provide appliances indicated on the Drawings and attached catilog sheets.

C. Refrigerator: 36" wide, 3 door, counter deep, stainless steel finish.
   1. Manufacturers: Sub-zero, Bosh, Monogram and Thermador
   2. Basis of design: E4: BOSCH, 800 Series – Stainless Steel B36CT80SNS

3. Capacity
    a. Total capacity 20.8 cu. ft.
    b. Refrigerator capacity 14.8 cu. ft.
    c. Freezer capacity 6 cu. ft.
4. Technical Details
    a. Current 15 A
    b. Volts 115 V
    c. Frequency 60 Hz
    d. Power cord length 67"
    e. Plug type 120V-3 prong
5. Dimensions & Weight
    a. Appliance dimensions with hinges, handles and doors (HxWxD) 72" x 35 5/8" x 31 1/8"
    b. Appliance dimensions without hinges and doors (HxWxD) 71 1/2" x 35 5/8" x 24"
    c. Required cutout size (HxWxD) 72" x 36" x 25"
    d. Net weight 350 lbs
6. Accessories
    a. UltraClarityPro® Water Filter: BORPLFTR55

D. Electric cooktop brands :
1. Manufacturers: Wolf, Thermador, Monogram and Miele.
2. Cooktop: glass-ceramic cooktop.
3. E1: Basis of design: Wolf CI30460T/S
4. COOKTOP SPECIFICATIONS
    a. Brushed stainless trim
    b. Black ceramic glass surface
    c. Sensor based simmer, melt, and keep warm modes
    d. Boost Mode for rapid heat
    e. 1 - 6" 1,400 W Zone with 2,200 W Boost
    f. 2 - 8" 2,100 W Zone with 3,700 W Boost
    g. 1 - 10" 2,600 W Zone with 3,700 W Boost
    h. Dimensions: 30"W x 2"H x 21"D
    i. Electrical Supply 3-wire, 240/208 VAC, 60 Hz
    j. Electrical Service 40 amp dedicated circuit

E. Wall oven:
1. Manufacturers: Wolf, Thermador, Monogram and Miele.
2. Finish: Stainless Steel
3. Basis of design: E3: Wolf, 30" E SERIES TRANSITIONAL BUILT-IN SINGLE OVEN
    a. Dimensions 29 7/8"W x 28 1/2"H x 23"D
    b. Oven 1 Interior Dimensions 25 1/4"W x 17 1/2"H x 18 1/2"D
    c. Electrical Supply grounded, 240/208 VAC, 60 Hz
    d. Electrical Service 30 amp dedicated circuit

F. Cooking Exhaust:
1. Manufacturers: Wolf, Zephyr and Monogram
2. Finish: Stainless-steel.
3. 60" wide
4. 600 cfm. Single internal blower.

5. Remote controls for ADA accessibility
6. Basis of design:
    a. E2: ZEPh'r, PRO, TITAN, WALL.
    b. Optional Wireless Remote Control

G. Microwave:
1. Manufacturers: Wolf, Thermador, Monogram, Sharp and Zephyr
2. 24" wide, drawer style
3. Stainless and glass
4. Finish: Stainless-steel and glass
5. Basis of Design:
    a. E6: SHARP I Simply, SMD2440JS
    b. Finish: Stainless Steel
    c. Drawer Opening: Open/Close Button
    d. Width: 24"
    e. Capacity: (cu. ft.) 1.2
    f. Output Power: (watts) 950W
    g. Interior Light: Incandescent
    h. Timer/Clock: Yes
    i. Open/Close: Yes
    j. Start/+30Sec; Yes
    k. Stop/Clear: Yes
    l. Power Level: 11
    m. Control Lock: Yes
    n. Help/Settings: Yes
    o. Demo Mode: Yes
    p. End of Cooking Reminder: Yes

H. Dishwasher, built-in, undercounter, ADA, quiet models, sound level under 46 dB(A)
1. Manufacturers: Cove, Miele and Bosh
2. Finish: Stainless-steel
3. Basis of design:
    a. E7: BOSCH, 24" Bar Handle ADA-compliant Dishwasher, 800 Series – Stainless Steel SGX78C55UC.
        1) Wash system: PrecisionWash®
        2) Drying system: CrystalDry™
        3) Third rack Standard
        4) Rack adjustability: RackMatic®
        5) Tub material Stainless steel
        6) Control type: Buttons
        7) Concealed water heating element
        8) Leak protection system: 24/7 AquaStop® Plus
        9) NSF®-certified† sanitize option
        10) Water softener
        11) Five-level wash
        12) Dimensions (HxWxD): 32 1/16" x 23 9/16" x 22 9/16"
        13) Required cutout size (HxWxD) 32 1/8" x 24" x 24"
        14) Technical Details
            (a) Current 12 Amps
            (b) Volts 120 V

(c) Frequency 60 Hz

2.2 LAUNDRY APPLIANCES

A. Provide appliances indicated on the Drawgs.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.3 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.4 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manually operated roller shades with single rollers.

B. Motor-operated roller shades with single rollers.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
      a. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
   2. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
      a. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
   3. Samples: For each type of roller shade.
      a. Shadeband Material: Not less than 10 inches (250 mm) square. Mark interior face of material if applicable.
   4. Product Schedule: For roller shades. Use same designations indicated on Drawings.

B. Informational Submittals:
   1. Qualification Data: For Installer.
   2. Product Certificates: For each type of shadeband material.
   3. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Closeout Submittals:
   1. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Draper, Inc.
2. Hunter Douglas Contract.
3. Lutron Electronics Co.
4. MechoShade Systems, Inc.

B. Basis of Design:
1. WNT1: Mechoshade, Ecoveil 1350 Series, 1369 Silver Birch, 5%.
2. WNT2: Mechoshade, EcoGlass Blackout 2820 series, 2822 Linen, unless otherwise indicated on the Drawings.
3. WNT3: MechoShade, MOTORIZED ROLLER SHADES: 1350 SERIES, 1369 SILVER BIRCH - 5%.
4. WNT4: MechoShade, Ecoglass Blackout, MOTORIZED ROLLER SHADES: 2820 SERIES, 2822 LINEN.

C. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Manufacturer's standard.
a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Clip, jamb mount.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
    a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criterion is more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
    1. Roller Drive-End Location: Right side of interior face of shade.
    2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
    3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:
    1. Shadeband Material: Light-filtering fabric.
        a. Basis of Design: WNT1: WINDOW TREATMENT, ROLLER SHADES: 1350 SERIES, 1369 SILVER BIRCH - 5% MECHOSHADE ECOVEIL 5%
    2. Shadeband Material: Light-blocking fabric.
        a. Basis of Design: WNT2: WINDOW TREATMENT, ROLLER SHADES: 2820 SERIES, 2822 LINEN MECHOSHADE ECOGLASS BLACKOUT
    3. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
        a. Type: Enclosed in sealed pocket of shadeband material.

E. Installation Accessories:
    1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
        a. Shape: L-shaped.
        b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
    2. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
        a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 6 inches (152 mm).
        b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
    3. Endcap Covers: To cover exposed endcaps.
    4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
        a. Closure-Panel Width: 2 inches (51 mm).
    5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
      a. Electrical Characteristics: 24-V dc.
      b. Maximum Total Shade Width: As required to operate roller shades indicated.
      c. Maximum Shade Drop: As required to operate roller shades indicated.
      d. Maximum Weight Capacity: As required to operate roller shades indicated.
   3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
      a. Group Control Station: Maintained-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for single-switch group control.
      b. Color: As selected by Architect from manufacturer's full range.
   4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
   5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
   6. Operating Features:
      a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
      b. Capable of interface with audiovisual control system.
      c. Capable of accepting input from building automation control system.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: Right side of interior face of shade.
   2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
   3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:
   1. Shadeband Material: Light-filtering fabric.
      a. Basis of Design: WNT3: WINDOW TREATMENT, ROLLER SHADES: 1350 SERIES, 1369 SILVER BIRCH - 5% MECHOSHADE ECOVEIL 5%

2. Shadeband Material: Light-blocking fabric.
   a. Basis of Design: WNT4: WINDOW TREATMENT, ROLLER SHADES: 2820 SERIES, 2822 LINEN MECHOSHADE ECOGLASS BLACKOUT
3. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.

E. Installation Accessories:
1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Manufacturer's standard in height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
2. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 6 inches (152 mm).
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
3. Endcap Covers: To cover exposed endcaps.
4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
   a. Closure-Panel Width: 2 inches (51 mm).
5. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
6. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
1. Source: Roller shade manufacturer.
2. Type / Weave / Openness Factor: As indicated in Interior Finish Legend on Drawings.
3. Orientation on Shadeband: Up the bolt unless otherwise indicated on Drawings.
4. Color: As indicated in Interior Finish Legend on Drawings.

2.5 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
   1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
   1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
   1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

C. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

SECTION 12 31 01

MANUFACTURED METAL CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fixed stainless-steel casework.

1.2 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of metal casework.

B. Coordinate installation of metal casework with installation of equipment.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For each type of product.
   2. Shop Drawings: For metal casework.
      a. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
      b. Indicate types and sizes of casework.
      c. Indicate manufacturer's catalog numbers for casework.
      d. Show fabrication details, including types and locations of hardware.
      e. Indicate locations and types of service fittings.
      f. Include details of utility spaces showing supports for conduits and piping.
      g. Include details of support framing system.
      h. Include details of exposed conduits, if required, for service fittings.
      i. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
      j. Include coordinated dimensions for equipment specified in other Sections.
   3. Delegated Design Submittals: For metal casework indicated to comply with seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Informational Submittals:
   1. Qualification Data: For manufacturer.
   2. Product Test Reports:
      a. Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of metal casework with requirements of specified product standard[and system structural performance specified in "Performance Requirements" Article].

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 M.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.6 FIELD CONDITIONS

A. Field Measurements: Where metal casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

B. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain metal casework from single source from single manufacturer unless otherwise indicated.

2.2 PERFORMANCE REQUIREMENTS

A. Fixed Casework System Structural Performance: metal casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
   1. Support Framing System: 600 lb/ft. (900 kg/m) .
   2. Suspended Base Cabinets (Internal Load): 160 lb/ft. (240 kg/m) .
   3. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft. (240 kg/m).
   4. Wall Cabinets (Upper Cabinets): 160 lb/ft. (240 kg/m).
   5. Shelves: 40 lb/sq. ft. (200 kg/sq. m).

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal casework installation.

C. Seismic Performance: Casework installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .
   1. Component Importance Factor: 1.5.
   2. Base Cabinet Load (Including Countertop and Load on Countertop): 320 lb/ft. (480 kg/m).
   3. Wall Cabinet (Upper Cabinet) Load: 160 lb/ft. (240 kg/m).

2.3 MANUFACTURERS

A. Manufacturers:
1. AT Villa.
2. Bedcolab.
3. Kewaunee Scientific.
4. Mott Manufacturing

B. Basis of Design: Mott Manufacturing

2.4 METAL CASEWORK, GENERAL

A. Casework: Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, factory-assembled, and factory-finished.

B. Style: Flush overlay - square edge.

C. Primary Cabinet Material:
1. Stainless Steel Sheet: ASTM A240/A240M, Type 304.

2.5 FIXED CASEWORK SYSTEM

A. Provide casework manufacturer's standard integrated system that includes support framing, suspended modular cabinets, filler and closure panels, wall panes, undercabinet task-lighting fixtures, countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.
1. Cabinets can be removed and reinstalled without use of special tools for relocation within system.
2. Base cabinets can be removed without providing temporary support for, or removing, countertops.
3. Sinks are supported independent of base cabinets.
4. Support framing has provision for fastening pipe supports at utility space in not more than 1-inch (25-mm) increments.
5. System includes filler and closure panels to close spaces between support framing, cabinets, shelves, countertops, floors, and walls unless otherwise indicated. Fabricate panels from same material and with same finish as metal cabinets and with hemmed or flanged edges.

2.6 CABINET HARDWARE

A. General: Provide metal casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Stainless-steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors 48 inches (1200 mm) high or less and three for doors more than 48 inches (1200 mm) high.

C. Hinged-Door and Drawer Pulls: Solid-aluminum, stainless steel, or chrome-plated-brass, back-mounted pulls. Provide two pulls for drawers more than 24 inches (600 mm) wide.

1. Design: Wire pulls.
2. Overall Size: As selected from manufacturer's full range.

D. Sliding-Door Pulls: Stainless steel or chrome-plated recessed flush pulls.
1. Design and Size: As selected from manufacturer's full range.

E. Door Catches: Stainless-steel Nylon-roller spring catches. Provide two catches on doors more than 48 inches (1200 mm) high.

F. Drawer Slides: ANSI/BHMA A156.9.
1. Heavy Duty (Grade 1HD-100): Side mount.
a. Type: Full extension.
b. Material: Epoxy-coated polymer slides.
2. General-purpose drawers; provide 100 lb (45 kg) load capacity.
3. File drawers; provide 150 lb (45 kg) load capacity.

G. Sliding-Door Hardware Sets: metal casework manufacturer's standard, to suit type and size of sliding-door units.

2.7 METAL CABINET FABRICATION

A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Except where otherwise specified, integrally frame and weld cabinet bodies to form dirt- and vermin-resistant enclosures. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).

B. Hinged Doors: Mortise for hinges and reinforce with angles welded inside inner pans at hinge edge.

C. Drawers: Fronts made from outer and inner pans that nest into box formation, without raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Provide drawers with rubber bumpers, polymer roller slides, and positive stops to prevent metal-to-metal contact or accidental removal.

D. Adjustable Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.

E. Toe Space: Fully enclosed, 4 inches (100 mm) high by 3 inches (75 mm) deep, with no open gaps or pockets.

F. Utilities: Provide space, cutouts, and holes for pipes, conduits, and fittings in cabinet bodies to accommodate utility services and their support-strut assemblies.
1. Provide base cabinets with removable backs for access to utility space.

G. Filler and Closure Panels: Provide where indicated and as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework and with hemmed or flanged edges unless otherwise indicated.

1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where cabinets are not installed against a wall or where space is not otherwise closed. Fabricate from back-to-back panels or of hollow construction to eliminate exposed hemmed or flanged edges.
2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.8 METAL CABINET FINISH

A. General: Prepare, treat, and finish welded assemblies after assembling. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.

2.9 STAINLESS-STEEL FINISH

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Stainless Steel Sheet and Plate Finishes:
1. Directional Satin Finish: ASTM A480/ASTM A480M, No. 4.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

A. Install level, plumb, and true in line; shim as required using concealed shims. Where metal casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet (1.5 mm in 3 m).
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).
3. Variation of Faces of Casework from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).

B. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches (400 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
   1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches (600 mm) o.c. and at sides of cabinets with not less than two fasteners per side.

C. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches (400 mm) o.c.

D. Install hardware uniformly and precisely.

E. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil (0.15-mm) plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches (1200 mm) o.c.

END OF SECTION

SECTION 12 36 16

METAL COUNTERTOPS AND SHELVES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes stainless-steel countertops, shelves and racks.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal countertops only after casework has been completed in installation areas.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 07 92 00 "Joint Sealants."
   1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
   2. Color: Clear.
   3. Sealant shall have a VOC content of less than 250 g/L.

2.2 STAINLESS-STEEL COUNTERTOPS AND SHELVES

A. Countertops: Fabricate from 0.062-inch- (1.59-mm-) thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch (25.4 mm) over the base cabinets.
   1. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.
   2. Weld shop-made joints.
   3. Sound deaden the undersurface with heavy-build mastic coating.
   4. Extend the top down to provide a 1-inch- (25-mm-) thick edge with a 1/2-inch (12.7-mm) return flange.
   5. Form the backsplash coved to and integral with top surface, with a 1/2-inch- (12.7-mm) thick top edge and 1/2-inch (12.7-mm) return flange.
   6. Provide raised (marine) edge around perimeter of tops containing sinks and where indicated; pitch tops containing sinks two ways to provide drainage without channeling or grooving.

B. Wall-Mounted Shelves: Fabricate from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Weld shop-made joints. Fold down the front edge a minimum of 3/4 inch (19.05 mm); fold up the back edge a minimum of 3 inches (76.2 mm). Provide integral stiffening brackets, formed by folding up ends a minimum of 3/4 inch (19.05 mm) and by welding to upturned back edge.
   1. Supports:
      a. Basis of Design: ULTIMATE L BRACKET BY KNAPE & VOGHT MODEL #208 BLK 400"

C. Manufactured Wall Mounted Shelves:
   1. Solid Wall Mounted Shelf, Stainless Steel.
   2. Basis of Design: Advance Tabco; Model #: WS-12-36-16, and WS-12-60-16.

D. Manufactured Wall Mounted Racks:
   1. Pot Rack, wall-mounted, single bar design, with plated double hooks, constructed of 1/4" x 2" stainless steel, 8 1/2 inch projection from wall.
   2. Basis of Design: Advance Tabco; Model #: SW1-60, and SW1-72.

2.3 STAINLESS-STEEL FINISH

A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

F. Wall-Mounted Shelves: Fasten to masonry, partition framing, blocking, or reinforcements in partitions. Fasten each shelf through upturned back edge at not less than 24 inches (609.6 mm) o.c.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches (1219.2 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum entrance floor grilles.

1.2 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.

C. Shop Drawings: Indicate dimensions and details for recessed frame.
   1. For recessed frames located within a dimensionally restricted area, show dimensions of space within which the frame will be installed.

D. Samples: Submit two samples, illustrating pattern, color, finish, and edging.

E. Maintenance Data: Include cleaning instructions, and stain removal procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Entrance Floor Grilles and Gratings:
   1. Activar Construction Products Group - JL Industries; Entrance Grilles: www.activarcpg.com/#sle.
   2. Babcock-Davis: www.babcockdavis.com/#sle.
   3. Construction Specialties, Inc; Entrance Grids: www.c-sgroup.com/#sle.
   4. Nystrom, Inc: www.nystrom.com/#sle.
   5. Matter.

B. Basis of Design:
   1. WOM1: Matter; Ultra Track Entrance System.

2.2 ENTRANCE FLOOR GRILLES AND GRATINGS

A. Entrance Floor Grilles: Recessed extruded aluminum grille assembly

B. Entrance Floor Grilles: Recessed extruded aluminum grille assembly with tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
   1. Recess Depth: 2 inches (51 mm).

2. Tread Surfaces: Serrated anodized aluminum.
3. Frame: Anodized aluminum for embedding in concrete; minimal exposed trim; stud or hook concrete anchors.
4. Pan: Anodized aluminum bottom pan with drain, sealed to frame.

C. Mounting: Top of non-resilient members level with adjacent floor.

D. Structural Capacity: Capable of supporting a rolling load of 1000 pounds (453.6 kg) without permanent deformation or noticeable deflection.

E. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.

2.3 FABRICATION

A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor opening for mats are ready to receive work.

3.2 PREPARATION

A. Mats: Verify size of floor recess before fabricating mats.

B. Vacuum clean floor recess.

3.3 INSTALLATION

A. Install frames to achieve flush plane with finished floor surface.

B. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.4 TOLERANCES

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch (6 mm).

END OF SECTION

SECTION 12 93 00

SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Documents, as listed in the Table of Contents, and applicable parts of Division 1, General Requirements shall be included in and made a part of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SCOPE OF WORK

A. The work of this Section consists of all site improvements and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:

1. Flagpoles
2. Steel Pipe Bollard
3. Wheel Stop
4. ADA Detectable Warning Mat

1.3 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

Section 31 00 00 – Earthwork

Section 03 30 00 – Cast-In-Place Concrete

1.4 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform himself of existing conditions of the site before submitting their bid and shall be fully responsible for carrying out all site work required to fully and properly executing the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Landscape Architect's knowledge, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

1.5 SCHEDULING

A. The Contractor shall submit to the Landscape Architect, for approval by the Owner, a progress schedule for all work as specified herein.

1.6 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:

1. ASTM: American Society for Testing and Materials
2. ANSI: American National Standards Institute
3. FS: Federal Specifications
4. IMI: International Masonry Institute
5. PCA: Portland Cement Association

B. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

C. Layout: After staking out the work, and before beginning final construction, obtain the Landscape Architect's approval for layout. Contractor shall make adjustments as determined by the Landscape Architect. Landscape Architect may make adjustments to layout as is required to meet existing and proposed conditions without additional cost to the contract price.

1.7 SUBMITTALS: IN ACCORDANCE WITH SECTION 01 33 23 SUBMITTAL PROCEDURES, SUBMIT THE FOLLOWING:

A. Shop Drawings: Submit shop drawings for all products in accordance with Division 01 requirements.

B. Product Information: Provide manufacturer's data for all products showing installation and limitations in use. Supply Certificates of Compliance for all materials required for fabrication and installation, certifying that each material item complies with, or exceeds, specific requirements.

PART 2 - PRODUCTS

2.1 FLAGPOLES

A. Submit complete and detailed shop drawings indicating entire flagpole, installation, foundation and all accessories.

B. 35' Flagpole shall be one of the following:

C. 35ft (1) Piece Wind Speed 87 Mph 6 Butt Dia. X .156 Wall Thickness Internal Halyard Winch Aluminum Flagpole Item #IW356156 by The Flagpole Co. P.O. Box 765 Brooklyn MI 49230 (Sales@flagpolecompany.com) or

D. Approved equal.

E. Finish shall be Black Anodized. Finish to be impregnated permanently in pole. Internal Halyard with stainless steel cable.

F. Flash Collar: Provide and install decorative spun aluminum collar and ground sleeve as required for height of pole specified.

G. Lightning Protection: 3/4 inch diameter steel lightning protector ground spike welded to base plate and to support plate.

H. Flagpole loads shall be in accordance with ANSI FP 1001-07.

I. Shim blocks shall be pressure treated hardwood wedges at top of foundation tube to adjust pole and maintain true vertical position.

2.2 STEEL PIPE BOLLARD

A. Steel pipe bollard shall be 4-1/2" diameter schedule 40 steel (ASTM A36), a welded dome cap, 72" length, 7" steel rebar, primed with a black powder coated finish per Model #BOS-EMBEDDED, as manufactured by Dawn Enterprises, 275 Progress Drive, Suite B, Manchester CT 06042, 800-262-3296, website: www.godawn.com, or approved equal.

B. Bollard shall have an embedded mounting in concrete.

2.3 WHEEL STOP

A. Wheel Stops shall be precast concrete single face, model number BBSF, weight 270 lbs as manufactured by Shea Concrete, Inc., Wilmington, MA, or approved equal. Refer to contract drawings for quantities and locations. All final locations are to be approved in the field by the Engineer.

2.4 ADA DETECTABLE WARNING MAT

A. The ADA detectable warning mat shall be manufactured by ADA Solutions, Inc., Chelmsford, MA, or

B. An approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

B. The Contractor shall be responsible for timing the delivery of all site improvement elements so as to minimize on-site storage time prior to installation. All stored materials must be protected from weather, careless handling and vandalism.

C. Contractor shall anchor all furnishings per manufacturer's recommendations.

END OF SECTION

SECTION 14 21 23

ELECTRIC TRACTION MRL ELEVATORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The following types of machine room-less electric traction elevators:
   1. Service elevators.

1.2 DEFINITIONS

A. Definitions in ASME A17.1 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Service Elevator: A passenger elevator that is also used to carry freight.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:
      a. Car enclosures and hoistway entrances.
      b. Operation, control, and signal systems.
   2. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
   3. Samples for Initial Selection: For finishes involving color selection.
   4. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- (75-mm-) square Samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

B. Informational Submittals:

1. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, including emergency generator, as shown and specified, are adequate for elevator system being provided.

C. Closeout Submittals:
1. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
   a. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
2. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
3. Warranty: Special warranty specified in this Section.
4. Continuing Maintenance Proposal: Service agreement specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an experienced installer approved by elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain elevators through one source from a single manufacturer.
1. Provide major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.
1. Effective peak velocity acceleration (Av) for Project's location is less than 0.10 (seismic risk zones 0 and 1).
2. Provide earthquake equipment required by ASME A17.1.
3. Design earthquake spectral response acceleration, short period (Sds) for Project is .
4. Project's seismic design category is as indicated on the Drawings.
5. Elevator importance factor is 1.5.

D. Accessibility Requirements: In addition to local governing regulations, comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA)" .

E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

F. Comply with Fire Fighter’s Service Requirements in ASME A17.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.6 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

C. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by manufacturer agreeing to repair, restore, or replace defective elevator work within specified warranty period.
   1. Warranty Period: 12 months from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance service by skilled employees of the elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment.
   1. Perform maintenance, including emergency callback service, during normal working hours.
   2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
      a. Response Time: Two hours or less.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
   1. Include location of complete parts and service center.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Otis Elevator Co.

B. ThyssenKrupp Elevator.

C. Fujitec America, Inc.

D. KONE Inc.

E. Otis Elevator Co.

F. Schindler Elevator Corp.

G. ThyssenKrupp Elevator.

H. Basis of Design Product: Refer to "Service Elevators" Article in this Section.

2.2 MATERIALS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components, published by manufacturer as included in standard pre-engineered elevator systems and as required for a complete system.

B. Elevator Machines: Provide variable-voltage, variable-frequency ac-type hoisting machines. Provide solid-state power converters using 10,000 pulse per second technology.
   1. Provide regenerative system.
   2. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
   3. Provide means for absorbing regenerated power when elevator system is operating on standby power.
   4. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Specification Section.

D. Roller Guides: Provide roller guides at top and bottom of car and counterweight frames.

E. Car Frame and Platform: Welded steel units.

2.3 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system for each elevator or group of elevators as required to provide type of operation system indicated.

B. Single-Car Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:

1. Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel. Manual operation causes automatic operation to cease.
2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.
3. Nuisance Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
4. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car will respond only to car calls, not to hall calls.

2.4 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with a uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for a predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.5 FINISH MATERIALS

A. General: Provide the following materials and finishes for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated:

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.

C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.

D. Satin Stainless Steel: ASTM A666/A666M6, Type 304, with No. 4, directional satin finish.

E. Stainless-Steel Bars: ASTM A276/A276M, Type 304.

F. Stainless-Steel Tubing: ASTM A554, Grade MT 304.

G. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063.

H. Nickel Silver Extrusions: ASTM B151/B 151M, Alloy UNS No. C74500 or No. C77600.

I. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications; Type BKV for panel backing.
   1. Color, Texture, and Pattern: As selected by Architect from plastic-laminate manufacturer's full range of products. Refer to Interior Finish Legend on Drawings.

2.6 CAR ENCLOSURES

A. General: Provide manufacturer's standard enameled-steel car enclosures with removable wall panels, suspended ceiling, trim, accessories, access doors, doors, power door operators, sills (thresholds), lighting, and ventilation.
   1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
   2. Provide finished car including materials and finishes specified below.

B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:
   1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch (16-mm) nominal thickness.
   2. Floor Finish: RSF1 (rubber flooring to match the corridor), As specified in a Division 09 Section.
   3. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from patterned stainless-steel sheet.
   4. Fabricate car with recesses and cutouts for signal equipment.
   5. Fabricate car door frame integrally with front wall of car.
   6. Stainless-Steel Doors: Flush, hollow-metal construction, fabricated from stainless steel.
   7. Sight Guards: Provide sight guards on car doors.
   8. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
   9. Ceiling: Satin stainless steel panels with LED downlights.
   10. Handrails: Manufacturer's standard handrails, of metal and finish indicated.

2.7 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.
   1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.

B. Materials and Fabrication: Provide manufacturer's standards but not less than the following:
   1. Stainless-Steel Frames: Formed stainless-steel sheet.
   2. Stainless-Steel Doors: Flush, hollow-metal construction, fabricated from stainless steel.
   3. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
   4. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.8 SIGNAL EQUIPMENT

A. General: Provide signal equipment for each elevator or group of elevators with hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements of acrylic or other permanent, non-yellowing translucent plastic.

B. Car Control Stations: Provide manufacturer's standard recessed car control stations. Mount in return panel adjacent to car door, if not otherwise indicated.

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)." On activation, system dials preprogrammed number of monitoring station (within building) and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Fire Department Communication System: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 28 Section "Digital Addressable Fire Alarm System."

E. Car Position Indicator: For passenger elevator cars, provide illuminated-signal type, digital-display type, or segmented type, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.
   1. Include travel direction arrows if not provided in car control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing for each single elevator or group of elevators, but not less than one station for each four elevators in a group.
   1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
   2. Provide units with direction-indicating buttons; two buttons at intermediate landings; one button at terminal landings.

G. Hall Lanterns: Provide units with illuminated arrows, but provide single arrow at terminal landings.
   1. Provide units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
   2. Place lanterns either above or beside each hoistway entrance, unless otherwise indicated. Mount at a minimum of 72 inches (1829 mm) above finished floor.
   3. With each lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
      a. At manufacturer's option, audible signals may be placed on each car.

H. Hall Position Indicators: Provide illuminated-signal type or digital-display type, located above each hoistway entrance at ground floor. Provide units with flat faceplate for mounting with body of unit recessed in wall.
   1. Integrate ground-floor hall lanterns with hall position indicators.

I. Signage and Identification:

1. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.
2. For emergency stretcher-accessible elevators, provide three-inch "Star of Life" emblem, applied between 78 inches and 84 inches above floor, to hoistway door jamb.

2.9 PASSENGER/SERVICE ELEVATORS

A. Elevator No. 1 – Service Elevator:
1. Basis of Design Product: Otis GEN3EDGE .
2. Type: Gearless traction passenger elevator.
3. Machine Location: Inside the hoistway, at top.
4. Rated Load: 3500 lb (1588 kg).
5. Rated Speed: 150 fpm.
6. Stops: Two.
7. Openings: Front and rear.
8. Operation System: Single car automatic operation.
9. Power Supply: 480VAC, 60 Hz, 3 Phase.
10. Auxiliary Operations:
    a. Standby power operation.
    b. Automatic dispatching of loaded car.
    c. Nuisance call cancel.
    d. Independent service.
    e. Loaded-car bypass.
11. Cab Dimensions: As follows, unless otherwise indicated.
    a. Clear Inside Dimensions: 6'-5 9/16" (1970 mm), unless otherwise indicate
    b. Clear Inside Dimensions: 5'-6 1/8" (1543 mm), unless otherwise indicated
    c. Inside Height: 9'-9" (2971.8 mm), unless otherwise indicated
12. Car Enclosures: As follows:
    a. Front Walls: Satin stainless steel with integral car door frames.
    b. Car Fixtures: Satin stainless steel.
    c. Side and Rear Wall Panels: Patterned Stainless steel.
    d. Reveals: Satin stainless steel.
    e. Door Faces (Interior): Satin stainless steel.
    f. Door Sills: Aluminum.
    g. Ceiling: Satin stainless steel panels.
    h. Lighting: LED lighting.
    i. Handrails: Flat bar, continuous, satin stainless steel.
    j. Floor prepared to receive finish flooring as specified in Division 09, RSF1 (rubber flooring to match the corridor)
13. Hoistway Entrances: Front and rear, as follows:
    a. Width: 3'-6" (1067 mm)
    b. Height: 84 inches (2134 mm).
    c. Type: Single-speed, side opening.
    d. Fire-Protection Rating: Same as that scheduled for surrounding shaft wall assembly.

e. Frames: Satin stainless steel.
f. Doors: Satin stainless steel.
g. Sills: Aluminum.

14. Hall Fixtures: Manufacturer's Flush, LDE displays, satin stainless steel.
15. Additional Requirements: As follows:
    a. Provide inspection certificate in each car, mounted under acrylic cover with satin stainless-steel frame.
    b. Provide protective blanket hooks and two complete sets of full-height padded blankets in each car.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
   1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to minimize transmission of vibrations to structure and thereby minimize structure-borne noise from elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and direction of travel.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows, unless otherwise indicated:

1. Place hall lanterns either above or beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for each elevator used for construction purposes:
   1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
   2. Provide strippable protective film on entrance and car doors and frames.
   3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
   4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
   5. Do not load elevators beyond their rated weight capacity.
   6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
   7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s). Refer to Section 01 79 00 - Demonstration and Training.

B. Instruct Owner's personnel in proper use, operation, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

C. Check operation of each elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

D. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION