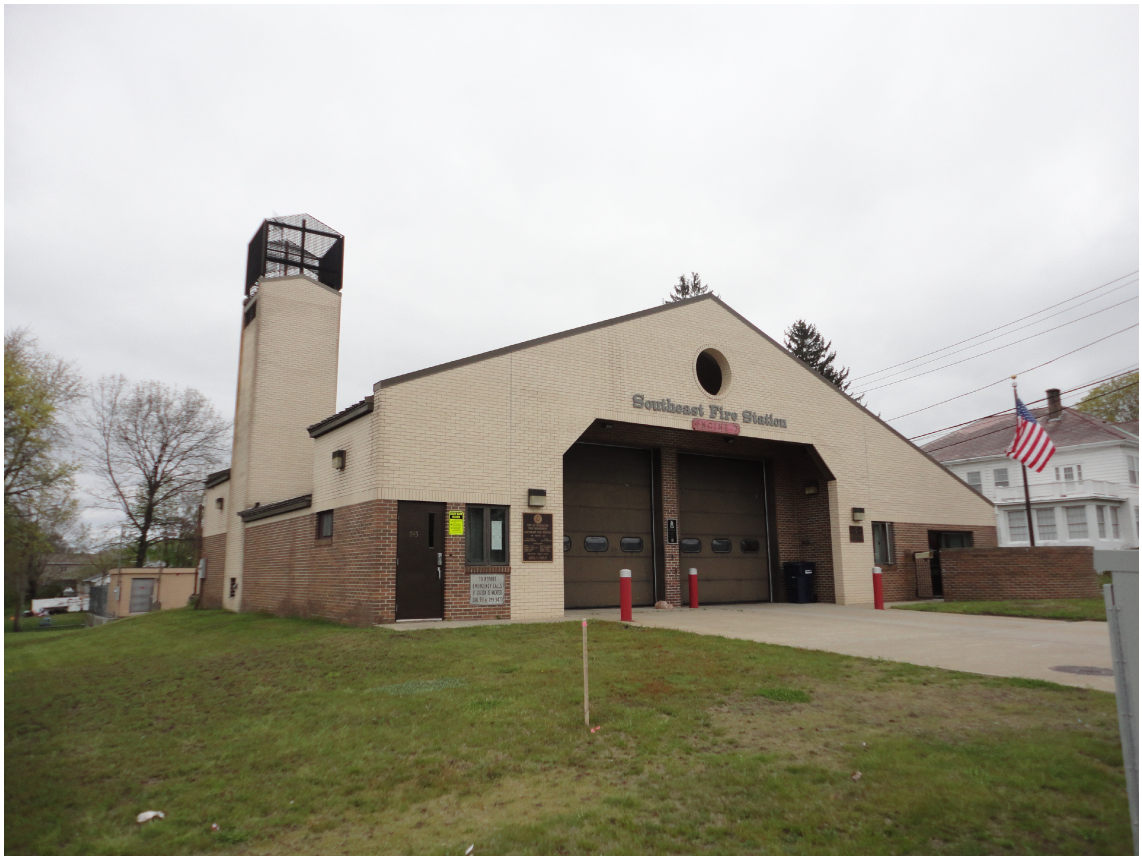
SOUTHEAST FIRE STATION
BATHROOM RENOVATION

for the

City of Worcester
Fire Department
Worcester, MA 01610

August 2025



Bid Set Specifications

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SECTION 01 11 00

SUMMARY OF WORK

I PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. This section supplements the Conditions of the Contract, Prime Requirements, Drawings, and all other parts of the Contract Documents.

B. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.02 REQUIREMENTS INCLUDED

A. Work under this Contract.
B. Examination of Site and Documents.
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1.03 WORK UNDER THIS CONTRACT

A. The work to be done under this contract consists of executing and completing all work required for the Bathroom Renovation at the Southeast Fire Station, located at 745 Grafton St, Worcester, MA 01604.

B. The Prime Contractor for this project will be the General Contractor, who will be solely in control of the performance or subcontracting of all work required. Where work to be subcontracted would normally be performed by licensed tradesmen (i.e. electrical disconnection of fans) the Prime contractor must arrange for licensed individuals to perform that work.

C. The scope of work, without limiting the generality thereof, includes all labor, materials, equipment and services required to perform the work described fully in the Drawings and Specifications and includes, but is not limited to the following major work:

1. Demolition of existing walls and bathroom fixtures. Construction and installation of new walls, a new shower enclosure, sink, and door to create a new shower room.

D. The following major elements will be performed by the Owner, under separate contracts, for which the Prime Contractor has a coordinating responsibility:

1. None. All work will be done by the Contractor.

E. The following major elements will be furnished by the Owner, for installation by the Contractor or sub-contractors:

1. None. Furnish all materials required for the complete project.

F. Reference to Drawings: The work to be done under this Contract is shown on the Drawings listed at the end of this Section.

G. Prevailing Wage: The Massachusetts Standard Labor Wage rates, as outlined in the exhibits, will be used in the construction of this project

1.04 EXAMINATION OF SITE AND DOCUMENTS

A. A pre-bid meeting will be held at the job site on the date and at the time indicated in the Invitation to Bid.

B. Bidders may also visit the site on a non-holiday weekday acceptable to the Owner, between the hours of 9:00 AM and 5:00 PM to visually inspect the location of the work and existing conditions that may affect new work.

C. The bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which the work is to be carried out. The Owner and Designers will not be responsible for errors, omissions, and/or charges for extra work arising from the Prime Contractor's or Subcontractor's failure to familiarize themselves with the contract documents. The Prime Contractor and Subcontractors acknowledge that they are familiar with the conditions and requirements of the contract documents where they require, in any part of the work a given result to be produced, and that the contract documents are adequate and will produce the required results.

1.05 CONTRACT METHOD

A. Work under this contract shall be lump sum price, for the scopes of work as described in these specifications and shown on the Drawings.

1.06 WORK SEQUENCE

A. The Work will be conducted in the following sequence of demolition/construction:

1. Actual sequence of the work will be left to the discretion of the Contractor, who will prepare a construction schedule showing the sequence and duration of work, for review and approval by the Owner.

2. Do not remove more roof than can be replaced in the same day.

1.07 SUPERVISION OF WORK

A. The Prime Contractor shall be held directly responsible for the correct installation of all work performed under this Contract. The Prime Contractor must make good repair, without expense to the Owner, of any part of the new work, or existing work to remain, which may become inoperative on account of leaving the work unprotected or unsupervised during construction of the system or which may break or give out in any manner by reason of poor workmanship, defective materials or any lack of space to allow for expansion and contraction of the work during the Prime Contractor's warranty period, from the date of final acceptance of the work by the Owner.

B. The Prime Contractor shall furnish a competent Massachusetts licensed superintendent satisfactory to the Owner and to the Designer. The licensed superintendent shall supervise all work under this contract and who shall remain on duty at the site throughout the Contract period while work is in progress.

1. Submit the name and resume of the superintendent for approval to the Architect. Include experience with projects of equal size and complexity.

1.08 PRIME CONTRACTOR'S USE OF PREMISES

A. Use of the Site: Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use.

2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Schedule and perform work to afford minimum of interruption to normal and continuous operation of utility systems. Submit for approval, a proposed schedule for performing work; including construction of new utilities, re-routing of existing utilities and final connection of new work to existing work. Schedule shall indicate shutdown time required for each operation.

C. The Prime Contractor shall schedule as per Section 01.50.00 - Temporary Facilities and Controls, the shutting down or interrupting any utilities, services or facilities which may affect the operation of the building outside the area of work or other buildings, services or facilities.

D. The Prime Contractor can gain access to the premises during the hours specified below. In addition the Prime Contractor and his personnel will limit themselves only within the working premises during working hours. If work needs to be scheduled during times other than those listed below, Prime Contractor shall inform the Owner one week prior to work.

1. Deliveries: 7:00 AM to 6:00 PM.
2. Work on site: 8:00 AM to 5:00 PM
3. Weekends: with Owner's prior approval.
4. Holidays: with Owner's prior approval.

E. The Prime Contractor shall verify that Subcontractors have visited the site and included all costs associated with the location of the project, and any restriction or limitations the location of the project may pose.

F. All contractors shall at all times conduct their operations in a courteous, professional manner while on the project or in the vicinity of the project. Harassment, offensive language or behavior will not be permitted on the site.

G. The Owner can neither accept nor assume responsibility for the security of the Contractor's material or equipment which is lost, stolen or vandalized. The Contractor is advised to exert caution in placement and storage of his equipment and material.

H. Parking: Parking within the parking lot will be limited. Contractors should expect to park on the side street or in an adjacent lot.

I. Radios, tape players, "boom boxes", or other audio entertainment equipment, including personal entertainment devices, shall not be allowed on the project site.

J. The Contractor shall not permit smoking within the building. Locate smoking areas away from entries, outdoor intakes, and operable windows, including adjacent buildings.

K. The Contractor shall not allow the use of intoxicating beverages or non-prescription controlled substance drugs upon or about the work site.

L. The Contractor shall provide and maintain in good serviceable condition at all times, warning signs and non-combustible barriers, forms and fire resistive tarps or plastic, each of which shall be approved by the Owner, shall be suitable for the purpose, and shall be installed adjacent to each work area, for complete enclosure and/or isolation of all excavations, wells, pits, manholes, shafts, overhead areas, etc., which are associated with the work under the contract. Barriers shall be a secure fence, guardrail, cover, or similar assembly designed and erected to provide protection for concrete, protection from the weather, and to prevent accidental access. Barrier tape and/or sawhorses shall not be used as a means of such access protection.

1.09 COORDINATION

A. The Prime Contractor shall be responsible for the proper fitting of all the work and for the coordination of the operations of all Subcontractors or material and persons engaged upon the work. The Prime Contractor shall do, or cause his agents to do, all cutting, fitting, adjusting, and repair necessary in order to make the several parts of the work come together properly.

1. Examine Contract Documents in advance of start of construction and identify in writing questions, irregularities or interference to the designer in writing. Failure to identify and address such issues in advance becomes the sole responsibility of the Prime Contractor. A conflict that would cause the reduction of the normal ceiling height of any occupied space is considered to be an interference.

B. Execute the work in an orderly and careful manner with due regard to the occupants of the facility, the public, the employees, and the normal function of the facility.

C. The work sequence shall follow planning and schedule established by the Prime Contractor as approved by the Designer and the Owner. The work upon the site of the project shall commence promptly and be executed with full simultaneous progress. Work operations which require the interruption of utilities, service, and access shall be scheduled so as to involve minimum disruption and inconvenience, and to be expedited so as to insure minimum duration of any periods of disruption or inconvenience.

D. The Prime Contractor shall review the tolerances established in the specifications for each type of work and as established by Subcontractor organizations. The Prime Contractor shall coordinate the various Subcontractors and resolve any conflicts that may exist between Subcontractor tolerances without additional cost to the Owner. The Prime Contractor shall provide any chipping, leveling, shoring or surveys to ensure that the various materials align as detailed by the Designer and as necessary for smooth transitions not noticeable in the finished work.

1.10 PROJECT MEETINGS

A. Project meetings shall be held on a bi-weekly basis and as required subject to the discretion of the Owner.

B. Attendees: In addition to the Project Manager and Designer, 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 conference shall be familiar with Project and authorized to conclude matters relating to the Work.

C. In order to expedite construction progress on this project, the Prime Contractor shall order all materials immediately after the approval of shop drawings and shall obtain a fixed date of delivery to the project site for all materials ordered which shall not impede or otherwise interfere with construction progress. The

Prime Contractor shall present a list and written proof of all materials and equipment ordered (through purchase orders). Such list shall be presented at the meetings and shall be continuously updated.

D. Scheduling shall be discussed with all concerned parties, and methods shall be presented by the Prime Contractor, which shall reflect construction completion not being deferred or foreshortened. Identify critical long-lead items and other special scheduling requirements. The project schedule is to include time for submission of shop drawing submittals, time for review, and allowance for resubmittal and review.

1.11 PERMITS, INSPECTION, AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having any jurisdiction require any portion of the Work to be inspected, tested, or approved, the Prime Contractor shall give the Designer, the Owner or his/her designated representative, and such Authority timely notice (5 business days minimum) of its readiness so the Designer may observe such inspecting, testing, or approval.

B. Prior to the start of construction, the Prime Contractor shall complete application to the applicable Building Code enforcement authority for a Building Permit. Such Permit shall be displayed in a conspicuous location at the project site. The building permit fee shall be paid by the Contractor.

C. Unless otherwise specified under the Sections of the Specifications, the Prime Contractor shall pay such proper and legal fees to public officers and others as may be necessary for the due and faithful performance of the work and which may arise incidental to the fulfilling of this Contract. As such, all fees, charges, and assessments in connection with the above shall be paid by the Prime Contractor.

D. Prime Contractor and specialized Subcontractors as applicable shall identify all permits (other than Prime building permit) required from Authorities having jurisdiction over the Project for the construction and occupancy of the work. The Prime Contractor shall prepare the necessary applications and submit required plans and documents to obtain such permits in a timely manner, and shall furnish the required information to the Building Official and obtain the required permits as early as practicable after award of the Contract.

E. Prior to the start of construction, the Prime Contractor shall complete applicable applications, permits, and notifications to the MADEP, such as the Demolition/Construction form BWP AQ-06, and pay the required fees. These forms must be submitted at least 10 working days in advance of any regulated activity on the site. Demolition permits must be submitted for any work involving demolition, new construction and renovation.

1.12 CUTTING, CORING, AND PATCHING, UNLESS OTHERWISE INDICATED

A. The Prime Contractor shall coordinate that the work of the Subcontractor is not endangered by any cutting, coring, excavating, or otherwise altering of the work and shall not allow the cutting or altering the work of any Subcontractor except with the written consent of the Designer.

B. Performance:

1. Execute cutting and patching by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

(a) In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.

(b) Prior to cutting and structural steel or concrete work, contact Designer and Project Structural Engineer in writing. Do not cut any structural steel and concrete work until approval has been granted by the Designer and the Project Structural Engineer.

2. Employ original installer or fabricator to perform cutting and patching for:

(a) Weather-exposed or moisture-resistant elements.
(b) Sight-exposed finished surfaces.

3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

4. Restore work which has been cut or removed; install new products matching existing to provide completed Work in accordance with requirements of Contract Documents.

5. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

6. Patch with seams which are durable and as invisible as possible. Flash and seal all penetration of exterior work. Comply with specified tolerances for the work.

7. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.

   (a) Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.

8. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

   (a) For continuous surfaces, refinish to nearest intersection.
   (b) For an assembly, refinish entire unit.

C. Existing Utilities Services:

1. Interruptions to critical existing utility services will not be allowed except as scheduled per Section 01.50.00 - Temporary Facilities and Controls.

2. The Prime Contractor shall locate and record on Drawings all existing utilities along the course of the work by such means as the Designer and the Owner may approve, and shall preserve such marked locations until the work has progressed to the point where the encountered utility is fully exposed and protected as required. It shall be the Prime Contractor's responsibility to notify the proper authorities and/or utility company before interfering therewith.

3. Existing utilities that are indicated on the Drawings or whose locations are made known to the Prime Contractor prior to excavations, though accuracy and information as to grades and elevations may be lacking, shall be protected from damage during the excavation and backfilling operations and, if damaged by the Prime Contractor, it shall be repaired by the Prime Contractor at his/her own expense.

4. All exposed conduits, wires, and/or cables shall be provided with sufficient protection and support to prevent failure, fraying, or damage due to backfilling or other construction operations.

1.13 DEBRIS REMOVAL

A. The Prime Contractor shall coordinate the removal of all demolition and construction waste including waste by all Subcontractors from the job site on a daily basis.

B. Debris shall be legally disposed of in a D.E.P. approved disposal site.

C. The Prime Contractor shall bear responsibility for maintaining the building and site clean and free of debris, leaving all work in clean and proper condition satisfactory to the Owner and the Designer. The Prime Contractor shall ensure that each of the Subcontractors clean up during and immediately upon completion of

their work. Clean up includes the following tasks:

1. Remove all rubbish, waste, tools, equipment, appurtenances caused by and used in the execution of work.

2. Sweep for nails using magnetic nail sweepers, daily.

D. Prevent the accumulation of debris at the construction site, storage areas, parking areas, and along access roads and haul routes.

E. Provide containers for deposit of debris and schedule periodic collection and disposal of debris.

F. Prohibit overloading of trucks to prevent spillage on access and haul routes.

G. The Prime Contractor shall be responsible for proper disposal of all construction debris leaving the site.

1.14 FIELD MEASUREMENTS

A. Although care has been taken to ensure their accuracy, the dimensions shown for existing items and structures are not guaranteed. It is the responsibility of the Prime Contractor to verify these dimensions in the field before fabricating any construction component. No claims for extra payment due to incorrect dimensions will be considered by the Owner.

1.15 SAFETY REGULATIONS

A. This project is subject to compliance with Public Law 91 596 "Occupational Safety and Health Act" latest edition (OSHA 29 CFR 1926), with respect to all rules and regulations pertaining to construction, including Volume 36, numbers 75 and 105, of the Federal Register, as amended, and as published by the U.S. Department of Labor.

B. Hazardous Waste Generation: Any work generating Hazardous or so-called Universal Wastes will comply with all requirements of 310 CMR 30.000. The proper storage, use and disposal of any hazardous chemicals or substances brought on site by the Contractor are the responsibility of Contractor. The Owner will not be responsible for any hazardous materials left on site, the cost to remove these materials will be the Contractor's responsibility. All hazardous wastes generated as a result of demolition and remodeling shall be contained, collected, segregated, labeled per all applicable federal EPA, Massachusetts DEP, and Federal DOT regulations or other applicable local, state or federal hazardous waste regulations, pending the appropriate disposition.

1.16 OSHA SAFETY AND HEALTH COURSE DOCUMENTATION

A. OSHA Safety and Health Course Documentation Records: Chapter 306 of the Massachusetts Acts of 2004 requires that everyone employed at the jobsite must complete a minimum 10-hour long course in construction safety and health approved by the U.S. Occupational Safety and Health Administration (OSHA) prior to working at the jobsite. Compliance is required of Prime Contractors' and Subcontractors' on-site employees at all levels whether stationed in the trailer or working in the field. Unless the Massachusetts Attorney General's office indicates otherwise, this requirement does not apply to home-office employees visiting the site or to suppliers' employees who are making deliveries.

B. OSHA 10 cards for anyone working on site are to be submitted prior to the first requisition.

C. Documentation records shall be initially compiled by the Prime Contractor and Subcontractors, and the Prime Contractor shall create and maintain a copy of the documentation on site at all times.

1.17 DAMAGE RESPONSIBILITY

A. The Prime Contractor shall repair, at no cost to the Owner, any damage to building elements, site appurtenances, landscaping, utilities, etc. caused during demolition operation and work of this Contract.

1.18 OWNER FURNISHED PRODUCTS

A. Products indicated "N.I.C." (Not in Contract), or "E. O." (Equipment by Owner), or "O.F.O.I." (Owner Furnished Owner Installed), or other similar acronyms as defined in the contract documents will be furnished and installed by the Owner. Coordination and provision of service lines for such products shall be included under these Construction Contract Documents, if indicated. Final connections from service lines to equipment will be by the Owner, unless otherwise indicated

1.19 ASBESTOS AND HAZARDOUS MATERIALS DISCOVERY

A. If unanticipated asbestos-containing materials or other Hazardous Materials not included in Contract are discovered at any time during the course of work, the Prime Contractor shall cease work in the affected areas only and continue work in other areas, at the same time notify the Designer of such discovery. Do not proceed with work in such affected areas until written instructions are received. If removal is required, payment will be made in accordance with the contract unit prices bid for each respective material. In the absence of unit prices, costs shall be negotiated or otherwise established prior to commencement of removal, in accordance with provisions of the Contract.

B. The Owner or Designer will work with the Contractor to initiate removal or encapsulation of the asbestos. An extension of the completion date may be granted equal to the time lost. Proper notification must be made to the MADEP through the ANF-001 form, and the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

I. PART I - GENERAL

1.01 GENERAL PROVISIONS

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.

1.02 SUMMARY

A. Without limitations, coordination will include Critical Path Method Scheduling (CPM), coordination of submittals, coordination of all elements of the Work, and coordination of contract closeout.

B. Description:

1. Coordinate scheduling, submittals, and work of the various trades and elements of the Work to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

2. Coordinate sequence of the Work to accommodate Occupancy.

C. Meetings:

1. Prior to commencement of the Work, the Contractor shall meet in conference with the Owner and Architect to discuss and develop mutual understandings relative to administration of the quality assurance program, safety program, labor provisions, the schedule of work, and other procedures.

2. The Architect will regularly conduct job meetings, and keep the Owner informed of the progress and quality of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work. The Architect's minutes of meetings shall be the official minutes kept on the Project. The Architect shall provide copies of the meeting minutes to the Contractor and Owner.

3. In addition to progress meetings, hold coordination meetings and pre-installation conferences with personnel and Sub-Contractors to assure coordination of the Work. The coordination meetings are to be separate from the commissioning or commissioning meetings.

D. Coordination of Submittals:

1. Schedule and coordinate submittals.

2. Coordinate work of various trades having interdependent responsibilities for installing, connecting to, and placing in service such equipment.

3. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other trades.

4. Change orders caused by lack of coordination will not be entertained.

1.03 PROJECT MANAGEMENT

A. Project Superintendent:

1. The Contractor shall employ a Superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The Superintendent shall represent the Contractor, and

communications given to the Superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

2. The Superintendent shall be a competent and responsible employee, satisfactory to the Owner, who is regularly employed by the Contractor and is designated by the Contractor as its representative to be in full time attendance at the Project site throughout the construction of the Work.

3. The Superintendent shall be responsible for coordinating all the Work of the Contractor and the Subcontractors. The Superintendent shall be licensed consistent with the Massachusetts Building Code.

4. The Superintendent's resume shall be submitted to the Owner prior to commencement of construction and must demonstrate to the Owner's reasonable satisfaction that the Superintendent has performed the same duties on previous construction projects similar to the Project.

5. The Superintendent shall attend each job meeting.

B. The Contractor must supply to the Owner the home telephone number of a responsible person who may be contacted during non-work-hours for emergencies on the Project.

C. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them, and whenever the Owner shall notify the Contractor, in writing, that any worker is, in its 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 Owner.

1.04 FIELD COORDINATION

A. The Contractor shall submit for approval to the Owner a detailed operational plan showing the sequence of operations prior to commencement of any work at the site. The Owner must approve any changes to this operational plan.

B. The work must be completed in a continuous uninterrupted operation. The Contractor must use sufficient personnel and adequate equipment to complete all the necessary work requirements within a minimum period of time.

C. Project scopes of limited complexity or limited utility installation will not require coordination drawings. The Prime Contractor remains responsible for field coordinating the work of all trades, to see that it comes together without conflict or loss of functionality.

1. Where field coordination is performed, the Prime Contractor shall advise the Designers of any conflict or field condition which results in the system being installed other than as designed.

2. In such instances, contractors are expected to propose alternative routes based on field conditions revealed through the performance of the demolition. Rerouting shall not be performed, however, until first approved by the Designers. No additional compensation will be due for field coordination efforts.

3. Where rerouting of utilities differently than designed creates a conflict with another trade, which was not forseen or properly coordinated between the contractors, the conflicting utility shall be revised at no expense to the Owner, to eliminate the conflict.

II. PRODUCTS (Not Used)

III. EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

I. PART I - GENERAL

1.01 GENERAL PROVISIONS

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.

1.02 REQUIREMENTS INCLUDED

A. Procedures and requirements for submission and review of progress schedules and reports.

1.03 RELATED SECTIONS

A. Section 01 11 00 – SUMMARY OF WORK

1. Project meetings.

B. Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

1. Progress and coordination meetings.

C. Section 01 33 00 - SUBMITTAL REQUIREMENTS

1. Project reports.
2. Schedule of values.
3. Shop drawings, product data, and samples.

1.04 SCHEDULES

A. The Prime Contractor is fully responsible for the project schedule, including the scheduling of the work of all sub-contractors.

B. At the pre-construction meeting, the Prime Contractor shall provide a draft overall construction schedule, showing activities for the performance of the work through project completion. If Notice to Proceed has not been issued and a start date not established, the contractor shall prepare a duration schedule, showing the time period associated with each activity, without filling in specific dates.

1. The Owner will review the draft schedule and advise of any critical dates when work cannot be performed or when work must occur to permit the continued use of the occupied facility.

2. Revise the draft schedule to reflect the Owner’s limitations, and resubmit for record.

C. If action submittals are not made at the time of the construction schedule, prepare a submittal schedule. The submittal schedule shall:

1. Identify all items to be submitted for the project.

2. Identify the date by which the submittal needs to be approved to leave adequate time for ordering, manufacturing and shipping to the site in time for installation by the scheduled date.

3. Identify the date the submittal will be made to the designers, to leave adequate time for review. Allow 7 days for submittals requiring only the Architect’s review and 10 days for submittals requiring review by the engineers.

D. Weekly, prepare and submit a look-ahead schedule showing the major activities to be performed over the next two weeks, by trade. Update the look-ahead weekly; a two-week look ahead schedule does not mean the schedule is to be updated bi-weekly.

E. Monthly, update the overall construction schedule to reflect any slippage or acceleration in the project's performance.

F. The format of the schedules is not mandated, however, the schedules must be readily understandable. The Architect reserves the right to request an alternate format if the schedules do not clearly communicate the required information.

1.05 REQUESTS FOR INTERPRETATION (RFIs)

A. Where documents are unclear, or in the opinion of the contracts appear to contain conflicts or omissions, request a formal interpretation from the designers. The format of the RFI is not mandated, but contractors are encouraged to ask questions as clearly as possible. Designers are only required to rely on the information provided in the RFI when providing a response.

1. Any RFIs from sub-contractors should be channeled through the Prime contractor and not sent to the designers directly.

B. Should the answer require clarification, the designers may prepare sketches, memos and/or bulletins to memorialize the direction being given. The Prime Contractor is responsible for disseminating any clarifications given to sub-contractors as appropriate.

C. If the direction given results in a monetary change to the project cost, contractors must follow the procedures for contract modifications. Work performed based on direction given the in response to an RFI, without approval of a proposed change order, will be considered to be a no-cost change.

D. The Prime Contractor shall maintain an RFI log, recording all questions and answers, and referencing any SK's issued and change orders resulting from the clarifications. The log shall be updated and circulated to all parties each time an RFI is answered.

1.06 CONSTRUCTION CHANGE LOG

A. The Prime Contractor shall maintain a log of all construction changes, listing the Proposed Change Order (PCO) by number with a single line summary of the change and a listing of which PCOs were included in which Change Order.

B. The PCO log shall be provided fore review at each construction meeting.

II. PRODUCTS (Not Used)

III. EXECUTION (Not Used)

END OF SECTION

SECTION 01.33.00

SUBMITTALS

I. PART 1 - GENERAL

1.01 GENERAL PROVISIONS

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.

1.02 RELATED DOCUMENTS

A. This Section supplements the General Conditions.

B. Consult the individual sections of the specifications for the specific submittals required under those sections and for further details and descriptions of the requirements

1.03 GENERAL PROCEDURES FOR SUBMITTALS

A. Timeliness - The Contractor shall transmit each submittal to the Architect sufficiently in advance of performing related Work or other applicable activities so that the installation is not delayed by processing times, including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect in advance of the Work.

B. Sequence - The Contractor shall transmit each submittal in a sequence which will not result in the Architect's approval having to be later modified or rescinded by reason of subsequent submittals which should have been processed earlier or concurrently for coordination.

C. Contractor's Review and Approval - Only submittals received from and bearing the stamp of approval of the Contractor will be considered for review by the Architect. Submittals shall be accompanied by a transmittal notice stating name of Project, date of submittal, "To", "From" (Contractor, Subcontractor, Installer, Manufacturer, Supplier), Specification Section, or Drawing No. to which the submittal refers, purpose (first submittal, resubmittal), description, remarks, distribution record, and signature of transmitter.

D. Architect's Action - The Architect will review the Contractor's submittals and return them with one of the following actions recorded thereon by appropriate markings:

1. Final Unrestricted Release: Where marked "No Exceptions Taken" the Work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents.

2. Final-But-Restricted Release: When marked "Note Markings" or “Comments Attached” the Work may proceed provided it complies with the Architect's notations or corrections on the submittal and complies with the requirements of the Contract Documents. Acceptance of the Work will depend on these compliances.

3. Returned for Resubmittal: When marked "Resubmit" or "Rejected" the Work covered by the submittal (such as purchasing, fabrication, delivery, or other activity) should not proceed. The submittal should be revised or a new submittal resubmitted without delay, in accordance with the Architect's notations stating the reasons for returning the submittal.

E. Processing - All costs for printing, preparing, packaging, submitting, resubmitting, and mailing, or delivering submittals required by this contract shall be included in the Contract Sum.

1.04 OR EQUALS

A. Definition - Whenever a specification section names one or more brands for a given item, and the Contractor wishes to submit, for consideration, another brand, the submission shall be considered an "or-equal" or a "material substitution". For the purposes of this Contract, the terms "or-equal" and "material substitution" shall be considered synonymous.

B. In no case may an item be furnished on the Work other than the item named or described, unless the Architect, with the Owner's written concurrence, shall consider the item equal to the Item so named or described.

C. The equality of items offered as "equal" to items named or described shall be proved to the satisfaction of the Architect at the expense of the Contractor submitting the substitution.

1.05 SUBMISSION OF PRODUCT DATA

A. The Contractor shall submit an electronic copy of Product Data, in Adobe Acrobat (pdf) format to the Architect. All such data shall be specific and identification of material or equipment submitted shall be clearly marked or highlighted. Data of general nature will not be accepted.

B. Product Data shall be accompanied by a transmittal notice. The Contractor's stamp of approval shall appear on the printed information itself, in a location which will not impair legibility.

C. Product Data returned by the Architect as "Rejected" shall be resubmitted until the Architects approval is obtained.

D. When the Product Data are acceptable, the Architect will stamp them “No Exceptions Taken”, and return 1 copy to the Contractor. The Contractor shall provide and distribute additional copies as may be required to complete the Work.

E. The Contractor shall maintain one full set of approved, original, Product Data at the site.

1.06 SUBMISSION OF SHOP DRAWINGS

A. Shop Drawings shall be complete, giving all information necessary or requested in the individual section of the specifications. They shall also show adjoining Work and details of connection thereto.

B. Shop Drawings shall be for whole systems. Partial submissions will not be accepted.

C. The Architect reserves the right to review and approve shop drawings only after approval of related product data and samples.

D. Shop drawings shall be properly identified and contain the name of the project, name of the firm submitting the shop drawings, shop drawing number, date of shop drawings and revisions, Contractor's stamp of approval, and sufficient spaces near the title block for the Architect's stamp.

E. The Contractor shall submit to the Architect three (3) black line prints of each shop drawing or one electronic copy in Adobe Acrobat (pdf) format, at the Architect’s discretion. Prints may be mailed, delivered in roll form or emailed. Each submittal shall be accompanied by a transmittal notice bearing the Contractor's approval stamp.

F. When the Architect returns a marked submittal with the stamp "Resubmit" or "Confirm", the Contractor shall correct the original drawing or prepare a new drawing and resubmit three prints or an electronic version thereof to the Architect for approval. This procedure shall be repeated until the Architect's approval is obtained.

G. When the Architect returns submittal with the stamp "No Exceptions Taken", the Contractor shall provide and distribute the prints for all Contractor and Subcontractors use.

H. The Contractor shall maintain one full set of approved shop drawings at the site.

1.07 SUBMISSION OF SAMPLES

A. Unless otherwise specified in the individual section, the Contractor shall submit two specimens of each sample.

B. A transmittal notice with the Contractors stamp of approval shall be included with all sample submittals.

C. Samples shall be of adequate size to permit proper evaluation of materials. Where variations in color or in other characteristics are to be expected, samples shall show the maximum range of variation. Materials exceeding the variation of approved samples will not be approved on the Work.

D. Samples that can be conveniently mailed shall be sent directly to the Architect, accompanied by a transmittal notice. All transmittals shall be stamped with the Contractor's approval stamp of the material submitted.

E. All other samples shall be delivered at the field office of the Project Representative with sample identification tag attached and properly filled in.

F. If a sample is rejected by the Architect, a new sample shall be resubmitted in the specified manner. This procedure shall be repeated until the Architect approves the sample.

G. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of samples whether or not particular mention is made in the specifications, at no additional cost to the Owner.

1.08 SCHEDULE OF VALUES

A. Prior to the first request for payment, the General Contractor shall submit to the Designer and Owner, a Schedule of Values of the various portions of the Work in sufficient detail to reflect various major components of each Subcontractor, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments for work under each Section. The schedule shall be prepared in such form as specified or as the Designer or the UMA Project Manager may approve, and it shall include data to substantiate its accuracy. Each item in the Schedule of Values shall include its proper share of overhead and profit. This schedule, including breakdown and values, requires the approval of the Designer and theOwner and shall be used only as a basis for the General Contractor's request for payment.

1. The General Contractor and all filed sub-bidders shall include on the Schedule of Values, a line item for “General Conditions” which shall equal roughly 10% of the respective contract value. This line items covers superintendence and management of the project, and will be paid out proportionally to the overall progress of the project.

2. Where materials are expected to be delivered to the site and requisitioned for prior to their installation, the value of the materials shall be shown separately from the value of the labor on the Schedule of Values.

3. A discreet line item for “Close Out” documentation, for each trade from which close out documents are required. Retainage is not to be used for the value of the close out effort.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

I. PART I - GENERAL

1.01 GENERAL PROVISIONS

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.

1.02 REQUIREMENTS INCLUDED

A. Temporary Facilities and Controls including the following:

1. Temporary Water.
2. Weather Protection.
3. Heating During Construction.
4. Temporary Power.
5. Hoisting Equipment and Machinery.
6. Staging.
7. Maintenance of Access.
8. Dust Control.
9. Noise Control.
10. Enclosures.
11. Cleaning During Construction.
12. Field Offices.
13. Telephone Service.
14. Sanitary Facilities.
15. Construction Barriers.
16. Parking.
17. Debris Control and Removal.
18. Safety Protection.
19. Vehicle and Equipment Protection.
20. Project Identification Sign.
21. Delivery of Materials.
22. Shut Down Notice.
23. Construction Cores.
24. Covered Walkways
25. Excavations and Field Survey Requirements

1.03 TEMPORARY WATER

A. The Prime Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his Subcontractors.

1.04 WEATHER PROTECTION

A. It is the intent of these Specifications to require that the Prime Contractor shall provide temporary enclosures and heat to permit construction work to be carried on during the months of February through March in compliance with M.G.L. Chapter 149, Section 44D(G). Under no circumstances shall the Prime Contractor suspend any work during the months of February through March because of their reluctance to provide and pay for temporary weather protection. These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of the Designer. Included in the preceding category, without limitation, are such items as site work, excavation, steel erection, erection of certain "exterior" wall panels, roofing, and similar operations.

B. "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind, and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of February through March as determined by the Designer and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The Prime Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 50 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the Prime Contractor.

1. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.
2. The Prime Contractor shall furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Designer.

1.05 HEATING DURING CONSTRUCTION

A. Not applicable. Temporary heat should not be required for this project scope.

1.06 TEMPORARY POWER

A. Contractors may utilize electrical power where available in or around the Work Area, and the Owner shall pay the cost of electricity used.

1. The use of cordless tools is strongly encouraged.

2. Contractors shall provide their own electrical cords, and cords shall not be run through, across or draped within corridors or circulation spaces used by the public. If running electrical cords across circulation spaces is unavoidable, cords shall be secured to the floor with readily visible colored duct tape, and shall be removed as soon as power is no longer needed.

B. Modification of electrical panels is not permitted, except where higher voltages are required for specialty tools. Any panel modifications may only be performed by a licensed electrician, and with the Owner's approval.

C. Generators for temporary power will be permitted, with the Owner's permission, provided they are equipped with mufflers/silencers and set up where directed by the Owner. Should noise or exhaust fumes affect the use of the building, the Owner reserves the right to suspend the use of generators.

1.07 MAINTENANCE OF ACCESS

A. The Prime Contractor shall provide and maintain for the duration of his contract, a means of access to, around and within the site, for vehicular traffic and authorized personnel. This means of access shall be construed to sustain the weight of equipment customarily engaged for use in construction projects of this type and magnitude. The Prime Contractor shall, without additional compensation from the Owner, furnish labor and materials as may be required from time to time to maintain this means of access in an acceptable condition as determined by the Designer. Pedestrian access shall provide adequate protection against falling debris, slippage, adequate lighting, warning and directional signs, and protection against construction activities.

1.08 DUST CONTROL

A. The Prime Contractor shall have all Subcontractors provide adequate means for the purpose of preventing dust caused by construction operations from creating a hazard, nuisance, and from entering adjacent occupied areas throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the Prime Contractor.

1.09 NOISE CONTROL

A. Work must be scheduled and performed in such a manner as to not interfere with the operations of the Owner. Construction work that is deemed by the Owner to be excessively noisy may be required to be done during non-normal working hours and at no additional expense.

B. Comply with requirements of authorities having jurisdiction. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

C. Execute construction work by methods and by use of equipment which will reduce excess noise.
   1. Equip air compressors with silencers, and power equipment with mufflers.
   2. Manage vehicular traffic and scheduling to reduce noise.
   3. No heavy equipment may be started or idled before 7A.M.

1.10 CLEANING DURING CONSTRUCTION

A. Unless otherwise specified under the various Sections of the Specifications, the Prime Contractor shall perform clean-up operations during construction as herein specified.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site in a legal manner. The Prime Contractor shall bear all costs, including fees resulting from such disposal.

C. Clean all dirt and debris tracked into other buildings by construction personnel, to the satisfaction of the Owner.

D. Maintain project in accordance with all local and Federal Regulatory Requirements.

E. Store volatile wastes in covered metal containers, and remove from premises.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

H. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

   1. Do not burn or bury rubbish and waste materials on site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
   3. Do not dispose of wastes into streams or waterways.
   4. Identify potential sources of cleaning water runoff and propose abatement procedures.

I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

J. Use only those cleaning materials and methods recommended by manufacturer of surface materials to be cleaned.

K. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

L. Provide on-site containers for collection of waste materials, debris, and rubbish.

M. Remove waste materials, debris and rubbish form the site periodically and dispose of at legal disposal dump site (DEP approved). Recycle where possible.

N. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

O. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

1.11 FIELD OFFICES

A. No space within the building is available for the contractor's use as field offices.

B. If permitted by the Owner, the Prime Contractor may provide a suitable field office on site for its own use. The office trailer shall be relocated if required by the Owner., and shall be secured to the site as required by the Building Code.

1.12 TELEPHONE SERVICE

A. Wired telephone service to the office trailer or project site is not required, although contractors may elect to have such service at their own expense.

B. All Designers, Superintendents and Project Managers shall maintain cellular telephones and be reachable Monday - Friday between 8AM and 5PM, and after hours for emergency calls. Phone numbers shall be listed on a Project Directory, to be submitted at the pre-construction meeting.

1.13 SANITARY FACILITIES

A. The Prime Contractor shall provide suitable toilet facilities on site, in a location as required by the Owner. Maintain chemical toilets where work is in progress and in quantity required by OSHA Code.

B. Chemical toilets and their maintenance shall meet requirements of state and local health regulations and ordinances and shall be subject to the approval the Resident Engineer and Designer.

C. If the Owner allows the use of public toilet rooms on site, the Prime Contractor shall take responsibility for maintenance and cleaning of such areas and shall leave them in first class condition equal to the accepted conditions of toilet facilities not used for construction personnel.

1.14 PARKING

A. Contractor's shall park where directed by the Owner, and move vehicles when requested by the Owner.

1. Contractors should anticipate being assigned the spaces which are the furthest from the building.

2. Access to loading docks, driveways, staff, faculty, visitor or tenant parking shall not be blocked by construction vehicles.

3. Parking in handicapped accessible spaces will not be permitted.

B. Idling of vehicles on site will not be permitted.

C. If the Owner authorizes parking on lawns, the Prime Contractor shall be responsible for repairing any damage to lawns or curbs from parked vehicles.

1.15 DEBRIS CONTROL AND REMOVAL

A. Debris shall not be permitted to accumulate or migrate and the work shall at all times be kept satisfactorily clean. Facility trash receptors shall not be used for the disposal of debris. Dumpsters shall be provided by the Prime Contractor for removal of debris for all Subcontractors.

B. Remove debris from the work site on a daily basis and dispose of same at any (private or public) DEP approved dump that the Prime Contractor may choose providing that the Prime Contractor shall make all arrangements and obtain all approvals and permits necessary from the owner or officials in charge of such dumps. During disposal process, copies of daily receipts from dumpsite shall be submitted on a regular basis.

1.16 SAFETY PROTECTION

A. At no time shall the work be left unattended without proper safety protection and shall not be left unprotected to the weather and accessible to the public. It is the responsibility of the Prime Contractor to maintain proper safety protection for the public while work is in progress or unattended.

1.17 VEHICLE AND EQUIPMENT PROTECTION

A. All construction activities shall be performed in such a manner so as not to dust, stain or damage any building elements, equipment, vehicles, etc. within general vicinity of the construction work area. Any damage to these items shall be cleaned and repaired at the expense of the Prime Contractor.

1. All construction vehicles and equipment on site shall be effectively disabled and secured when not in use.

1.18 PROJECT IDENTIFICATION

A. No project sign is required by the Owner.

B. If the Contractor wishes to provide a project sign, at his own expense, the Owner reserves the right to approve the content and appearance of the sign.

C. Any signs will be located on site where directed by the Owner, and shall be relocated or removed if the Owner so directs.

1.19 DELIVERY OF MATERIALS

A. All Materials shall be delivered to the Contractor's or Sub-Contractor's warehouse or may be delivered to the site if the Contractor's representative is present to receive them.

B. No materials will be received by the Owner's personnel.

1.20 SHUT DOWN NOTICE

A. The Contractor shall notify the Owner, at least fourteen (14) calendar days in advance, of the need for any utility shut down to install or modify any utilities or building systems. The shutdown request shall indicate:

1. The utility to be shutdown.
2. The duration of the shutdown.
3. The spaces anticipated to be affected by the shutdown.

B. Shutdowns involving sprinkler systems or fire alarm systems, for which the Authority Having Jurisdiction (AHJ) requires a fire watch, the contractor performing the shutdown shall provide and pay for the fire watch at no additional cost to the Owner.

C. Utility shutdowns affecting other buildings will be limited to occur after normal working hours. No additional compensation will be paid for overtime.

II. PART II - PRODUCTS (Not Used)

III. PART III - EXECUTION (Not Used)

END OF SECTION
01.50.00

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, are hereby made a part of this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching work not specified elsewhere.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements of this Section apply to all Sections of the Specifications, including mechanical and electrical installations.

C. Any finished new work required to be cut out due to lack of coordination and scheduling, will be repaired by the trade causing cutting and patching to be done. This work will be done at no additional cost to the Owner.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures seven (7) days in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching will be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

a. Foundation construction.

b. Bearing walls.
c. Structural concrete.
d. Lintels.
e. Structural decking.
f. Miscellaneous structural metals.
g. Piping, ductwork, and equipment.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Primary operational systems and equipment.
b. Air or smoke barriers.
c. Water, moisture, or vapor barriers.
d. Membranes and flashing.
e. Control systems.
f. Communication systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with material in such a manner so as not to void any existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

B. Lumber: Where cutting of lumber is required for the installation of utilities or recessed items such at toilet room accessories, or for the incidental replacement of damaged or unsuitable framing materials, new materials used to patch, sister, header or box out openings shall be kiln dried, stud grade S-P-F dimensional lumber with a dressed size of 1½" x the depth of the members receiving the work.

1. Use pressure-treated lumber when in contact with ground, masonry, concrete, or for roof blocking, with CCA preservative and a minimum retention rate of 0.25 pcf. Treat all cut ends by touching up in field with preservative. Use only galvanized fasters and separate from materials which will react with preservative by using a separation sheet of peel-and-stick bituminous flashing tape.

C. Concrete Masonry Unit (CMU) walls shall be patched by toothing out cut, broken, or missing blocks and installing full masonry units. New block shall match the existing block being patched in height, width, and thickness.

1. Hollow masonry walls can be patched with non-loadbearing CMU meeting ASTM C129.

2. Grouted masonry walls shall receive loadbearing block meeting ASTM C90 and shall be grouted fully.
3. Where patching involves more than three courses of block, install 9 gauge ladder-type wire reinforcement.
4. Mortar shall be Type N. Tool joints to match existing. If adjacent block has received a parge coat, paint, or block filler, finish the patch material to match existing.

D. Grout, where used to close annular space around CMU wall penetrations, shall be:

1. Non-shrink type, prepackage and pre-proportioned, requiring only the addition of potable water before use, meeting or exceeding the following standards:

    a. General Properties: ASTM C 1107-02
    b. Compressive Strength: ASTM C 109
    c. Bond Strength: ASTM C 882

E. Metal Lintels meeting ASTM A36/ A36M.

1. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit.

    a. 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, unless otherwise indicated.

2. Finish: Zinc-Rich Primer: Urethane zinc rich primer compatible with topcoat Specified in Section 099000 - PAINTS AND COATINGS. Provide primer with a VOC content of 250 g/L (2.8 lb/gal.) or less per OTC and HAPS COMPLIANT STANDARDS PER 2010 standards when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Provide Tnemec Series 394 Perimerprime at 3.0 mils DFT, PPG PMC Amercoat 68 MCZ Zinc Rich Primer, or equal by DuPont, Keeler and Long.

3. Miscellaneous Materials and Supports:

    a. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
    b. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete, where used to patch abandoned penetrations in floors, shall be:

1. Normal weight concrete proportioned in accordance with ACI 211.1 and ACI 30 for 4,000 psi compressive strength @ 28 days.
2. At openings over 6" wide, provide ASTM A 615/A 615M, Grade 60, deformed reinforcing bars doweled into to the existing slab 48" on center, both sides, staggered.
3. At horizontal openings less than 6" wide, chip out the top of the opening to enlarge it, creating a tapered or conical hole to patch, such that the patch material cannot drop through the hole.

G. Gypsum Board: Patch gypsum board with ASTM C-1396 board materials of a thickness to match existing.

1. Patches in rated assemblies shall be made with Type X materials.
2. Patches in wet areas shall be made with MR (moisture resistant) materials.
3. Joints and fasteners shall receive three (3) coats of setting or drying type joint compound (contractor’s opinion), sanded and feathered in successive wider applications to deliver a Level 4 finish to the patched area.

H. Paint, where touching up painted surfaces which received cutting or patching, shall meet the quality specified in Section 09 90 00 – PAINTING. Match any texture of the surface being painted with suitable products.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with parties involved in cutting and patching. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. All cutting and patching by all trades shall be done under direction and coordination of the General Contractor. Accurately lay out all conduit runs, piping, recessed items, etc.

C. Inspect existing conditions of project, including elements subject to damage or to movement, during cutting and patching.

D. After uncovering work, inspect conditions affecting installation of products, or performance of work.

E. Report unsatisfactory or questionable conditions to the Architect in writing; do not proceed with work until Architect has provided further instructions.

F. No holes or slots shall be drilled through any structural member. Inspect holes after finishes have been removed to assure that substrate is not structural. No holes to be blindly drilled through walls, ceilings, etc.

3.2 PROTECTION

A. Protect existing trees, plants, roads, walls etc. to remain. Special protection of any lawns and planting around buildings is the responsibility of the Contractor. Contractor will replace any planting killed or damaged by construction operations.

3.3 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building.

E. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

F. Provide devices and methods to protect other portions of project from damage.

G. Provide protection from elements for that portion of the project, which may be exposed by cutting and patching work.

3.4 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction.

1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or diamond core drill.
4. Comply with requirements of applicable Sections of Division 2 where cutting and patching requires excavating and backfilling.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. 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.

D. Execute cutting and demolition by methods, which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

F. Restore work, which has been cut or removed to match the original adjacent surfaces exactly in color, material and texture. Include repainting of new work. Install new products to provide completed work in accordance with requirements of Contract Documents.

G. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. All penetrations through separation walls shall be sealed with fire stopping sealant. All penetrations through foundations and exterior walls shall be sealed watertight and shall include proper flashings, drip loops, weatherproof covers, etc. as necessary.

H. Dust and debris from cutting shall be cleaned up immediately after.

3.5 HOLES

A. The General Contractor and subcontractors shall drill all their own holes if sleeves were missed, improperly placed, or not large enough. Holes made by the General Contractor and subcontractors shall be accurate and neat and not just punched out. No long slots shall be made where piping or

conduit may be placed in individual holes. No cutting or patching shall be done which, in the opinion of the Architect, will endanger or impair construction or finish.

B. No cores shall be drilled in concrete walls or slabs in excess of six (6) inches without prior approval from the Structural Engineer. The Structural Engineer must approve any cutting of structural steel.

C. Holes cut in fire-resistive walls and floors shall be neatly made and consistent with listing for firestopping assembly to be used.

3.6 CLEANING

A. Thoroughly and completely clean areas and spaces where cutting and patching is performed or used as access. Remove paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finish is applied. Restore damaged pipe covering to its original conditions.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

I. PART 1 - GENERAL

1.01 SCOPE

A. This section lists the procedures required for the proper completion of this project including processing the Release of Retainage and making the Final Payment to the Contractor.

B. Consult the Individual sections of the specifications for requirements affecting Project Close Out.

1.02 RELATED DOCUMENTS

A. This section supplements the General Conditions.

B. Consult the individual sections of the specifications for specific items required under those sections.

1.03 SUBSTANTIAL COMPLETION

A. Prior to requesting Substantial Completion the Contractor shall make a thorough inspection of the Work. During this inspection the Contractor shall prepare a comprehensive list of all items remaining to be completed or corrected. This list shall include all remaining Contractor and Subcontractor items to be provided under the Contract Documents.

B. Upon completion of the items noted on the Contractor's list the Contractor shall notify the Architect that the Work is Substantially Complete. The Architect shall then conduct a similar thorough inspection. If the Architect agrees that the Work is Substantially Complete, the Architect will promptly make a thorough inspection and prepare a punch list, setting forth in accurate detail any items on the Contractor's list and additional items that are not acceptable or incomplete. The Contractor shall coordinate all Subcontractors to achieve prompt completion of the punch list.

C. The Contractor shall not be relieved of the responsibility to provide Contract items left off of the Architect's punch list.

D. If the Architect determines that the Work is not Substantially Complete, the Architect shall inform the Contractor of those items that must be completed before the Architect will prepare a punch list. Upon completion of those items, the Contractor shall again request the Architect to prepare a punch list.

E. When the punch list has been prepared, the Architect will arrange a meeting with the Contractor and Subcontractors to identify and explain all punch list items and answer questions on work which must be done before final acceptance.

F. The Architect may revise the punch list, from time to time, to ensure that all items of Work are properly completed.

G. The Architect shall prepare the Certificate of Substantial Completion in accordance with the General Conditions.

H. The Contractors shall correct the items noted on the punchlist(s). The General Contractor shall check the work of his forces, and of all sub-contractors to verify that the work has been corrected, and notify the architect that the project is ready for reinspection. The Architect and Engineers may, at their discretion, check the work to confirm the punchlist has been completed, and advise the Owner.

1. If the Contractor calls for reinspection, and the Project is not actually ready or punchlist items have not been corrected and subsequent reinspections are required, the Architect reserves the right to bill

the Owner for the reinspections, and such monies will be deducted from the balance due to the Contractor.

1.04 RECORD DRAWINGS

A. As-built Drawings shall consist of all the Contract Drawings. As-built Drawings shall be kept up-to-date. Information from on-going Work shall be recorded on As-built Drawings within 48 hours of Work being performed.

B. The General Contractor and each Subcontractor shall be required to maintain one set of As-built Drawings, as the work relates to their Sections of the Specifications, at the site.

C. The As-built Drawings shall be stored and maintained in the General Contractor's field office or a secure location apart from other documents used for construction. The As-built Drawings shall be maintained in a clean, dry, and legible condition and shall not be used for construction purposes.

D. As-built Drawings, as submitted by the General Contractor shall be verified in the field by the Designer or his Consultants. Verification by the Designer shall occur during the construction process and prior to the related work being completed and covered up.

E. The As-built Drawings shall be available at all time for inspection by the Project Manager or Designer. All deficiencies noted shall be promptly corrected.

F. The following information shall be indicated on the As-Built Drawings:

1. Record all changes, including change orders, in the location, size, number and type both horizontally and vertically of all elements of the project which deviate from those indicated on all the Contract Drawings.

2. The tolerance for the actual location of utilities and appurtenances within the building to be marked on the As-built Drawings shall be plus or minus two (2) inches.

3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) ft. intervals and at all changes of direction.

4. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps and maintenance devices. The location of these internal utilities, appurtenances, and devices shall be shown by offsets to the column grid lines on the Drawings, or marked accurately on the as-built reflected ceiling plans.

5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served and function on the As-built Drawings.

G. At the end of each month and before payment for materials installed, the General Contractor, each Subcontractor, the Architect and Project Manager shall review the As-built Drawings for purpose of payment.

1. If the changes in location of all installed elements are not shown on the As-Built Drawings and verified in the field, then the material shall not be considered as installed and payment will be withheld.

H. Prior to the installation of all finish materials, a review of the As-built Drawings shall be made to confirm that all changes have been recorded. All costs to investigate such conditions shall be borne by the applicable party as determined by the Designer.

I. At the completion of the contract, each Subcontractor shall submit to the General Contractor a complete set of his respective As-built Drawings indicating all changes. After checking the above drawings, the General Contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the As-built Drawings to the Designer.

J. The original hand-noted as-Built Drawings shall be scanned in color to Adobe Acrobat (*.pdf) format and submitted on CD or DVD to the Designer, to be added to the complete plans as constructed.

1.05 RECORD SURVEYS

A. Not applicable.

1.06 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Consult the individual sections of the specifications for the specific requirements for those sections and for further details and descriptions of the requirements.

B. Prior to final payment and completion the Contractor shall provide all Operating Manuals and Maintenance Instructions as required by the Contract Documents.

C. Operating Instructions and Manuals:

1. Subcontractors, installers, and suppliers shall furnish to the Contractor two sets of operating and maintenance instructions of all mechanical, electrical, and manually operated equipment furnished and installed by them. Mechanical and electrical subcontractors shall furnish instructions as specified in their respective sections.

2. The Contractor shall collect all of the above instructions, bind them into two complete sets, and submit them to the Architect who will deliver them to the Owner.

3. The Contractor shall prepare a CD of all O&M items and deliver to the Owner.

4. Submission of operating and maintenance instructions shall be a condition precedent to final payment

D. Instruction of Owner's Personnel

1. Where specified in the individual sections of the specifications, the Contractor and Subcontractor shall instruct the Owner's personnel at the site, in the use and maintenance of equipment installed under the Contract.

2. Submission to the Architect of a certificate of compliance to this requirement, signed by the Contractor and the Owner's Representative, shall be a condition precedent to final payment.

1.07 PARTIAL RELEASE OF RETAINAGE

A. If within 65 days after Substantial Completion, any of the items on the Architect's punch list are not complete or if the Contractor has not provided the appropriate marked up As Built Drawings, Operating Manuals, Warranties, Guarantees, or Spare Parts the Architect shall assign a monetary value for each incomplete item as well as any other items as provided by M.G.L. c.30 §39K, and the Architect shall prepare a Certificate for Partial Release of Retainage.

B. If the Architect is required to prepare a Certificate for Partial Release of Retainage the Contractor shall complete all remaining Work in accordance with the provisions of the General Conditions.

C. The Contractor's signature on this Certificate shall be notarized.

D. The Contractor may make a request for additional releases of retainage when portions of the Work listed on the Architect's punch list have been satisfactorily completed. Each request shall be accompanied by a new application for payment and a new signed and notarized Certificate for Partial Release of Retainage.

E. The Architect's inspections, required to complete the additional payment applications described above, are subject to provisions of the General Conditions.

F. If the Owner has required Performance and Payment Bonds, then prior to the partial release of retainage, the General Contractor shall submit to the Owner Consent of Surety to Partial Release of Retainage using AIA Document G707A or an equivilent document.

1.08 FINAL RELEASE OF RETAINAGE

A. Prior to the final release of retainage, the General Contractor shall submit to the Owner:

1. Consent of Surety, using AIA Document G707 or similar document, if performance and payment bonds were required for the project.

2. Contractor’s Affidavit of Release of Liens, using AIA Document G706A or equivalent. This document shall be accompanied by certified statements from all sub-contractors working on the project, that they have received all monies due, and have paid all suppliers and sub-sub contractors accordingly.

(a) Should any payments be outstanding and contingent upon receipt of the retainage in order to be paid, the General Contractor shall submit AIA Document 706, itemizing those items which have not been paid.

END OF SECTION

SECTION 02 40 00

SELECTIVE DEMOLITION

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Demolition of existing 12" thick CMU wall.
2. Demolition of exterior door.
3. Demolition of counters.
4. Demolition of piping and sink where shown on drawings.
5. All other demolition as shown on drawings.

B. **Alternates:** None.

C. **Items to Be Installed Only:** None.

D. **Items to Be Furnished Only:** None.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 01.73.29 - Cutting & Patching: for cutting/coring of existing materials.
2. Section 01.74.19 - Construction Waste Management and Disposal.

1.3 SUBMITTALS

A. Refer to SECTION 01.33.00 - SUBMITTALS for submittal provisions and procedures.

B. Schedule: Provide detailed sequence of demolition and removal work.

1.4 JOB CONDITIONS

A. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

B. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel.

2. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations. Protect site with suitable coverings when necessary.

3. Remove protections at completion of work.

C. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

D. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum

interference with roads, streets, walks, and other adjacent occupied or used facilities.

E. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

G. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

H. Environmental Controls: Use temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

2. PART 2 - PRODUCTS (Not Applicable)

3. PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to commencement of demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Architect prior to starting work.

3.2 PREPARATION

A. Submit a demolition plan and schedule under the provisions of Section 01.33.00 - Submittals, prior to performing any demolition work.

B. Sequence work in occupied areas so as to minimize disruption, and to allow continued use of spaces.

C. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

D. Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

E. Ensure areas to be demolished have been made safe by sub-trades thorough disconnection of utility services, prior to start of work.

3.3 DEMOLITION

A. Demolition shall include the removal of all incidental items associated with the work shown to be demolished. This includes all cleats, nailers, blocking, brackets, clips and hangers, nails and fasteners, etc. After demolition:

1. The substrates to receive new work shall be sound and smooth, ready for attachment of new materials

2. No unnecessary or abandoned items shall remain in the area, whether in the way of new work or not.

B. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

C. Cut plaster in neat straight lines.

D. Provide services for effective air and water pollution controls as required by local authorities having

jurisdiction.

E. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Designer in written, accurate detail. Pending receipt of directive from Designer, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

F. Notify Architect immediately if materials scheduled to remain are found to be unsuitable for the installation of the new work, or if existing conditions deviate substantially from those shown on the drawings. Remove and replace, or make good, any existing materials unsuitable for installation of new work.

G. Sequence work in accordance with requirements of Section 01.31.00. Schedule new work to coincide with demolition work, to minimize amount of disruption.

3.4 WALL AND CEILING DEMOLITION

A. Demolition of wall finishes includes all finishes to the studs.

B. Demolition of interior wall finishes at exterior walls will include the removal of the existing insulation for replacement with new materials specified elsewhere.

1. This includes areas where removal of wall finish alone is shown.

2. For purposes of bidding, contractors shall assume existing insulation is batt insulation.

3. Insulation shall be removed for replacement regardless of whether it remains intact within the stud cavity, after removal of the wall finish.

4. After removal of the insulation, but prior to the installation if new, the Contractor shall inspect the condition of the exterior wall sheathing for rot or insect damage. If damage is encountered, notify the Owner prior to placing new materials.

5. Demolition of bearing walls will include all required shoring and temporary walls.

3.5 WINDOW AND DOOR DEMOLITION

A. On exterior doors and windows, coordinate the start of work such that the new materials can be installed the same day. The building shall not be left without a door at the end of the work day, without the Owner's prior approval of a temporary secure installation that permits emergency egress.

B. Remove existing doors and frames where noted, in their entirety. Where selective repairs are noted, remove unsuitable materials back to sound materials and prep for patching.

1. After removal of materials to be demolished, inspect framing for damage. Unsuitable framing shall be selectively repaired where encountered, using materials specified in Section 06.10.00.

C. Adjust rough openings to provide a square opening ready to receive the new doors and frames.

3.6 DISPOSAL OF DEMOLISHED MATERIALS.

A. All demolished materials shall be removed to dumpsters, and segregated where hazardous materials are involved and where recycling is possible. Refer to 01.74.19 for mandatory and voluntary recycling requirements.

B. The General Contractor shall provide dumpsters for all trades.

C. Transport and legally dispose of materials off site. Furnish waste manifests with close-out documentation wherever the disposal of hazardous materials is required.

D. Where hazardous materials are encountered during demolition operations, comply with applicable

regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

E. Burning of removed materials is not permitted on project site.

3.7 CLEAN-UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 04 21 00

BRICK MASONRY UNIT

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Brick modular units.
2. Reinforcements, anchors, and accessories.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. None.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 01.73.29 - CUTTING AND PATCHING for new CMU backup wall.
2. Section 07.20.00 - INSULATION AND BARRIERS for new vapor barrier and rigid insulation.

1.3 SUBMITTALS

A. Submit samples of brick to reflect the full range of color, shades and surface texture of brick specified.

1.4 1.07 ENVIRONMENTAL CONDITIONS

A. Follow hot weather and cold weather requirements in the masonry code and specifications, TMS 402 and TMS 602.

1.5 DELIVERY, STORAGE AND HANDLING OF MATERIALS

A. Deliver, store, and handle materials to prevent inclusion of foreign materials and damage by water or weather. Store packaged materials in their original packages. Damaged or deteriorated materials shall be removed from the premises.

2. PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Modular unit brick products by Acme Brick Company, Belden Brick Company, Summit Brick Company or approved equal meeting the properties specified herein.

2.2 BRICK UNITS

A. Standard face brick shall be FBS and shall be as follows:

1. Modular in size, dimensions to match existing brick.
   a. 2-1/4" x 3-5/8" x 7-5/8" presumed existing brick dimension. G.C. to verify in field.
2. Conform to requirements of ASTM C216.
3. Grade: SW.

2.3 ACCESSORIES

A. Anchors: Dur-O-Eye or equal anchors welded to joint reinforcing shall be used with masonry backup walls. Missing or damage anchors shall be replaced as necessary with DW19 anchors fastened to wall with corrosion resistant Tapcon screws.

B. Weep Holes: Open head joints where indicated on drawings.

C. Compressible Filler: Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35% of width and thickness indicated.

D. Mortar Net: Provide continuous Mortar Net along base of air space to catch mortar drippings. High-density polyethylene, 90% open mesh, dovetail shape.

1. As an alternate to Mortar Net, every third brick may be left out at base of air space and cavity cleaned and inspected to be free of mortar droppings.

E. Through Wall Flashing: 26 gauge 304 Stainless Steel, 2B finish.

3. PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Pre-wet all brick having initial rate of absorption greater than 30 before laying.

B. Heat water and sand in cold weather. Do not lay brick in temperature below freezing unless such heating of materials and protection of work is properly provided for.

C. The exterior surfaces of concrete and concrete masonry backup walls shall be damp-proofed before face brick are laid.

D. All brickwork shall be laid true to dimensions, plumb, square, and in bond. All courses shall be level with joints of uniform width and height. Align horizontal joints with adjacent existing joints.

E. Vertical joints in facing bond work shall be spaced so as to line up plumb and true, and all joints shall be as uniform as the type of brick will allow.

F. Lay facing brick in full mortar bed with shoved head joints. Completely fill joints with mortar. Do not deep furrow bed joints.

G. Bond for facing brick shall match existing adjacent brick. Refer to drawings.

H. Anchor facing brick to masonry backup at 16 inches o.c. vertically and 16 inches o.c. horizontally with adjustable anchors and ties.

I. Joint thickness shall be such as to provide coursing pattern to match existing brickwork. When the joints have become thumbprint hard, all exposed joints shall be tooled with a sled-jointing tool. The jointer shall be larger than the width of the joints so that a complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Joints shall be pointed as the tool proceeds.

J. Form weep holes in head joints where shown on the drawings. Rake out bed joint mortar to clean flashing

surface. Weep holes shall be filled with preformed mesh type vent at bottom of head joints not more than 24 inches o.c.

K. Keep air space clean of mortar at all times.

L. When flashing is to be laid on or against masonry, the surface of the masonry shall be smooth and free from projections which might puncture the flashing material.

M. Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond with the new work. All loose brick and mortar shall be removed.

3.2 FLASHINGS

A. Where metal flashing or drip edge is shown, align drip with face of brick. Edge of flashing or drip edge shall be a simple hem rolled edge and not turned down.

3.3 CLEANING

A. After pointing is done and wall is dry, clean face brick surface with dry brush.

B. After 3 days clean with water and mild detergent or cleaners recommended by brick manufacturer. Do not use muriatic acid.

1. Wet brick surfaces thoroughly before applying cleaning solution.
2. Apply cleaning solution with bucket and brush or LOW PRESSURE spray.
3. Remove all stains and mortar streaks using stiff fiber bristle brush.
4. Rinse thoroughly with water.
5. Protect windows, landscaping, and surrounding masonry surfaces from cleaning solution and rinse water.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Wood blocking.
2. Plywood counter.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. None.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 12.36.23 - PLASTIC COUNTERTOPS, for new plastic laminate countertop.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. 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, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. 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. Shop Drawings: Submit Shop Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

1.4 QUALITY ASSURANCE

A. Lumber: Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark.

B. Plywood: Mark each sheet with the mark of a recognized association or independent inspection agency that

maintains continuing control over the quality of the plywood. The mark shall identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870. Surfaces that are to be exposed to view shall not bear grademarks or other types of identifying marks

C. Preservative Treated Lumber and Plywood: The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor shall provide inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in the manufacturer's original containers, dry, undamaged, and with seals and labels intact.

B. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings. Store products in a weather-protected environment, clear of ground and moisture.

C. Protect all existing and new wood stored on site to prevent moisture absorption. Stacked materials should be covered with tarps (top, sides, and bottom) and stacked to provide sufficient slope to shed water.

2. PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 15 percent by weight on a dry weight basis maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Plywood Panels:

1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

2.2 FRAMING AND MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent maximum moisture content.

2.3 PANEL PRODUCTS

A. Plywood Grading: Comply with Product Standard PS 1, "Construction and Industrial Plywood".

B. Certification and Marking: The producer shall include a Certificate of Inspection with each shipment. Grade mark each panel in compliance with applicable standards of Product Standard PS 1.

C. Moisture Content: Provide plywood which has been seasoned by kiln drying to a moisture content not to exceed 19%.

D. Thickness: As indicated on drawings.

2.4 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 of Type 304 stainless steel.
2. The fasteners shall be of sufficient length to penetrate the receiving member a minimum of 1-1/4 inch minimum for wood or plywood into wood, full depth into plywood, and 5/8 inch minimum for wood into steel deck or metal stud framing

B. Nails, Wire, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Wood Screws: ASME B18.6.1.

2.5 MISCELLANEOUS MATERIALS

A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

3. PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement. Stagger joints layer to layer. Prepared surfaces must be clean and dry. Fill, chip, or grind as required to provide a smooth, uniform surface.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach carpentry work as indicated and according to applicable codes and the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER 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.

END OF SECTION

SECTION 07 20 00

INSULATION AND BARRIERS

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Rigid wall insulation.
2. Fiberglass insulation.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. None.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 10.28.19 - SHOWER ENCLOSURES, for shower system’s waterproofing underlayement.

1.3 REFERENCES

A. 780 CMR, Massachusetts State Building Code, 10th Edition, Massachusetts Amendments
B. International Energy Conservation Code (IECC) 2
C. ASTM C 665
D. ASTM E96, vapor transmission, desiccant method
E. ASTM C 518
F. UL D369

1.4 SUBMITTALS

A. Submit in accordance with Section 01.33.00.

1.5 QUALITY ASSURANCE

A. Performance requirements of exterior envelope shall conform to 2021 IECC, 9th Edition MSBC.

B. Insulation and barrier installation techniques shall conform to 2021 IECC, 9th Edition MSBC.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect stored materials from damage and moisture, before, during and after installation.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by the manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. Installer's Warranty: 1 year labor and materials on all products installed.

2. PART 2 - PRODUCTS

2.1 INSULATION

A. Wall Thermal Insulation

1. Fiberglass batt insulation
2. Unfaced.
3. 3.5" or as required to fully fill the cavity. R13 minimum.
4. Flame spread=<25, Smoke developed index=<50, ASTM E84

B. Exterior Rigid Insulation

1. Extruded Polystrene (XPS) Insulation
2. 2" thickness, R5 minimum.
3. Compressive strength=25 psi, min., ASTM D1621
4. Meets ASTM C578 Type IV.
5. Flame spread=10 max, Smoke developed index=175 max, ASTM E84
6. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
7. Joint Tape: manufacturer's standard tape for board seams.

2.2 BARRIERS

A. Vapor Barrier

1. Sheet polyethylene, Class 1 Vapor Retarder, with a perm rating of less than or equal to 0.1.

3. PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive work and field measurements are as shown on shop drawings.

B. Verify that mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Verify that framing is straight and true, and ready to receive the work of this section.

B. Correct any defects prior to installation of new materials.

3.3 INSTALLATION

A. Batt Insulation

1. Friction fit batts between joists and studs. Batts shall fit neatly and be cut to fit smaller cavities. Fit insulation neatly and fully around all cavity utilities. Install spray foam at any areas that are too small to insulate properly.
2. Secure unfaced insulation in place with strapping, wires or other means if required, to support insulation in unoccupied spaces on face of wall with no finish.
3. Use continuous lengths of insulation, wherever possible. Where multiple lengths are required, butt batts together to eliminate any joints.
4. Insulate all cavities at jack studs and other such framing, by loosely filling gaps with insulation material. Insulation of cavities which will be concealed through the process of framing, should be performed by the framing installers as that work progresses.

B. Rigid Insulation

1. On vertical surfaces, set rigid insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

C. Vapor Barrier

1. Install vapor barrier in continuous pieces across exterior face of CMU, prior to installation of exterior insulation and wall finish.
2. Tape vapor barrier to existing barrier to remain, and tape all joints in vapor barrier as work progresses in accordance with Current Energy Codes.

3.4 ADJUSTMENT, CLEANING AND PROTECTING.

A. Inspect and repair any defects or damage in barriers, prior to installation of wall finishes and siding.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS, FRAMES, AND HARDWARE

PART 1 - GENERAL

1.01 GENERAL

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.

1.02 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. New hollow metal door and frame.
2. New hardware.

B. **Alternates:** Not applicable.

C. **Items to Be Installed Only:** Not applicable..

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. None.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Sections:

1. Section 01.73.29 - CUTTING AND PATCHING for new Masonry Opening and Lintel.
2. Section 09.90.00 - PAINTING AND COATING for field painting steel doors and frames.

1.03 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, temperature-rise ratings, and finishes for each type of steel door and frame specified.

B. Shop Drawings:

1. Elevations of each door design, including transoms.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of steel door and frame.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. Fire-Rated Assemblies: Not applicable.

D. Fire-Rated, Borrowed-Light Assemblies (Including Sidelights and Transoms): Not applicable.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.07 COORDINATION

A. Coordinate installation of anchorages 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.

PART 2 - PRODUCTS

1.08 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld International.
2. Ceco Door Products; an ASSA ABLOY Group Company.
3. CURRIES Company; an ASSA ABLOY Group Company.
4. Mesker Door Inc.
5. Pioneer Industries, Inc.
6. Republic Builders Products Company.
7. Steelcraft, an Ingersoll Rand Company.

1.09 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. 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 hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

1.10 STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
   (a) Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
   (b) Thermal-Rated (Insulated) Exterior Doors: Provide doors with internal insulation complying with the minimum r-values required by 2021 IECC.
3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets.
4. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. All Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.6.

1. Level 2 18 gauge steel faces, Heavy Duty, Model 1 (Full Flush), 1-3/4 inches thick.

1.11 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 2 Steel Doors: 16 gauge.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

1.12 FRAME ANCHORS

A. Jamb Anchors

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1. Existing Masonry Walls: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Existing Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

1.13 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

1.14 FABRICATION

A. Fabricate hollow metal work 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.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2. Astragals: Not required.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and not visible.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

5. Masonry Type: Locate 3 anchors per jamb not more than 18 inches from top and bottom of frame.

6. Door Silencers: Except on weather-stripped doors, 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.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive existing, salvaged hardware; include cutouts, reinforcement, mortising, drilling, and tapping.

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

1.15 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

1.16 HARDWARE

A. Cylindrical Lockset

1. Manufacturer: Basis of Design is Schlage ND series. Approved equal products from Sargent, Trudoor, or another manufacturer will be accepted, provided they meet the requirements herein:

(a) Lever Design: Rhodes
(b) Function: Privacy Set
(c) Provide escutcheon with lock status/ occupancy indicator.
(d) Provide locks with standard 2-3/4" backset.
(e) Finish: Satin Chrome

B. Deadbolt

1. Manufacturer: Basis of Design is Schlage J-Series. Approved equal products from Sargent, Trudoor, or another manufacturer will be accepted, provided they meet the requirements herein:

(a) ANSI/BHMA A156.36-2010 Grade 3
(b) Function: Thumbturn one side only; opposite side blank.
(c) Standard 2-3/4" backset
(d) Finish: Satin Chrome

C. Where new doors are noted on the Drawings, provide the following:

1. Hinges: Provide IVES BB, Hagar BB or Stanley FBB five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:

(a) All doors: standard weight, bronze/stainless steel, 4-1/2 inches high, 4-1/2" deep

2. Closers: Provide LCN 4010 or approved equal ANSI/BHMA A156.4 Grade 1 closer certified by a BHMA certified independent testing laboratory. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.

3. Silencers: Provide (3) "push-in" type silencers for each new hollow metal frame. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

PART 3 - EXECUTION

1.17 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1.18 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 welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, 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.

1.19 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. 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, leaving surfaces smooth and undamaged.

(a) Install door silencers in frames before grouting.

(b) Remove temporary braces necessary for installation only after frames have been properly set and secured.

(c) Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

(d) Field apply bituminous coating to backs of frames that are filled with grout.

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. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

(a) Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

(b) Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

(c) Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

(d) Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
2. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch .
3. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
4. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

1.20 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. 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.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION
08.11.13

SECTION 08 50 00

WINDOWS

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Replacement window sash.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. None.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. None.

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
1. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
2. AAMA 613 - Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.

B. American Society for Testing and Materials (ASTM):
1. ASTM C 1036 - Flat Glass.
2. ASTM C 1048 - Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.
3. ASTM D 3656 - Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
4. ASTM E 283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
5. ASTM E 547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.

C. Screen Manufacturers Association (SMA):
1. SMA 1201 - Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors.

D. Window and Door Manufacturers Association (WDMA):
1. ANSI/AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

1.4 SUBMITTALS

A. Submit in accordance with Section 01.33.00.

B. Product Data: Submit manufacturer's product data, including installation instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Store materials off ground and under cover.
3. Protect materials from weather, direct sunlight, and construction activities.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.6 WARRANTY

A. Non-glass Components. Transferable Ten-Year (10 Year) Limited Warranty. Warrant the nonglass components of its covered products, including the hardware, shall be free from manufacturing defects in material or workmanship that significantly impair the their proper operation and function for ten (10) years from the date of sale by or authorized dealer. If the manufacturer is given notice of a defect or workmanship occurring within ten years from the date of sale: 1) repair or replace the defective part(s) or product(s) (with cost of labor included by the installing Contractor within one (1) year of the dates of sale by the authorized dealer) or 2) refund the original purchase price. The limited Warranty on Non glass Components does not apply to non-painted hardware finishes.

B. Glazing: Non-laminated Glass. Transferable Twenty-Year (20 Year) Limited Warranty. Manufacturer shall warrant the non-laminated glass so that is shall be free from premature failure or permanent material obstruction of vision due to a failure of the glass seal for twenty (20) years from the date of sale by the manufacturer or authorized dealer. If the manufacturer is given notice of a glass defect occurring within ten (10) years of the date of sale. 1) Repair or replacement of the defective glass (with cost of labor included by the installing Contractor within one (1) year of the date of sale or refund the original purchase price.

C. Provide manufacturer’s warranty under provisions of Section 01.77.00.

2. PART 2 - PRODUCTS

2.1 FIXED SASH

A. Proprietary specification: Andersen SCA E-series Picture Window, Sash/ Panel/ Direct set Glass.

1. Operation: Fixed
2. Glazing: Dual pane, Low-E4, Argon fill
3. Color: Black exterior, painted pine interior.
4. Dimensions: Refer to drawings.

B. Provide and install all stops in glazing and at head, sill, and jambs as required by manufacturer.

3. PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate with Section 02.41.00 to ensure that all required demolition is complete.

3.2 PREPARATION

A. Verify that all openings are square, jambs are plumb and sill / heads are level. Make minor adjustments as required.

B. The start of installation constitutes the acceptance of existing conditions.

3.3 REPLACEMENT SASH INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install windows to be weather-tight and freely operating.

C. Maintain alignment with adjacent work.

D. Leave window closed and locked.

3.4 FIELD QUALITY CONTROL

A. Field Testing: If the quality of the window construction or installation is questionable, the Owner may, at their discretion, require field testing of windows in place following the procedures of AAMA 502, Test Method A.

1. The Owner will select and arrange for the testing agency.
2. If tested windows pass, the costs of the testing shall be paid for by the Owner.
3. If the tested windows fail, the costs of the testing shall be paid for by the Contractor, the window shall be removed and replaced or repaired, and then retested.

3.5 ADJUSTING AND CLEANING

A. Adjusting:

1. Perform adjustments immediately after installation.
2. Adjust units for smooth operation without binding or racking.
3. Adjust sash locks and screens for smooth operation.
4. Adjust shades to roll up completely.

B. Remove labels and visible markings after Inspection or when permitted by the Building Inspector.

C. Clean window frames and glass in accordance with Division 1 requirements.

D. Do not use harsh cleaning materials or methods that would damage finish or glass.

3.6 PROTECTION

A. Protect installed windows to ensure that, except for normal weathering, windows will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 09 20 00

GYPSUM BOARD ASSEMBLIES

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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 drywall on walls.
2. Shower backer board.
3. All required accessories.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. Not Applicable.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 09.22.16 - NON-STRUCTURAL METAL STUDS, for stud framing.
2. Section 09.90.00 - PAINTING, for finishes.

1.3 REFERENCES

A. ANSI/ASTM C1396 - Gypsum Wallboard.
B. ANSI/ASTM C630 - Water Resistant Gypsum Backing Board.
C. ANSI/ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
D. ANSI/ASTM C646 - Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs.
E. ANSI/ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
F. ASTM E84- Surface Burning Characteristics.
G. ASTM D3273- Mold Growth ASTM D3273-00 - “Standard Test Method for Resistance to Growth on Mold...”
H. GA-201 - Gypsum Board for Walls and Ceilings.
I. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 01.33.00.

B. Provide product data on specified products.

2. PART 2 - PRODUCTS

2.1 GYPSUM BOARD MATERIALS AND FINISH

A. Bathrooms: Gypsum board shall be USG Sheetrock Brand Mold Tough Panels, Gold Bond XP Gypsum Board, GP Tough Rock or approved equal meeting or exceeding the following:

1. Thickness: 5/8" thickness at walls, maximum permissible length; ends square cut, tapered edges.
2. Core: Type X.
3. Mold resistance score of 10 when tested to ASTM D3273-00.
4. Flame spread of 15 and smoke developed of 0, per ASTM E84.
5. Comply with ASTM C1396

B. All other locations: Gypsum board shall be USG Sheetrock Brand or approved equal meeting or exceeding the following:

1. Thickness: 5/8" thickness at walls, maximum permissible length; ends square cut, tapered edges.

a. Where used to patch existing ceilings, match existing (½" assumed).

2. Core: Type X.
3. Flame spread of 15 and smoke developed of 0, per ASTM E84.

C. USG Imperial Veneer Plaster Finish:

1. Thickness: 1/16-3/32" full coat thickness.
2. 3,000 lb./in.2 compressive strength, abrasion resistant finished surface.

2.2 ACCESSORIES

A. Joint Materials: ANSI/ASTM C475; GA 201 and GA 216; reinforcing tape, joint compound, adhesive, water, and fasteners

B. Joint Compound: setting type, curing time selected by installer.

C. Corner Beads:

1. Outside and inside corners: metal and paper combination
2. Intersection of dissimilar materials: J-stop, L-trim or J-trim as conditions dictate.

D. Fasteners: as recommended by board manufacturer for specific application.

3. PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.

B. Beginning of installation means acceptance of conditions.

3.2 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA 201 and GA 216 and manufacturer's instructions.

B. Install gypsum board in accordance with associated UL listed assembly number.

C. Extend all new work to floor framing or other existing construction above the new work, and finish joint following specified procedures.

D. Erect single-layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing. Install gypsum board tight to underside of structure on both face of each partition.

E. Use drywall screws of appropriate size for both layers, no less than 12" o/c in all directions, to metal framing.

F. Treat cut edges and holes in moisture resistant gypsum board with sealant.

G. Place control joints consistent with lines of building spaces as indicated or as directed.

H. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

3.3 JOINT TREATMENT

A. Finish drywall installations in accordance with Gypsum Association's GA-214 as follows:

1. Finished spaces, level 5.
2. Concealed spaces, such as above ceilings, may be rough taped and sanded.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes in strict accordance with the manufacturer's instructions.

C. Align "Imperial Type P" pressure-sensitive tape over the joint and press into place over the entire length of the joint. Eliminate wrinkles and assure maximum adhesive bond by pressing the entire length of tape with a steel finishing knife or trowel. Press the tape into corners with a corner tool. Do not overlap.

1. Embed the tape and fill beads with a coat of "Imperial" Interior Finish Plaster and allow to set, but not dry, prior to finish application. Slightly underfill in the bead by screeding along the bead with edge of trowel after setting the bead.

3.4 CLEANING

A. Vacuum all dust generated by installation.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL STUDS

1. PART 1 - GENERAL

1.1 GENERAL

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. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 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. Metal studs for new wall framing.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. Not Applicable.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Not Applicable.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Studs and Runners: Provide documentation that framing members' code compliance is verified by independent third party testing to meet the following standards: International Building Code (IBC), ASTM C 645, and American Iron and Steel Institute (AISI) North American Standard for Cold-Formed Steel Framing - General Provisions (AISI S200).

2. PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For wall assemblies, limited based on cladding listed below and a horizontal loading of 5 lbf/sq. ft. Overall deflection shall be limited to:

1. Gypsum board finishes: 1/120 of wall height.
2. Tile or stucco or veneer plaster or thin brick: 1/360 of wall height.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: Any of the following, as listed in ASTM A1003, table 1, are permitted:
   a. ASTM A 653/A 653M, G40 (Galvanized).
   b. ASTM A792/A792M, AZ50 (Galvalume).
   c. ASTM A875/A875M, T1-25 or T2-100 (Galfan).
   d. ASTM A879/A879M, 20Z/20Z (Electro-galvanized).
   e. ASTM A1046 (Zinc-Aluminum-Magnesium Alloy - ZAM).
3. Other coatings claiming equivalent corrosion resistance are not permitted.

B. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

   a. Basis-of-Design Product: Subject to compliance with requirements, provide The EDGE™ by Super Stud Building Products, Inc.; or equivalent product by one of the following:

      (a) Super Stud Building Products, Inc.
      (b) Super Stud Building Products South, LLC
      (c) ClarkDietrich.
      (d) Marino\Ware

   b. Minimum Base-Metal Thickness:

      (a) 0.019" Design thickness, 70 KSI at walls up to 10'-0" high.
      (b) 0.032" Design thickness, 33 KSI at walls over 10'0" high.

   c. Width: As indicated on Drawings.

   d. Braced 48" on center with floor track and deep leg deflection track of comparable construction. Full height to deck, unless noted otherwise.

3. PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, 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 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 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.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. 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.

a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09 30 00

TILING

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Floor and wall tile.
2. Waterproofing and crack-suppression membrane for tile installations.
3. Elastomeric sealants for expansion, contraction, control, and isolation joints in tile surfaces.
4. Surface preparation for tile and accessories.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. Not Applicable.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 09.20.00 - GYPSUM BOARD ASSEMBLIES, for cementitious backer units.
2. Section 10.28.19 - SHOWER ENCLOSURES, for new shower system.

1.3 DEFINITIONS

A. Module Size: Actual tile size plus joint width indicated.

B. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

A. For tile installed on walking surfaces, provide products with the following values as determined by the test protocol provided in ANSI A137.1, Section 9.6.

1. Dynamic Coefficient of Friction: Not less than 0.42.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. 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.

C. Samples for Verification:

1. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Stone thresholds in 6-inch lengths.
4. Metal edge strips in 6-inch lengths.

D. Qualification Data: For installer.

E. Material Test Reports: For each tile-setting and grouting product.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile 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 a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Joint sealants.
4. Cementitious backer units.

D. Mockups: Install mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. To set quality standards for installation, install mockup of floor area.

2. To set quality standards for sanding and application of field finishes, prepare finish mockup of floor area as shown on Drawings.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 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 requirement in ANSI A137.1 for labeling sealed 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 avoided.

D. Store liquid additives in unopened containers and protected from freezing.

1.8 PROJECT 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.

1.9 EXTRA MATERIALS

A. 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.

1. Tile and Trim Units: Furnish one box of each size, color and pattern installed.
2. Grout: Furnish one unopened bag of each grout used.

2. PART 2 - PRODUCTS

2.1 TILE SCHEDULE

A. Provide the following tile(s) where scheduled on the Drawings. This is not a proprietary specification, however, substitutions must match the appearance of the specified materials to the satisfaction of the Architect.

B. Ceramic Floor Tile: Daltile "Keystone" or equal mosaic 2x2 floor tile, price tiers 1-2, three color blend.

C. Ceramic Wall Base: Daltile “Classic” 6” sanitary cove base, semi-gloss

D. Ceramic Wall Tile: Daltile “Classic” 4x4 semi gloss wall tile, pattern and colors to be selected by Owner from the following price tiers:

1. Tier 2: 80%
2. Tier 3: 20%

2.2 INSTALLATION METHODS

A. Bathroom:

1. Floors: TCNA Method F113-21 at interior floor installations on concrete; cement mortar bed (thickset) bonded to concrete; on-ground or above-ground and ANSI A108.5.

a. Tile Type: Ceramic
b. Thin-Set Mortar.
c. Crack suppression membrane.
d. Grout: cementitious unsanded grout.
e. Joint Width: 1/16 inch.

2. Shower:

a. Floor and Walls: TCNA Method B415-21, mortar bed method for showers without prefabricated receptors.

(a) Tile Type: Ceramic.
(b) Thickset Mortar at floor tile.
(c) Cementitious bond coat mortar at wall tile.
(d) Waterproofing membrane at shower floor extending 36” out from wall.
(e) Vapor Barrier at all walls
(f) Grout: cementitious unsanded grout.

(g) Joint Width: 1/16 inch.

2.3 PRODUCTS, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Olean Tile Co.
2. Daltile Corporation.
3. Summitville Tiles.
4. Or equal.

B. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
3. Large Format Tiles are defined as more than 15 inches in any nominal dimension.

C. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

F. Marble Thresholds: Uniform, fine- to medium-grained white stone with gray veining, ASTM C 503 with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish. Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

G. Fabric-Reinforced, Fluid-Applied Waterproofing and Crack Suppression Membrane: System consisting of liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), and fabric reinforcement.

1. ARDEX Engineered Cements; 8 + 9 Waterproofing Compound.
2. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
3. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
4. MAPEI Corporation; PRP M19.
5. Summitville Tiles, Inc.; S-9000.
6. Or equal.

H. Crack Suppression Adhesive: Provide a sound abatement and crack suppression adhesive complying with ANSI A118.12, extra heavy rating and a minimum ΔIIC of 15:

1. Service Rating per ASTM C 627: Extra Heavy
2. Delta Impact Insulation Class per ΔIIC; ASTM E 2179: 15.
3. Point Load per ANSI A118.12 5.2: >1,000 psi.
4. Shear Bond Strength (ANSI A118.12): 100psi.

I. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

J. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ardex Engineered Cements.
    b. Bostik, Inc.
    c. Laticrete International, Inc.
    d. MAPEI Corporation.
    e. Summitville Tiles, Inc.
    f. TEC; a subsidiary of H. B. Fuller Company.
    g. Or equal.

2. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.

K. Latex-Portland Cement Mortar (Thin Set): ANSI A118.1 or better.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ardex Engineered Cements.
    b. Bostik, Inc.
    c. Custom Building Products.
    d. Laticrete International, Inc.
    e. MAPEI Corporation.
    f. Summitville Tiles, Inc.
    g. TEC; a subsidiary of H. B. Fuller Company.
    h. Or equal.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added 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.

L. Cementitous Grout: ANSI A118.6 or better.

1. Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

    a. Unsanded grout mixture for joints 1/8 inch (3.2 mm) and narrower.
    b. Sanded grout mixture for joints 1/8 inch (3.2 mm) and wider.

M. 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.

N. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

2.4 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicate. Comply with applicable requirements in Section 079200 - JOINT SEALANTS.

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Available Products:

a. Custom Building Products; 100% Commercial Silicone Caulk.
b. Dow Corning Corporation; Dow Corning 786.
c. GE Silicones; Sanitary 1700.
d. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
e. Tremco, Inc.; Tremsil 600 White.
f. Or equal.

D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

1. Available Products:

a. Bostik; Chem-Calk 550.
b. Pecora Corporation; NR-200 Urexpan.
c. Tremco, Inc.; Vulkem 245.
d. Tremco, Inc.; THC-900.
e. Or equal.

2.5 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.

2.6 ACCESSORIES

A. Shower Shelves: Schluter “Shelf-E” corner shelf

1. Style: “Square:
2. Material: stainless steel
3. Finish: brushed
4. Quantity: two.

3. 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 installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. 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 before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not

coordinated, adjust joint locations in consultation with Designer.
4. Verify flatness of floor is within manufacturer's limitations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCNA Installation Guidelines: TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. 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.

D. 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.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. 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.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with manufacturer's requirements.

G. Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

3.4 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

B. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed. After seven days, cover areas subject to construction traffic with heavy cardboard.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Moisture-resistant ceiling panels.
2. Suspension systems, grid systems, and ceiling hangers.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Not Applicable.

1.3 REFERENCES

A. Abbreviations and Acronyms:

1. CISCA: Ceilings & Interior Systems Construction Association; www.cisca.org.

B. Reference Standards:

1. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
2. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
4. ASTM E1264 - Standard Classification for Acoustical Ceiling Products

1.4 SUBMITTALS

A. Submit in accordance with Section 01.33.00.

B. Product Data: For each item specified submit product data showing quality of construction, fabrication, and installation. Include details of anchors, hardware, and fastenings.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.

D. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.

E. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
2. Suspension Systems: Obtain each type through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages 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.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, 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.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate layout with fabrication of decorative coffer systems.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. One case of each type of tile installed, plus all unused and uncut tiles left after installation.

1.10 WARRANTY

A. Manufacturer Warranty: Submit a written warranty executed by manufacturer for a period of 30 years from date of Substantial Completion, agreeing to repair or replace suspension system components that fail or are compromised within the specified warranty period. Failed or compromised parts can include, but are not limited to rusting or defects directly made by the manufacturer.

2. PART 2 - PRODUCTS

2.1 CEILING PANELS

A. Basis of Design are “Glasbord + Kemply” Fiberglass Reinforced Plastic (FRB) ceiling panels by Crane Composites, or approved equal meeting the following:

1. Material: ½" gypsum with fiberglass embossing.
2. Fire Rating: Class A per ASTM E84.
3. Size: 2' x 2'
4. Finish: Smooth
5. Flexural Strength and Modulus: 94 MPa and 4137 MPa per ASTM D790.
6. Tensile Strength and Modulus: 52 MPa and 6205 MPa per ASTM D638.
7. Coefficient of Linear Thermal Expansion: 1.7 x 10^{-5} in/in/°F per ASTM D696.
8. Water Absorption: 0.32%/24hrs @ 77°F per ASTM D570.

2.2 METAL SUSPENSION SYSTEMS

A. Basis of Design is “SANIGRID” Ceiling Grid System by Crane Composites, or approved equal meeting the following:

1. Manufacturer: manufacturer of grid shall be the same manufacturer of the tiles.
2. Material: Fiberglass.
3. Structural Classification: Intermediate-duty system.
4. Load span rating complying with applicable requirements in ASTM C 635.
5. Fire Rating: Class A per ASTM E84.
6. End Condition of Cross Runners: Override (stepped) or butt-edge type.
7. Face Design: Flat, flush.
8. Cap Material: Fiberglass.
9. Color: White, prefinished.
10. Grid Face Width: as specified with tile, above.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors 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 per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.
2. 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 per ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Material: 12 gauge stainless steel.

3. PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 COORDINATION

A. Coordinate location and size of openings in the counter for drop-in sinks with plumbing subcontractor.

1. Refer to Section 22.40.00 – Plumbing Fixtures, for type and size of sinks.

3.3 INSTALLATION

A. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

B. Install counters to be level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

C. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Countertops: Anchor securely by screwing through brackets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches and to walls with adhesive.
4. Calk space between backsplash and wall with manufacturer’s recommended sealant.

E. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.1 GENERAL

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. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 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. Surface Prep.
2. Interior Painting.
3. Exterior Painting.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Items to Be Furnished Only:** Furnish the following items for installation by the designated Sections:

1. Not Applicable.

E. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Not Applicable.

1.3 SUBMITTALS

A. Product Data: For each paint system indicated, including.

1. Product characteristics.
2. Surface preparation instructions and recommendations.
3. Primer requirements and finish specification.
4. Storage and handling requirements and recommendations.
5. Application methods.
6. Cautions for storage, handling and installation.
7. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

B. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

C. Only submit complying products based on project requirements. One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

D. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings 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.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.

1. Product name, and type (description).
2. Application and use instructions.
3. Surface preparation.
4. VOC content.
5. Environmental handling.
6. Batch date.
7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

2. PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Sherwin-Williams, Cleveland, OH or approved equal products by Benjamin Moore or California Paint.

2.2 APPLICATIONS/SCOPE

A. Interior Paints and Coatings: (LEED-09 NC/CI/CS COMPLIANT)

1. CMU: Interior concrete masonry unit.
2. Drywall: Drywall board, Gypsum board.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings.

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: 1 color throughout, as selected by Owner.

2.4 INTERIOR PAINT SYSTEMS (LEED-09 NC/CI/CS COMPLIANT)

A. DRYWALL - (Walls, Gypsum Board and similar items)

1. Latex Systems, Eg-Shel / Satin Finish:
   a. 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600
   b. 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
   c. 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series

B. FIBERGLASS DOORS

1. Acrylic Epoxy Systems
   a. 1st Coat: Extreme Bond Primer
   b. 2nd Coat: S-W Pro Industrial Water-Based Alkyd Urethane Semi Gloss
   c. 3rd Coat: S-W Pro Industrial Water-Based Alkyd Urethane Semi Gloss

C. METAL RAILINGS

1. Acrylic Epoxy Systems
   a. 1st Coat: Factory Primed
   b. 2nd Coat: S-W Pro Industrial DTM Acrylic
   c. 3rd Coat: S-W Pro Industrial DTM Acrylic

3. PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion

1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

2. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

3. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products

B. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

C. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

D. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections in existing wood to remain with a wood filler or putty and sand smooth. Caulk new, reinstalled, and existing trim with a siliconized acrylic and let cure prior to painting.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings

END OF SECTION

SECTION 10 28 00

BATHROOM ACCESSORIES

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Mirror.
2. Lockers.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 09.30.00 - TILING, for tile finish in shower enclosure.
2. Section 10.28.19 - SHOWER ENCLOSURE, for Shower system and accessories.

1.3 SUBMITTALS

A. Submit in accordance with Section 01.33.00.

B. Product Data: For each item specified submit product data showing quality of construction, fabrication, and installation. Include details of anchors, hardware, and fastenings.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTIES:

A. Manufacturer’s standard warranty on finishes and manufacturing defects.

2. PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

C. 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.

2.2 MIRRORS:

A. Provide Bobrick B-290 Series or approved equal meeting the following:

1. Size: 24" x 36"
2. Frame: 18-8 heavy gauge stainless steel 3/4"x 3/4" with continuous integral stiffener, satin finish
3. Glass: No. 1 quality ¼" select float glass.
4. Hanger: Concealed wall hanger
5. Location: Refer to drawings.

2.3 LOCKERS

A. Provide 18" wide, single tier locker meeting the following:

1. Dimensions: 18"W x 72"H x 18"D
2. Weight: 190 lbs.
3. Material: 16 gauge steel
4. Color: Selected by Owner.
5. Top: Flat top filler.
6. Base: Provide front and side bases.
7. Locking: Recessed hasp for separate padlock, by Owner.
8. Similar to Salsbury 18-51000 series.

3. PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to installation, ensure that substrates are smooth, free of defects and ready to receive accessories.

B. Correct any unsuitable conditions before proceeding. Start of installation constitutes acceptance of existing conditions.

3.2 INSTALLATION

A. Install accessories in locations noted on Drawings.

B. Install accessories to be plumb and level, and soundly attach to framing or blocking with screw type fasteners, furnished by accessory manufacturer.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for smooth operation.

B. Remove any protective films. Clean and polish surfaces as required.

END OF SECTION

SECTION 10 28 19

SHOWER ENCLOSURE

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. Shower components.
2. Shower controls.
3. Shower trim and accessories.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 09.30.00 - TILING, for tile finish in shower stall.
2. Section 10.28.00 - BATHROOM ACCESSORIES, for shower curtain rod.

1.3 SUBMITTALS

A. Submit in accordance with Section 01.33.00.

B. Product Data: For each item specified submit product data showing quality of construction, fabrication, and installation. Include details of anchors, hardware, and fastenings.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTIES:

A. Manufacturer’s standard warranty on finishes and manufacturing defects.

2. PART 2 - PRODUCTS

2.1 SHOWER SYSTEM

A. Shower System:

1. Provide Schluter-KERDI shower kit or approved equal meeting the following:

a. Material: PVC

b. Tray: 30" x 60"
c. Curb: 6"H x 4-1/2"W
d. Corners: Manufacturer's preformed waterproofing corners.
e. Drain: Provide manufacturers' 4" stainless steel grate drain.
(a) Flow through area: minimum 3.363 sq. in.

2. Provide manufacturer's waterproofing membrane.

3. Provide manufacturer's seals, strips, and other accessories required for a waterproof system.

4. Shelf: Provide stainless steel shelf for corner with square grate, similar to Schluter SHELF-E, Square.

a. Height: 48" above shower floor.

B. Shower Controls: Provide Symmons Dia Hand Shower, or approved equal meeting the following:

1. 30" slide bar for hand shower wand.
2. 60" flexible metal hose.
3. Dual Checks for backflow prevention.
4. 2.0 gpm flow restrictor.
5. Finish: Polished chrome.
6. Comply with ASME A112.18.1/ CSA B125.1.
7. Comply with WaterSense 2.0 gpm.

C. Shower Accessories:

1. Shower Curtain Rod: 18-8 heavy gauge stainless steel.
2. Shower Curtain Hook: 18-8, Type-304, 0.09" diameter stainless steel, similar to Bobrick 204-1.

3. PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate with framers to ensure blocking is installed in locations where wall mounted accessories are scheduled for installation. Furnish templates or samples as required.

B. Coordinate installation of curtain road so entire mounting flange is located entirely on the tile surround.

C. Prior to installation, ensure that substrates are smooth, free of defects and ready to receive accessories.

D. Correct any unsuitable conditions before proceeding. Start of installation constitutes acceptance of existing conditions.

3.2 INSTALLATION

A. Install accessories at heights per manufacturer's instructions.

B. Install accessories to be plumb and level, and soundly attach to framing or blocking with screw type fasteners, furnished by accessory manufacturer.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for smooth operation.

B. Remove any protective films. Clean and polish surfaces as required.

END OF SECTION

SECTION 12 36 23

PLASTIC COUNTERTOPS

1. PART 1 - GENERAL

1.1 GENERAL

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.

1.2 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. New plastic laminate countertop.
2. New wall brackets.

B. **Alternates:** None.

C. **Items to Be Installed Only:** Install the following items as furnished by the designated Sections:

1. Not Applicable.

D. **Related Work Specified Elsewhere:** The following items are not included in the Section, and will be performed under the designated Section:

1. Section 06.10.00 - ROUGH CARPENTRY, for blocking and plywood underlayment.

1.3 SUBMITTALS

A. Submit in accordance with Section 01.33.00.

B. Product Data: For each item specified submit product data showing quality of construction, fabrication, and installation. Include details of anchors, hardware, and fastenings.

C. Samples for color selection: Where applicable, submit Manufacturer's color charts showing the full range of colors, textures, and patterns available.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver counters until painting and similar operations that could damage the counters have been completed in installation areas. If counters must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 WARRANTIES:

A. Manufacturer’s standard warranty on finishes and manufacturing defects.

2. PART 2 - PRODUCTS

2.1 PLASTIC LAMINATE COUNTERTOPS

A. Grade: AWS Custom.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Edge Treatment: Bullnose

D. Core Material: Exterior-grade plywood.

E. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.2 WALL BRACKETS

A. Heavy duty: rated up to 600lbs/ bracket

B. One piece construction.

C. Rounded ends.

D. Finish: pre-finished white.

E. Similar to RAKKS EHR1209, or size as required to support counter depth

2.3 SHOP FINISHING

A. General: Comply with AWI/AWMAC/WI's "Architectural Woodwork Standards" for factory finishing.

1. Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen with sheen measured on 60-degree gloss meter per ASTM D 523:

1. Grade: Same as item to be finished.

2. AWS Finish System 5: Water white conversion varnish.

3. Staining: Match approved sample for color.

4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.

5. Sheen: Satin, 30-50 gloss units.

6. Effect: Partially filled pore.

2.4 MATERIALS

A. General: Provide materials that comply with requirements of AWI/AWMAC/WI's "Architectural Woodwork Standards" for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Stainless Steel: 16 gauge 304 18/8 stainless steel, approved for food preparation.

C. High-Pressure Decorative Plastic Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

2.5 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

C. VOC Limits for Installation Adhesives and Glues: Use installation adhesives 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. Contact Adhesives: Not permitted on the Project without Designer's prior approval.

2.6 FABRICATION, GENERAL

A. Complete fabrication, including assembly, finishing, 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.

B. 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.

1. Seal edges of openings in countertops with a coat of varnish.

3. PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 COORDINATION

A. Coordinate location and size of openings in the counter for drop-in sinks with plumbing subcontractor.

1. Refer to Section 22.40.00 – Plumbing Fixtures, for type and size of sinks.

3.3 INSTALLATION

A. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

B. Install counters to be level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

C. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Countertops: Anchor securely by screwing through brackets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches and to walls with adhesive.
4. Calk space between backsplash and wall with manufacturer’s recommended sealant.

E. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 22 00 00

PLUMBING

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1, General Requirements, are hereby made a part of the work of this Section. Where paragraphs of this Section conflict with Division 1, requirements of this Section shall govern.

B. All work shall comply with all federal, state and local codes and any other authorities having jurisdiction.

1.02 SCOPE

A. The scope of work consists of the installation of all materials to be furnished under Section 22.00.00, and without limiting the generality thereof, consists of furnishing all labor, materials, equipment, plant, transportation, rigging, staging up to eight (8) feet, appurtenances, and services necessary and/or incidental to properly complete all work as shown on the **Plumbing** drawings, as described in the Specifications, or as reasonably inferred from either, in the opinion of the Architect.

B. Perform work and provide material and equipment as required for a complete and operational plumbing system as shown on the Drawings and as specified in this Section. Completely coordinate with work of other trades and provide for complete and fully functional installation.

C. Coordinate all work of Alternates with G.C.

D. The work shall include, but is not limited to, the following major items of work:

1. Demolition of existing piping and lavatory fixture as shown on the drawing.

2. Provide complete sanitary drainage system connecting to existing sanitary drain line below grade within the building. All new plumbing requires new sanitary vent piping with vent connecting to existing.

3. Provide complete domestic cold water piping system connecting to existing water lines serving the restroom and installing new water piping serving the new plumbing fixtures.

4. Provide complete domestic hot water piping system connecting to existing water lines serving the restroom and installing new water piping serving the new plumbing fixtures.

5. Provide all plumbing fixtures and equipment as required and indicated on the drawings and as specified herein. This shall include all necessary waste, vent, cold water & hot water services.

6. This contractor is responsible for firestopping all penetrations of rated structure required of his work. Non-rated penetrations shall be sealed air tight.

7. Provide pipe insulation on all new water piping.

8. Obtain all permits and approvals required or work under this section.

1.03 COORDINATION

A. Before starting work, visit site and examine conditions under which work shall be performed including preparatory work by others. Report conditions which might adversely affect the work in writing to the Architect. Do not proceed with the work until the defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as acceptance of preparatory work and existing conditions.

B. Completely coordinate with work of other trades and provide for complete and fully functional installation. Although not specifically shown, provide supplementary or miscellaneous items, devices, appurtenances and materials incidental to or necessary for sound, secure and complete installation.

C. This contractor is responsible for sleeving all holes required of his work prior to pouring of the concrete slabs. All holes less than or equal to 1-1/2" shall be the responsibility of this contractor to core. Sizes larger shall be cored by the G.C. However, if coring is required due to the failure of this contractor to set a sleeve prior to pouring than this contractor shall be responsible for bearing the cost of any of this additional coring work required of the G.C.

D. Coordinate all work of the project alternates with the G.C.

1.04 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements which affect work of this Section.

B. Other specification sections which directly relate to the work of this Section include, but are not limited to, the following:

- Section 23.00.00 – HVAC
- Section 26.00.00 - Electrical

C. The following related work will be performed by other Divisions of the specifications:

1. Concrete work, including housekeeping pads.
2. Cutting and patching of masonry, concrete, tile and other parts of structure, with the exception of drilling for hangers or as specified otherwise herein.

3. Installation of access panels in ceilings and walls. Access panels shall be furnished by this Section.
4. Painting, except as specified herein.
5. Electric power wiring for all equipment. Control wiring shall be performed by this Section.
6. Structural supports except as specified herein.
7. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing.

1.05 CODES, STANDARDS AND AUTHORITIES

A. Perform all work in strict accordance with all rules, regulations, standards, codes, ordinances and laws of local, state and Federal governments, and other authorities having lawful jurisdiction, and be responsible for compliance therewith. Such authorities include but are not limited to the following: NFPA, OSHA, AGA, & EPA.

B. Give notices, file plans, obtain licenses and permits, pay fees and backcharges and obtain necessary approvals from authorities having jurisdiction.

C. Material and equipment shall be Underwriters' Laboratories (UL) listed for the service for which it is being used.

D. Whenever two or more codes, regulations, etc., conflict with each other or with the Contract Documents, the more severe requirements shall govern the conduct of the work.

1.06 GUARANTEE

A. Guarantee work performed under this Section in accordance with Division 1, General Requirements. Operation of systems or equipment for temporary services does not constitute beginning of guarantee period. As a minimum, all materials and work shall be guaranteed for a period of one (1) year from substantial project completion as determined by the Architect.

B. The Contractor also agrees to furnish service of the equipment for the above period, such service to be rendered quickly and promptly at the request of the Owner. This shall not be misconstrued to include routine maintenance.

1.07 CONTRACT DOCUMENTS

A. Plumbing drawings do not limit responsibility of determining full extent of work required by Contract Documents. Locations shown on drawings shall be checked against construction proper.

B. Drawings are diagrammatic and indicate general arrangement of systems and work of this Contract.

1.08 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications indicate discrepancies or are unclear, advise Architect in writing before award of Contract. Otherwise, Architect's interpretation of documents shall be final and no additional compensation shall be permitted due to discrepancies or unclear items.

B. Where Drawings or Specifications do not coincide with recommendations of the manufacturer of a material or piece of equipment, this shall be brought to the attention of the Architect in writing before installation of item in question. Otherwise, make changes in installation as Architect requires without additional cost to the Owner.

1.09 RECORD DRAWINGS

A. Maintain record drawings during construction in accordance with the General Conditions of the Contract.

1.10 SUBMITTALS

A. Submit five copies (or as otherwise directed by Division 1 requirements) of shop drawings and product data to Architect for approval. Any deviation from the Contract Documents, or proposed substitution of materials or equipment for those specified, must be requested by the Contractor in a separate letter, whether the deviations are due to field conditions, standard shop practices or other cause. Where any deviation or substitution is permitted, the Contractor shall fully coordinate all related changes to Architectural, Structural, Fire Protection, HVAC, Electrical or other work, and shall accomplish these related changes at no additional cost to the Owner.

B. Submit shop drawing or product data for the following:

1. Piping, valves and accessories.
2. Plumbing Fixtures and Accessories.
3. Pipe insulation.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Prior to the final inspection, the Plumbing Contractor shall provide to the Architect three (3) sets of operating and maintenance instructions. The Architect shall review the instructions for completeness prior to turning them over to the Owner.

B. Instructions: The Contractor shall provide qualified, factory-trained manufacturers' representative to give detailed instruction to assigned Owner personnel in the operation and complete maintenance for all equipment. All such training will be at the job site.

PART 2 - PRODUCTS

2.01 PRODUCTS CRITERIA

A. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.

B. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.

C. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

D. Asbestos products or equipment or materials containing asbestos shall not be used.

E. Lead-free products shall be used for all piping, fittings, valves, faucets and any other component that comes in contact with potable water.

2.02 PLUMBING FIXTURES

A. Provide plumbing fixtures as specified herein. Fixture trim, traps, faucet, escutcheons and waste pipes exposed to view in finished spaces shall be I.P.S. brass with polished chromium plating over nickel finish. Fixtures shall have manufacturer's label or trademark indication first quality.

B. Fixtures with wall outlet flanges shall be set proper distance from floor or wall to make first-class joint with closet setting compound or gasket.

C. Mounting heights shall be as shown on architectural details.

D. Each individual fixture shall be provided with supply stops for each water service.

E. Exposed piping below handicap lavatories and sinks shall be insulated with PVC coated insulation similar to Truebro LavGuard 2, Handy-Shield MAXX, or Plumberex Trap Gear. The product shall be rigid high-impact, stain-resistant PVC, 1/8” constant wall thickness with internal ribs, have UV protection, and have an E-Z Tear-To-Fit trim feature. The color shall be china white and shall be Compatibility #100 series to fit all 1-1/4” or 1-1/2” cast brass or tubular P-trap assemblies and 3/8” or ½” angle stop assemblies.

F. Fixture Schedule: Unless otherwise specified, fixtures shall be as follows (Note: Model numbers are provided to set standard of fixture) :

1. China Fixtures include Lavatory: American-Standard, Kohler Company, Zurn ZPPG, Eljer Plumbingware Inc., Crane Plumbing, Toto USA or equal.
2. Lavatory Faucet: Symmons Industries Inc., Powers (a Watts Industries Co.), American Standard, Zurn ZPPG, Chicago Faucets, Delta Faucet Company or equal.
3. Shower Valve: Bradley Corporation, Symmons Industries Inc., Zurn ZPPG, Powers (a Watts Industries Co.), Leonard Valve Co., Delta Commercial, Moen Commercial or equal.

P-1 Drop-In Countertop Lavatory (Handicap): American Standard model #0476.028 "Aqualyn" Countertop Sink, made from vitreous china, self-rimming with cutout template supplied, front overflow, faucet ledge, faucet holes on 4" centers. Nominal dimensions are 20-3/8" x 17-3/8" and bowl size is 16" wide x 10" front to back x 5-5/8" deep.
Symmons Metering Lavatory Faucet model #SLC-6000 Includes Metering lavatory faucet featuring 4" centerset mount, 3/8" copper supply tubes and temperature limit stop, Faucet constructed from brass, plated in standard polished chrome finish. 10 Year Commercial Warranty. ASME A112.18.1/CSA B125.1, NSF/ANSI 372 compliant.
Chicago #STC-11-11-AB Heavy Duty lead-free, loose key stops and supplies with flexible riser and flange. 1-1/4" x 1-1/2" polished chrome plated cast brass adjustable "P" trap, cleanout plug, extension to wall with escutcheon.
Concealed arm carrier support with foot support to suit construction. Install with rim at 34" maximum above finished floor.
Insulate cold water, hot water, and waste beneath lavatory. Refer to paragraph 2.02.E for additional information.

P-2 Shower Valve (Handicap): Symmons model # #3503-H321-V-CYL-B-TRM Hand Shower Trim featuring:

- Dia Hand Shower Trim
- Requires Temptrol® Pressure Balancing Shower Valve
- Metal lever handle
- 30" slide bar for hand shower wand
- Dual checks for backflow protection
- 60" flexible metal hose
- 1 mode hand shower wand
- 2.0 gpm flow restrictor
- Tub spout and showerhead not included
- Components shall be metal and nonmetallic construction

Symmons model #261XBODY Pressure Balancing Shower Valve body with service stops featuring:

- Brass, bronze and stainless steel construction
- Pressure balancing mixing valve to maintain safe shower temperature
- Adjustable stop screw to limit handle rotation
- Integral service stops allow water shut-off for valve servicing
- 3 port valve body in common plane
- Inlets: 1/2" IPS and 1/2" sweat
- Outlets: 1/2" IPS and 1/2" sweat
- Accommodates back-to-back installation when using reverse seat.
- Accommodates thin wall installations
- Stringer mounts included

2.03 PIPE MATERIALS

A. Sanitary, drainage, and all vent pipe and fittings above ground: 2-1/2 inches and larger - hubless cast iron, service weight soil pipe, mechanical joint. 2 inch and smaller - Type

DWV, hard temper copper pipe with cast brass, 95/5 solder joints, solder joint drainage fittings. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

1. Furnish and install hubless soil pipe couplings designated Heavy Weight (HW), made of extra wide, heavy duty corrugated type 304 stainless steel with axially slotted heavy duty, worm drive clamps tightened to 80 in lbs. of torque. Flanged gaskets to be made of neoprene rubber, meeting the requirements of ASTM C 564, with sealing rings under each stainless steel clamp. Manufacturers shall be Mission Heavy Weight, Husky 4000 or Clamp-All 125.

B. Sanitary, drainage, vent pipe and fittings below ground: Service weight cast iron solid pipe and fittings coated with tar and asphaltum. Joints to be packed oakum and molten lead or mechanical joint with resilient gaskets.

C. All hot water and cold water piping within the building shall be hard copper Type "L" seamless drawn tubing assembled with sweat fittings. All solder used shall be lead free, cadmium free, "Silverbrite - 100," or approved equal, complying with the latest issue of ANSI A-5.8 publication. All exposed runs to all toilet fixtures and sinks shall be chrome plated.

1. Press Fitting: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-Rings for copper press fittings shall be EPDM.

    a. Manufacturers of Copper Press Fittings:
    Viega, 17545 Daleview Dr., Lakewood, OH 44107, (877) 620-0016;
    Rigid Tool Company, 400 Clark Street, Elyria, OH 44035, (800) 519-3456;
    Elkhart Products Corporation “Xpress Press-Connect Fittings”, 1255 Oak Street, Elkhart, Indiana 46515, (800) 284-4851
    Nibco Press System, 1516 Middlebury Street, Elkhart, IN 46516-4740, (800)234-0227

2. Vic-Press 304™ Fittings: In lieu of alternate piping methods, Vic-Press 304™ may be used on piping systems 1/2" through 2” in size. Pipe shall be ASTM A312 .049 wall type 304/304L stainless steel, certified for use with Vic-Press 304™ products. Fittings and couplings shall be precision cold drawn austenitic stainless steel, complete with synthetic rubber O-ring. O-ring grade to suit the intended service. O-rings used on potable water systems shall be EPDM, UL classified in accordance with ANSI / NSF61 for potable water service.

    a. Manufacturers of Vic-Press 304™ Fittings:
    Victaulic Company of America

3. Solder Standard: Solder metal shall conform to the requirements of ASTM B32. Soldering fluxes shall conform to ASTM B813. Solder and fluxes used in drinking water systems shall have a maximum of 0.20-percent lead (Pb) content.

2.04 VALVES

A. Each valve type shall be of same manufacturer and appropriate for service in which used, valves shall be Milwaukee, Watts, Apollo or approved equal. Valves shall comply with all requirements of the Massachusetts Plumbing and Fuel Gas Code; type proposed for each service shall be submitted for approval. In general, shut-off valves, except for exposed stops at fixtures, shall be ball valves.

B. Each system shall be provided with valves as required by Code and as specified. Valves shall be installed for isolation and to facilitate operation, replacement and repair. Provide access panels where valves are concealed behind non-removable ceilings or walls. Provide shut-off valves for water supply piping to individual fixtures and appliances (i.e. water heater)

C. Ball Valves:

1. On water lines inside the building, ball valves 3 in. and smaller shall be as manufactured by Consolidated Valve Industries, Inc.'s "Apollo" 95-200-03 Series stop and drain with 1-1/4 in. extended stems for piping 1/2 in. to 1 in. size; 77-100/200 Series with 1-1/4 in. extended stems for piping 1-1/4 in. to 2-1/2 in. size. Valves shall be provided with stainless steel ball, reinforced Teflon seats and seals, bronze body, 400 PSI WOG, positive l00 percent shutoff. Valves 4 in. in size shall be equal to "Apollo" 82-24A-01 with extended stem. Ball valves shall be full port style.

2. Drain valves at all low points shall be "Apollo" 78-100 or 78-200 Series, 1/2 in. or 3/4 in. solder by 3/4 in. hose end with attached dust cover cap and chain.

3. Ball valves shall be of one (1) manufacturer, Conbraco Industries, Inc., "Apollo," Watts Regulator or Nibco/Scott.

2.05 TRAPS

A. Provide separate traps with integral cleanouts on fixtures and equipment requiring connections to sanitary system. Exceptions are fixtures with integral traps. Traps exposed to view, including connecting drain lines, shall be chrome plated. No trap shall be less than 1-1/2 inch and shall be sized as required by Code.

B. Traps shall be service weight cast-iron where buried in floors or serving floor drains with trap primer connections where noted on the Drawings. Where traps are not connected directly under the drain they serve in the floor, they shall be fitted with top cleanouts and extensions to the floor with access covers and plates.

2.06 INSULATION

A. All hot water, hot water recirculation and cold-water piping shall be insulated with Manville FLAME-SAFE fiberglass pipe insulation, Owens-Corning Fiberglass 25, or approved equal. The insulation shall have an average thermal conductivity not to exceed .25 BTU in. per sq. ft. per F. per hour at a mean temperature of 75 degrees F. Thickness

of the insulation shall be 1/2 in. for cold water piping up to and including 2 in. and 1 in. for hot water piping. Jacket shall be FLAME-SAFE AP. The insulation shall be applied over clean dry pipe with all joints butted firmly together. Longitudinal jacket laps and the butt strips shall be smoothly secured with Benjamin Foster 85-20 adhesive.

B. All fittings and valves shall be insulated with the proper factory pre-cut fiberglass insulation and covered using the factory, pre-molded, one-piece PVC fitting covers secured with flexible off-white 10 mil polyvinyl chloride film bonded with a specially formulated adhesive that can be installed indoors and out with a strong permanent bond conforming to MIL Spec. No. 7798-A.

C. Insulation shall be Manville, Owens-Corning, CertainTeed Corp., Armstrong, or approved equal.

D. Pipe hangers shall be outside insulation and shall be provided with 12" long, minimum 24-gauge galvanized steel insulation protection shields. Insulation on piping which passes through walls pr partitions shall pass continuously through sleeves, except at firewalls, smoke partitions and floor penetrations where space between sleeves and piping shall be firestopped with approved packing.

2.07 HANGERS

A. Hangers shall support piping from building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place and provide for expansion and contraction. Hangers shall be adjustable clevis type; trapeze hangers may be used where conditions permit. Hangers in contact with copper or brass pipe shall be copper plated steel.

B. Hanger spacing shall conform to requirements of state and local plumbing codes; in no case shall horizontal piping be supported at intervals greater that 10 ft.

C. Hanger rods shall be connected to beam clamp as required to attach to the building construction. No ram-set or shot shields will be allowed.

D. Electric Water Heater will be hung over the mop sink. The proposed equipment support is similar to HoldRite Quick Stand Equipment Platform model #60-SWHP-WM which supports up to 50 gallon water heaters or 750 LBS. It is a wall-mount configuration which includes six (6) brackets, two (2) support arms and connection hardware. There shall be a 1” welded galvanized steel drain fitting in the base pan. The equipment platform shall be watertight which eliminates the need to provide a separate drain pan. The equipment platform shall by constructed of galvanized steel. The drain pan size is 28-1/2” x 28-1/2” x 3” deep.

2.08 CLEANOUTS

A. Cleanouts shall be provided in soil and waste pipes at changes in direction, where shown on Drawings, and at other points required by Code so that lines will be readily accessible for cleaning or rodding out; provide a minimum of 24 inch clearance for rodding.

Cleanouts shall be same size as pipe in which they are installed but not larger than four inches.

B. Cleanouts shall be installed so that cleanout opens in direction of flow of drainage line served or at right angles thereto. Cleanout plug shall be kept free of dirt and construction materials and shall not be covered with cement, plaster or other permanent finishing materials.

C. Provide cleanouts a base of vertical stacks with cleanout plug located approximately 30 inches above floor. Extend cleanouts to wall with access covers. Cleanout shall consist of sanitary tees. Furnish nickel-bronze square frame and cover with minimum opening 6 x 6 inches at each wall cleanout.

E. In horizontal runs above grade, cleanouts shall consist of cast brass screw plug in fitting or in caulked cast iron ferrule.

F. Floor cleanouts shall have cast iron body and frame with square adjustable scoriated secured nickel bronze top. Unit shall be vertically adjustable for a minimum of two inches. When waterproofing membrane is used, provide clamping collar. Cleanouts shall consist of "Y" fittings and 1/8 inch bends with brass or bronze screw plugs. Cleanouts in tile floors shall have square top covers recessed for tile insertion; in carpeted areas, provide carpet cleanout markers. Floor cleanout shall be Zurn 1400 Series Level-trol Supreme cleanouts and Type ZN-1400-Z in terrazzo floors, Type ZN-1400-TX in tiled floors, Type ZN-1400-CM in carpeted floors, and Type ZN-1400 in all other locations. Cleanouts shall be set flush and level with top of finished floor surface except in carpeted areas where they shall be flush with concrete.

2.09 JOINTING COMPOUNDS

A. Provide pipe dope, Teflon tape, wax rings, neoprene gaskets and other jointing compounds as required by best standard practice and only on service as recommended by the manufacturer. Work shall conform to manufacturer’s recommendations with regard to use of putties, jointing compounds or both in installing plumbing fixtures and trim.

2.10 PIPE IDENTIFICATION AND VALVE TAGS

A. All piping, except that piping which is within inaccessible chases, shall be identified with semi-rigid plastic identification markers similar to Seton, PipeMarker or Emedco pipe markers. Directions of flow arrows are to be included on each marker. Each marker background shall be appropriately color coded with clearly printed legend to identify the contents of the pipe in conformance with the “Scheme for the Identification of Piping Systems” (ANSI 13.1-1981). Setmark snap-around markers shall be used above six inch overall diameters up to six inches and strap-around markers shall be used above six inch overall diameters. Markers shall be located adjacent to each valve, at each branch, at each cap for future, at each riser take off, at each passage through wall, at each pipe passage through floors, at each pipe passage to underground and on vertical and horizontal piping at 20 foot intervals maximum. All non-portable water lines and outlets shall be identified in accordance with the requirements of the Massachusetts Uniform State Plumbing Code.

B. All valves shall be designated by distinguishing numbers and letters carefully coordinated with a valve chart. Valve tags shall be 19 gauge polished brass, 1-1/2 inch diameter with stamped black filled letters similar to Seton S type 250-BL, Marking Services Inc. or Pipemarker. Lettering shall be 1/4 inch high for type service and 1/2 inch for valve number. Tag shall be attached to valves with approved brass "S" hooks, or brass jack chin. Whenever a valve is above a hung ceiling, the valve tag shall be located immediately above the hung ceiling.

C. Furnish a minimum of two typed valve lists to be framed under glass or plexi-glass. Each chart shall be enclosed in an approved .015-inch thick plastic closure for permanent protection. Valve numbers shall correspond to those indicated on the Record Drawings and on the printed valves lists. The printed list shall include the valve number, location and purpose of each valve. It shall state other necessary information such as the required opening or closing of another valve is to be opened of closed. Printed framed valve lists shall be displayed in each Mechanical Room or in location designated by the Owner.

D. Equipment nameplates shall be 3/4 inch by 2-1/2 inch long .02-inch aluminum with a black enamel background with engraved natural aluminum letters similar to Seton Style 2065-20. Nameplate shall have pressure sensitive taped backing.

E. Provide a brass will plaque, minimum .020-inch thickness, secured to the exterior wall just above the grade line for all buried serviced entrances or exits. Samples of such are: Water Service Below; Sanity Sewer Below; Kitchen Waste Below; Storm Drain Below; etc.

PART 3 - EXECUTION

3.01 SPECIAL RESPONSIBILITIES

A. Cooperate and coordinate with other trades in executing work of this Section. Perform work such that progress of entire project including work of other trades shall not be interfered with or delayed. Provide information on items furnished under this Section to be installed by other Sections.

1. Obtain detailed information from manufacturers of equipment as to proper method of installation. Give full information so that openings required for work of this Section may be coordinated with other work and other openings and many be provided for in advance. In case of failure to provide information, cutting and patching will be done at the expense of this Section to the satisfaction of the Architect.

2. Notify Architect of location and extent of existing piping and equipment not shown on the Drawings which interferes with new construction. With approval of Architect, relocate existing equipment to permit new work to be installed as required by Contract Documents. With approval of Architect, remove non-functioning or abandoned piping and equipment.

B. During progress of work, remove and properly dispose of resultant dirt and debris and keep premises reasonably clean. Upon completion of work, remove equipment and unused material provided for work.

C. Conduct work so as not to interfere with functioning of existing sewer, water and gas mains. Extreme care shall be observed to prevent debris from entering piping. Confer with Architect as to disruption of water service or other utilities due to testing or connection of new work to existing.

3.02 MATERIALS AND WORKMANSHIP

A. Work shall be executed in a workmanlike manner and shall present neat appearance when completed. Piping shall rum concealed except in mechanical rooms and areas where no hung ceiling exists. Material and equipment shall be installed according to manufacturer's recommended best practice.

B. Materials and equipment shall be new, unless otherwise noted.

3.03 ESCUTCHEONS

A. Escutcheons shall be installed around exposed pipe passing through finished floor, wall or ceiling. Escutcheons shall be heavy cast brass, chrome-plated, adjustable, of sufficient outside diameter to cover sleeve opening and to fit snugly around pipe or insulation.

3.04 SLEEVES AND INSERTS

A. Sleeves for piping between floors and through fire walls or smoke partitions shall be installed with approved packing between sleeves and piping to provide firestop.

3.05 INTERIOR WATER SUPPLY SYSTEM

A. Water supply piping shall be run as indicated on the Drawings, including new connections to mains and supplies to fixtures. Connections to fixtures shall be from top of mains and piping shall be pitched at least 1 inch in 40 feet in the direction of flow so that it can be drained completely at low points. Provide drain valves where necessary. Piping shall be pitched up towards fixtures for proper air relief.

B. Provide water hammer arrestors of proper size and type at end of each water branch with flush valves.

C. Provide ball type shut-off valves on water branches to individual areas and bathroom groups.

3.06 SANITARY, WASTE AND VENT PIPING

A. Interior horizontal sanitary and waste piping shall be installed in practical alignment at uniform grade of 1/8 inch per foot minimum up to1/4 inch per foot if possible or if required by code such as for waste piping smaller than 4”. Coordinate invert of tie-ins to

site piping with site contractor. Piping within building shall be coordinated closely with the work of other trades, in particular the HVAC ductwork.

3.07 ELECTRICAL ROOMS

A. Piping shall not be installed in or through Electrical Rooms, Electrical Closets, Transformer Rooms, Telephone Rooms or Elevator Machine rooms unless the piping is intended to serve these rooms. No piping shall be installed over electrical panels.

3.08 CLEANOUTS

A. All cleanouts shall be set flush with walls or floors. Finish shall be protected during construction with proper covering. Flush floor cleanouts shall be coordinated so as to not be located beneath any partitions, casework nor beneath any non-potable equipment.

3.09 VALVES

A. All valves shall be furnished and installed under this Section shall be located in a manner to allow proper access for service and repair.

B. In no case shall valve stem and handle on a gate or globe valve be installed below the center line of the pipe it serves.

3.10 JOINTS AND CONNECTIONS

A. Joints and connections of piping shall be made permanently gas and water tight.

B. Dielectric couplings or unions shall be used where dissimilar piping materials are joined.

C. Final plumbing and gas connections to all equipment furnished or installed by others shall be by this Section.

3.11 INSTALLATION OF EQUIPMENT

A. Install equipment to avoid interference with structure and work of other Sections, preserve adequate headroom and clear doors and passageways, to satisfaction of Architect, and in accordance with Code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the equipment being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation.

3.12 DISINFECTION

A. The domestic water distribution piping system shall be thoroughly disinfected with solution containing not less than 50 parts per million of available chlorine. Solution shall be introduced into system for period of eight hours, during which time valves and faucets

shall be opened and closed several times. After disinfection, solution shall be flushed from system with clean water until residual chlorine content is not greater than 0.2 parts per million.

3.13 CLEANING

A. Upon completion of work but prior to final system testing, all parts of installation shall be thoroughly cleaned. Fixtures, pipe, valves and fittings shall be completely cleaned of grease, metal cuttings, dirt, etc. Protective covers shall be removed and fixtures shall be cleaned and ready for use.

3.14 TESTING

A. Provide testing of plumbing systems as required by authorities having jurisdiction, including Owner and Architect. Tests shall be conducted as part of work of this Section and shall include labor, equipment, apparatus and services required to perform tests.

B. Prior to final acceptance, furnish Architect with certificates of testing and inspection for plumbing systems indicating approval of authorities having jurisdiction and conformance with requirements of Contract Documents.

C. Notify Architect and authorities involved at lest 48 hours prior to testing and inspection. Do not paint, cover or conceal work prior to testing, inspecting and obtaining approval.

D. Provide temporary piping and connections for testing, flushing or draining systems to be tested. Leaks, damage or defects discovered or resulting from test shall be repaired or replaced to like-new condition. Piping must be absolutely tight before it will be accepted and joints shall be made tight without caulking.

E. After soil and waste pipes have been installed, outlets shall be temporarily plugged up. Fill pipes with water to top of vertical lines and allow to remain for 24 hours. Repair leaks and retest as required.

F. Water piping shall be tested tight for 24 hours under hydrostatic pressure 1-1/2 times system working pressure. Tests shall be witnessed by Architect and approved before water is drained off. Repair leaks and retest as required.

3.15 LUBRICATION

A. After complete installation by the Contractor of any equipment which depends on lubrication for efficient operation, the Contractor shall properly lubricate per instructions of the manufacturer. This shall be done before any test runs or final operation.

3.16 LABELING

A. Provide pipe markers of either pressure sensitive tape or laminated plastic, color coded per ANSI standards and indicating the type and direction of flow of the plumbing service. All exposed CW, HW and gas piping shall be labeled a minimum of every 20 feet. Hot water of varying temperatures shall be labeled as such.

B. Provide engraved brass (1-1/2” disc) valve tags with black lettering on all main plumbing shut-off valves. Valves requiring tags shall be as follows:

- Valves isolating multiple fixtures and fixture groups.

Provide typed valve chart mounted in glass frame indicating valve ID, service and location. Mount in janitor closet. A copy of valve chart shall accompany each O&M manual.

END OF SECTION 22.00.00

SECTION 23.00.00

MECHANICAL

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, are hereby made a part of the work of this Section. Where paragraphs of this Section conflict with Division 1, the more stringent requirements shall govern.

B. All work shall comply with all federal, state and local codes and any other authorities having jurisdiction.

1.02 SUMMARY

A. Provide all materials, labor and equipment required to perform the work of this section, as shown on the Contract Drawings and as specified herein, to include:

1. Ceiling Exhaust Fan.
2. Miscellaneous supports and hangers as required.
3. Aluminum Ductwork and Ductwork Accessories.
4. Removal and relocation of existing electric baseboard heater.

B. Related Work Specified Under Other Divisions

1. Power circuiting.

1.03 SUBMITTALS

A. Product data: within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Coordinated shop drawings, showing proposed layout of equipment and other components of the system.

2. Manufacturers catalogs, samples and other items needed to fully demonstrate the quality of the proposed materials and equipment including product data on exhaust fans and thermal insulation.

B. Record Drawings:

1. Submit one reproducible and three blue line copies of As-Built drawings at completion of project.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. The Contractor's superintendent shall conduct all coordination between the Contractor, the Architect, the Engineers, etc., and shall fully represent the Contractor's position in his absence. All decisions by the superintendent shall become the responsibility of the Contractor and binding to the Contract. The Contractor shall be responsible for the drawings, and that which is written or implied in the specifications.

C. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

D. Before submitting the final proposal examine the site of the proposed work to determine existing conditions that may effect the work, as this section will be help responsible for any assumption in regard thereto.

1.05 GUARANTEE

A. The Contractor shall guarantee every component part of each system for a minimum of one year parts and labor. The contractor shall also provide the Owner with factory warranties for all equipment.

1.06 DRAWINGS

A. The Contractor shall examine the requirements and provisions of the Contract Documents and ascertain the extent of work and materials required or reasonably implied. The drawing pertaining to the work of this section is H1.

1.07 PAYMENT

A. Payment for work of the Section will be made for the quoted Contract Price and will constitute payment in full for all costs for furnishing all labor, materials and equipment necessary to complete the work as required. Payment under this contract shall be made in partial payments as approved by the Architect as the work progresses.

PART 2 - PRODUCTS

2.01 DUCTWORK

A. For the Heating and Ventilating systems, provide galvanized sheet metal ducts fabricated and installed to pertinent ASHRAE and SMACNA standards, except as otherwise indicated. Galvanized ductwork shall conform to ASTM A527 (G-90) having not less than 1.25 oz. of zinc on each side of each square foot of sheet. Duct systems shall comply with the pressure velocity classification in compliance with the SMACNA HVAC Duct Construction Standards, 2005 third edition. Minimum pressure classification shall be 2”w.g.

B. Furnish and install the size, connections and run of ducts as indicated on the drawings. Drawings indicate inside clear dimensions.

C. The sheet metal ductwork shall, whether indicated or not, rise and drop and change in shape to clear lighting fixtures, plumbing and structural framing etc., to maintain the desired clearances within the spaces.

D. The ductwork shall be continuous, with airtight joints and seams presenting a smooth surface on the inside and neatly finished on the outside. Ducts shall be constructed with curves and bends so as to effect an easy flow of air. Unless otherwise shown on the Drawings, the inside radius of all curves and bends shall be not less than width of ducts in plane of bend.

E. All ductwork, unless otherwise noted, shall be built from galvanized sheet steel and thoroughly braced and stiffened. All ductwork shall be of the gauge recommended by SMACNA except that the minimum gauge thickness for any duct shall be no less than 24.

F. Seal all duct seams, transverse and longitudinal, air tight with 3M “ED800” or equal duct sealing compound.

G. For all exhaust ductwork serving the restrooms, provide ductwork fabricated from aluminum.

2.02 EXHAUST FANS

A. Exhaust fans shall be of the type and capacity shown on the Drawings; Panasonic, Nutone, Broan, or equal. Fans shall be tested in accordance with AMCA and bear the AMCA Certified Performance Ratings Seal; fans shall be UL Listed. All fans shall come equipped with factory mounted back-draft dampers.

B. CEX-1: Ventilator shall be Panasonic model #FV-0511VKSL2 or approved equal. The fan shall have the following features:

1. Precision, whole-house ventilation solution ideal for use in the bathroom, laundry room, sun room, basement and garage.
2. Helps assure good indoor air quality for a healthy home and healthy living.
3. Customizable, connected fan and fan/dimmable LED light combinations.
4. Pick-A-Flow airflow selector (50 – 80 – 110 CFM model) combined with SmartFlow technology simplifies the selection process and ensures optimum performance to meet code and reduce callbacks.
5. Elegant grille design compliments the aesthetics of any room.
6. Single-hinged Flex-Z Fast bracket provides flexible, fast and easy installation.
7. Can be used to comply with ASHRAE 62.2.

Additional Benefits include:

1. Ideal IAQ solution for green builders.
2. Environmentally friendly 26 gauge housing using Zinc-Aluminum-Magnesium (ZAM) coating.
3. Integrated 4” or 6” dual duct adapter enhances installation options / fits in 2 x 8 construction.
4. Built-in metal flange provides blocking for penetrations through drywall as an air barrier.
5. Suitable for installation in ceiling insulated up to R60.
6. Dual access junction box simplified wiring in tight spaces.
7. UL Listed for tub/shower enclosure when GFCI protected.
8. 6-year warranty on ECM motor, 5 years on LED, 3 years on parts.

Base Fan/Light to be installed: Panasonic model #FV-0511VKSL2; 30 to 110 CFM pre-installed multi-speed + LED light.
Added Features include:

1. SmartAction Motion Sensor (FV-MSVK1) – Automatically activates when someone enters the room. Once the settings have been applied, the fan becomes truly automatic, making it ideal for people with disabilities and assisted living environments such as nursing homes and retirement communities. This module also activates an automatic 20-minute delay off timer for the fan.
2. Condensation Sensor (FV-CSVK1) – Helps control bathroom condensation to prevent mold and mildew. Advanced sensor technology detects relative humidity and temperature to anticipate dew point, automatically turning the fan on to control humidity. Built-in Relative Humidity (RH) sensitivity adjustment enables fine tuning for moist conditions (30% to 80%, in 10% increments) and for satisfying CALGreen requirements. When the condensation sensor is used in conjunction with multi-speed functionality, the fan will kick up to high speed when the condensation sensor detects moisture in the room. This module also activates an automatic 20-minute delay off timer for the fan.

2.03 CONTROLS

A. Furnish and install all control components necessary to obtain a fully functional control system as described herein. The contractor is responsible for providing all controls, relays, etc.. necessary to provide for a full turn-key installation.

B. CEX-1 bathroom exhaust fan shall be controlled by a grille mounted motion detector. Electrical contractor shall be responsible for wiring the fan. If someone enters the bathroom, fan shall run continuously. The fan shall have a built-in time delay switch that can be set to allow the fan to continue to operate after the bathroom occupant has left the room. The fan shall run for a minimum of 20 minutes at high speed. The fan shall be disabled whenever there is no motion detected.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of heating, ventilating and air conditioning system will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install equipment ductwork, piping and controls where shown with recognized industry standards and practices, to ensure that installation complies with requirements and serves intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Installation of Equipment:

1. Contractor shall examine location where equipment is to be installed and determine space conditions and notify Architect, in writing, of conditions detrimental to proper and timely completion of work.
2. Install equipment where shown in accordance with manufacturer's written instructions.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation test system to demonstrate compliance with requirements. When possible, field correct malfunctioning items then retest to demonstrate compliance. Replace materials which cannot be satisfactorily corrected. Refer to Section - Test and Balancing.

3.04 CLEANING

A. Clean all piping, equipment, etc. at completion of work for turnover to Owner.

END OF SECTION 23.00.00

SECTION 26 00 01

ELECTRICAL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING filed sub-bids:

A. The work of this section is work of a Publicly Bid Trade Contractor and includes the following requirements.

1. Specification requirements for the Trade Contract "ELECTRICAL" include all of the following listed Specification Sections: in their entirety:

a. Section 26 00 01 - ELECTRICAL

b. Section 260500 - COMMON WORK RESULTS FOR ELECTRICAL

c. Section 260519 - ELECTRICAL POWER CONDUCTORS AND CABLES

d. Section 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

e. Section 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

f. Section 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

g. Section 262726 - WIRING DEVICES

h. Section 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

i. Section 265100 - INTERIOR LIGHTING

j. Section 283111- ADDRESSABLE FIRE-ALARM SYSTEM

B. Sub-Bids for work under this Section shall be for the complete work and shall be bid electronically per Section 00 21 13 Instructions to Bidders.

C. Additional Requirements:

1. Trade contract bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
2. Each trade-contract bidder shall list in Paragraph E of the "Form for Filed Sub-Bid" 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.

Class of Work	Reference Specification	Paragraphs

D. The work to be completed by the Trade Contractor for the work of this Section is shown on the following listed Drawings:

1. The Work of this Trade Contract is shown on the following Drawings:

   E1, E2, E3.

2. The complete List of Drawings for the Project is provided in Section 00 01 15.
3. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section The listing of Contract Drawings above

does not limit Trade Contractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing Title Sheet, as modified by Addenda.

1.3 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 lighting systems including all fixtures, lamps, mounting accessories, switches, controls, outlets, wiring, raceways, and all other components and fittings required for a complete lighting system.
2. Grounding and bonding of all electrical systems and equipment.
3. Fire alarm system complete with all devices and wiring, and connection to existing system.
4. Wiring devices (switches and receptacles) complete with associated wall plates.
5. Access control system devices complete with cabling, wall plates, and patch panels.
6. Testing of all electrical systems.
7. Coordination between electrical and other trades.
8. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.
9. Core drilling for the Work of this Section.
10. Coordination drawings and record drawings and similar requirements.

B. Carefully examine all the Contract Documents for requirements which affect the work of this Section. The exact scope of this Section cannot be determined without a thorough review of all specifications sections and other Contract Documents.

C. Where referred to, Standard Specifications, Recommendations of Technical Societies, and/or Manufacturer's Associations, plus Codes of Federal, State, and Local Agencies shall include all amendments current as of date of issue of these specifications.

D. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Division 23– HEATING, VENTILATING AND AIR CONDITIONING:

a. Power connections for equipment, control panels, pumps, fans,

E. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. N/A

F. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Division 6 – ROUGH CARPENTRY for plywood backing panels.
2. Division 7 – FIRESTOPPING for coordination of floor and wall penetrations.
3. Division 8 – ACCESS DOOR & PANELS for coordination of access door & access panels.

G. The Electrical Sub-Contractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the electrical work.

H. The Owner shall be responsible for all Utility Company and Municipal backcharges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand.

1.4 SUBMITTALS

A. Comply with requirements specified in Division 1.

B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:

1. Electrical
2. Common Work Results for Electrical
3. Electrical Power Conductors and Cables
4. Grounding and Bonding for Electrical Systems
5. Hangers and Supports for Electrical Systems
6. Raceway and Boxes for Electrical Systems
7. Wiring Devices

8. Enclosed Switches and Circuit Breakers
9. Interior Lighting
10. Addressable Fire Alarm System

1.5 SERVICE CHARACTERISTICS

A. Secondary Building Voltage - Low Level: 480/277V & 208/120V

B. All equipment and wiring shall be suitable for the applied voltage.

1.6 TRAINING AND SERVICE

A. The Owner shall be thoroughly instructed in the use of for each type of system installed, as defined in the specifications by the system vendor.

B. The Owner shall be thoroughly instructed in the use and upkeep of the system, the training shall include routine maintenance and operational adjustments.

C. Final “as built” documentation must be available at the job site for all training sessions.

D. The Electrical Subcontractor shall provide training materials free from any copyright restrictions, and upon request from the Owner, furnish a reproducible set of these materials.

E. Instruction and training for the operation and routine maintenance of the system shall be provided at site, after final completion acceptance of the system, at a time mutually satisfactory to the Electrical Subcontractor and Owner.

F. The training shall include system(s) functional description and the proper adjustment procedure for every adjustment in the system(s).

G. The equipment will be made available by the Owner, after delivery and acceptance, for use in the instruction and training program. The Owner will provide space for the instruction and training. The Electrical Subcontractor shall provide the instructor(s) and all training materials.

1.7 WARRANTY

A. The Electrical Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

B. The warranty shall repair or replace defective materials, equipment, workmanship, and installation that develop within this period, promptly and to Owner's satisfaction and correct damage caused in making necessary repairs and replacements under warranty within Contract Price.

C. In addition to warranty requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

1. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
2. Replace material and equipment that require excessive service during warranty period as defined and as directed by Designer.
3. Provide 24-hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the warranty period. Service shall be at no cost to the Owner. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to the Owner’s approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
4. Submit copies of equipment and material warranties to the Owner before final payment.
5. At end of warranty period, transfer manufacturers' equipment and material warranties still in force to the Owner.
6. This Paragraph shall not be interpreted to limit the Owner’s rights under applicable codes and laws and under this Contract.
7. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph. Those paragraphs will govern.
8. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by the Owner and shall not initiate the warranty period.

9. Non-durable items, such as electric lamps, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.
10. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during warranty period immediately. If problems cannot be rectified immediately to the Owner’s satisfaction, advise the Owner in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will direct course of action.

1.8 FIRESTOPPING

A. Fire-stopping of all rated wall, floor, and ceiling penetrations used by this contractor for any work completed under this Section.

B. Walls requiring sound seal noted w/ STC rating including exterior walls (for water and air seal) to be sealed with non-combustible, water-proof material, as specified in Section 09 29 00 Gypsum Board, both sides of all penetrations.

C. The Electrical Contractor shall be responsible for fire stopping and sound sealing all wall, floor and ceiling penetrations for the electrical work as required for all conduit, wiring, cabinets, panels, etc. Materials shall be coordinated with the Construction Manager.

D. All conduit, wiring, cabinets, panels, etc. installed by the Electrical Contractor through acoustical partitions shall be sealed with an approved acoustical sealant, by the Electrical Contractor.

PART 2 - PRODUCTS

2.1 SEQUENCING

A. Phasing: Refer to Section 01 10 00 - Summary, and Drawings for phasing and milestone completion requirements which affect the General Contractor's Work and the Work of this Filed Subcontract.

B. Coordinate work of this Filed Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.

C. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.

D. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

2.2 SCAFFOLDS, STAGING, AND OTHER SIMILAR RAISED PLATFORMS

A. General: Filed Subcontractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - Temporary Facilities and Controls and herein.

1. Scaffolding and staging required for use by this Filed Subcontractor pursuant to requirements of Section 01 50 00 - Temporary Facilities and Controls shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub-Trade requiring such scaffolding.
2. Each Filed Subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - Temporary Facilities and Controls and as additionally required for dust control).
3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility this Filed Subcontractor.
4. Enclose all exterior scaffolding outside of the construction fence with 8-foot high plywood enclosure at end of each workday to prohibit access to the scaffolding by unauthorized individuals.

PART 3 - EXECUTION

NOT USED

End of Section

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS – FILED SUB-BID REQUIRED AS PART OF 260001 ELECTRICAL FILED SUB BID

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.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceways and cables.
2. Sleeve seals.
3. Grout.
4. Common electrical installation requirements.

1.3 SUBMITTALS

A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. Advance Products & Systems, Inc.

2. Calpico, Inc.
3. Metraflex Co.
4. Or approved equal.

2.2 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.3 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants".

J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

End of Section

SECTION 26 05 19
ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

A. Comply with Section 260001.

B. The Electrical Trade Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers – Conductors and Cables

1. AFC Cable Systems, Inc.
2. Southwire.
3. Genera Cable.
4. Or approved equal.

B. Acceptable Manufacturers – Connectors and Splices

1. AFC Cable Systems, Inc.
2. 3M; Electrical Products Division.
3. Tyco Electronics Corp.
4. Or approved equal.

2.2 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: 90 degree rated; Comply with NEMA WC 70 for THHN, THWN-2 and XHHW-2.

C. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

D. Emergency System Feeders: Emergency System Feeders: Mineral-insulated, metal-sheathed cable, Type MI.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.4 METAL CLAD (MC) CABLE ASSEMBLY

A. Description

1. Metal clad cable assemblies shall consist of 2 or more insulated, current carrying copper conductors. The Metal-Clad Cable shall be UL Classified as a Through-Penetrating Product (XHLY) for use in One, Two or Three-Hour Through-Penetration Firestop Systems {XHEZ). Assembly shall be suitable for use in cable trays in accordance with the NEC.
2. Current-Carrying Conductors: Soft annealed copper in compliance with the latest edition of ASTM B3 and/or B8.
3. Each separate circuit conductor shall have its own dedicated neutral conductor. The dedicated neutral conductor shall be white/grey with a continuous color stripe matching the color of its dedicated circuit conductor. Multi-wire branch circuits are not allowed.
4. Grounding/Bonding Conductor: Full sized bare aluminum bonding/grounding conductor, sized in accordance with Table 6,1 of UL1569, working in combination with the armor to create a low resistance ground path. Aluminum bonding/grounding conductor shall be cabled with the current-carrying conductors and shall be in intimate contact with the metal armor.
5. Insulated Equipment Grounding Conductor: The equipment ground shall be full-sized in accordance with Table 6.1 of UL 1569 and shall be soft-annealed copper in compliance with the latest edition of ASTM B3 and/or B8.
6. Insulated Conductor: The insulated conductor shall be Type THHN 90°C DRY with an extruded polypropylene protective covering. The Type THHN Insulated

Conductor with protective covering shall be manufactured and tested in accordance with UL 83 and UL 1569.

7. Armor: A zinc coated galvanized steel armor shall be applied over the cabled wire assembly with an interlock in compliance with Section 13 of UL 1569.

B. Fittings

1. Fittings shall be UL listed and identified for use with metal clad interlocking armor ground.
2. Connectors shall be of steel or malleable iron and shall have saddle clamp to insure a tight termination of MC Cable to box.

2.5 MINERAL INSULATE (MI) CABLE 2-HOUR RATED

A. Description

1. The wiring cable shall be 2-hour fire-rated.
2. The wiring cable shall be listed in the UL Fire Resistance Directory.
3. Mineral Insulated wiring Type MI cable shall have:

   a. Description: ANSI/NFPA 70, Type MI
   b. Conductor: solid high conductivity copper
   c. Insulation Voltage Rating: 600 volts
   d. Cable Temperature Rating: 90 degrees C
   e. Termination Temperature Rating: 90 degrees C
   f. Insulation Material: magnesium oxide
   g. Sheath Material: seamless soft-drawn copper
   h. Fire Rating: complete cable system shall have a 2-hour fire rating as listed and classified by Underwriters Laboratories, Inc.

4. Contractor shall have a minimum of 10 years of experience in the installation of such systems.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN-2, single conductors in raceway.

D. Exposed Feeders, Including Crawl Spaces: Type THHN-THWN-2, single conductors in raceway.

E. Exposed Feeders on Building Exterior, Including Roofs: Type XHHW-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN-2, single conductors in raceway; Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN-2, single conductors in raceway.

H. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN-2, single conductors in raceway. Coordinate all exposed runs of conduits with the Architect prior to installation.

I. Exposed Branch Circuits on Building Exterior, Including Roofs: Type XHHW-2, single conductors in raceway. Coordinate all exposed runs of conduits with the Architect prior to installation.

J. Emergency System Feeders in non-corrosive copper or brass environments: Mineral-insulated, metal-sheathed cable, Type MI.

K. Emergency System Feeders direct-buried: Mineral-insulated, metal-sheathed cable, Type MI with an extruded outer polyolefin jacket to provide additional protection.

L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

M. Class 1 Control Circuits: Type THHN-THWN-2, in raceway.

N. Class 2 Control Circuits: Type THHN-THWN-2, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 INSTALLATION OF METAL CLAD (MC) CABLEs

A. General

1. Pathways and Raceways are the support system for the infrastructure. All path-ways shall be run perpendicular or parallel to the building structure. MC Cable bend radius shall not be less than 7 times the external diameter of the cable. All horizontal cable shall be properly supported every 72". Infrastructure Support Systems include, but may not be limited to the following:

   a. Properly supported Cable Trays.
   b. Independent Cable Hangers spaced no more than 60" apart.
   c. 'Trapeze" style supports.

2. In existing buildings, the preferred method of support is independently supported cable hangers. These hangers are to be suitable for installation of MC Cable.
3. In new buildings the preferred method is a combination of Cable Tray and/or J Cable Hangers. All backbone cable shall also follow these cable tray pathways.

The primary cable routes will be located over corridors for future maintenance and access.

4. Wiring shall be installed in compliance with the latest version of the National Electrical Code and other applicable codes and standards as indicated elsewhere in these specifications.
5. Use of metal clad cable shall be permitted for lighting, equipment and receptacle branch circuits indicated on the Construction Drawings.
6. Bends in metal clad cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of a bend shall not be less than 7 times the diameter of the metallic sheath.
7. Each branch circuit shall have its own neutral conductor from the branch circuit load back to the circuit breaker panelboard. Shared neutral conductors shall not be installed.
8. All wiring shall be identified with permanent wire labels, using alphanumeric designations. Terminations and splices shall be identically labeled for the same wire {i.e., common conductors terminated in multiple locations). Wire labels shall agree with the circuit designations on the Construction Drawings.
9. Identify conductors in outlets, pull boxes and similar locations where conductors are accessible with printed plastic adhesive tapes to show circuit numbers. Wrap tapes at least two turns around conductor. Mark panel identification number with felt tip pen on cloth or plastic tag and attach to entering conductors with nylon string.
10. Conductors in Enclosures: Provide neat and workmanlike installation with conductors tied with nylon wire ties in terminal cabinets, gutters, and similar locations.

B. Splices and Terminations

1. Splices at junction boxes shall be made with an approved, insulated, live spring type connectors.

C. Fittings

1. Fittings used for connecting metal clad cable to boxes, light fixtures or other equipment shall be UL listed and identified for such use.
2. Cable preparation for installation of fittings shall follow manufacturer's instructions.

3. The cable end shall be cleanly cut with metal clad cable rotary cutting tool to ensure flush seating of the cable into the fitting. Fitting securement screws shall be properly torqued.

D. Arrangement and Support

1. Where metal clad cables are exposed, run parallel with walls or structural elements. Vertical runs shall be plumb, horizontal runs level and parallel with structure, as appropriate. Groups shall be racked together neatly with both straight runs and bends parallel and uniformly spaced.
2. Metal clad cables shall be securely fastened in place at intervals of not more than six feet, with suitable clamps or fasteners of approved type, and vertical runs shall be properly supported to present a secure installation.
3. Metal clad cable installed parallel to framing members, such as studs, joist, or rafters, shall be supported so that the nearest outside surface of the cable is not less than 1-1/4 inches {31 mm) from the nearest edge of the framing member. Where this distance cannot be maintained, the cable shall be protected by a steel plate, sleeve, or equivalent that is at least 1/16-inch thick.
4. Maintain at least 6-inch clearance between metal clad cables and other piping systems. Maintain 12-inch (300 mm) clearance between metal clad cables and heat sources such as flues, steam pipes, and heating appliances.
5. No metal clad cable shall be fastened to other conduits or pipes or installed so as to prevent the ready removal of other pipes or ducts for repairs.
6. Individual metal clad cables hung from roof structure or structural ceiling shall be supported by split-ring hangers and wrought-iron hanger rods. Where 3 or more metal clad cables are suspended from the ceiling in parallel runs, use steel channels, Unistrut or equal, hung from 1/2-inch (13 mm) rods to support the cables. The cables on these channels shall be held in place with metal clad cable clamps designed for the particular channel that is used.
7. Secure metal clad cable support racks to concrete walls and ceilings by means of cast-in-place anchors; die-cast, rustproof alloy expansion shields; or cast flush anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts shall not be used as a base to secure conduit supports.
8. Metal clad cable shall be supported immediately on each side of a bend and not more than 1 foot (300 mm) from an enclosure where a run of metal clad cable ends.
9. Use of cable tray:

a. Basket, ladder rack, or ventilated cable tray may be utilized for support of metal clad cabling.
b. The sum of the cross-sectional areas of cables shall not exceed the maximum allowable cable fill area allowed by NEC.
c. Ampacity of cables installed in cable tray shall meet the requirements of NEC.

10. Terminating metal clad cables into panelboards:

a. Provide a junction box within plenum space with sweep elbows down to panelboard, or
b. Use a ladder tray mounted vertically above the panelboard. Strap cables to rungs and install cover on cable tray.

E. Inspections and Tests

1. General: The electrical installation shall be inspected and tested to ensure safety to building occupants and operating personnel and conformity to Code, authorities and contract documents.
2. Field tests shall be performed in conformance with the National Electrical Testing Association {NETA) Standards.
3. All fittings and locknuts shall be re-examined for tightness. A continuity test is to be performed at each connection as a final means of inspection for tightness of joints.

3.5 INSTALLATION OF MINERAL INSULATED (MI) CABLES

A. Examination

1. Verify that the factory installed temporary end seals are intact.
2. Verify that no moisture has entered cable insulation.

B. Storage

1. Cables shall be shipped from the manufacturer with ends sealed against moisture.
2. Protect the exposed cable ends with shrinkable, molded polyolefin end caps or other suitable means such as standard conduit sealing compound and PVC tape.

3. Cable shall be stored in a clean dry location.

C. Handling

1. Cable shall be uncoiled by rolling or rotating supply reel.
2. Take precautions necessary to prevent damage to cable from contact with sharp objects, such as when pulled over foreign material on sheaves.

D. Installation

1. The wiring cable shall be installed according to the manufacturer's recommendations, the instructions in the Installation Specification or Manual and the requirements of the UL Fire resistance Directory listing.

E. Field Quality Control

F. Inspect cable for physical damage and proper connection.

G. Measure tightness of any bolted connections and compare torque measurements with manufacturer's recommended values.

H. Verify continuity of each conductor.

I. Prior to energizing cables, measure insulation resistance of each cable. Tabulate and submit for approval.

J. Provide certification from cable manufacturer that installation is in accordance with their requirements.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07.

End of Section

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

1.5 WARRANTY

A. Comply with Section 260001.

B. The Electrical Trade Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. Harger Lightning and Grounding
2. Burndy; Part of Hubbell Electrical Systems
3. ERICO International Corporation
4. Or approved equal.

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad; 3/4-inch by10 feet (19 mm by 3 m) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal

water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

F. Grounding for Lightning Protection System: Install 3/0 AWG copper grounding conductor, in conduit, to the building's main service ground busbar.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

    b. Perform tests by fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

End of Section

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 SUBMITTALS

A. Product Data: For steel slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers
    a. Cooper B-Line, Inc.; a division of Cooper Industries.
    b. Thomas & Betts Corporation.
    c. Unistrut; Tyco International, Ltd.
    d. Or approved equal.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    a. Manufacturers
        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Or approved equal.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Manufacturers

        1) Cooper B-Line, Inc.; a division of Cooper Industries.

        2) Empire Tool and Manufacturing Co., Inc.

        3) Hilti Inc.

        4) Or approved equal.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb. (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

F. The electrical trade contractor shall install all hangers and supports for electrical systems prior to fireproofing.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Concrete bases shall be provided by the electrical trade contractor.

B. The electrical trade contractor shall coordinate the anchor-bolt pattern for all light fixtures.

C. The electrical trade contractor shall provide to the respective subcontractor the layout of conduit and other materials that penetrate the equipment pads.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

End of Section

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. See Division 26 for exterior duct banks and manholes, and underground handholes, boxes, and utility construction.

1.3 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 WARRANTY

A. Comply with Section 260001.

B. The Electrical Trade Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Acceptable Manufacturers

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. O-Z Gedney; a unit of General Signal.
4. Or approved equal.

B. Rigid Steel Conduit: ANSI C80.1.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquid tight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.

2. Fittings for EMT: Steel, set screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Acceptable Manufacturers

1. AFC Cable Systems, Inc.
2. RACO; a Hubbell Company.
3. Thomas & Betts Corporation.
4. Or approved equal.

B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Acceptable Manufacturers

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric
4. Or approved equal.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 and Type 3R (exterior) unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

A. Acceptable Manufacturers

1. Hoffman.
2. Lamson & Sessions.
3. Carlon Electrical Products.
4. Or approved equal.

B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with Snap-On cover and mechanically coupled connections with plastic fasteners.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

A. Provide surface raceway systems for branch circuit and data network voice, video and other low-voltage wiring. Surface raceway system shall consist of raceway bases, covers, pre-divided raceway bases, appropriate fittings and device mounting plates necessary for a complete installation.

B. Surface Metal Raceways: Galvanized steel with Snap-On covers. Manufacturer's standard enamel finish in color selected by Architect.

1. Acceptable Manufacturers

a. Thomas & Betts Corporation.

b. Walker Systems, Inc.; Wiremold Company (The).

c. Wiremold Company (The); Electrical Sales Division.

d. Or approved equal.

C. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

1. Acceptable Manufacturers

a. Panduit Corp.

b. Walker Systems, Inc.; Wiremold Company (The).

c. Wiremold Company (The); Electrical Sales Division.

d. Or approved equal.

D. Raceway shall have the following features:

1. 4” x 2” minimum dimensions.
2. Tamper resistant.
3. 2" (51mm) bend radius compliant fittings.
4. Pre-punched mounting holes.
5. UL and cUL Listed component raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Acceptable Manufacturers

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
3. RACO; a Hubbell Company.
4. Or approved equal.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Above ground: Rigid steel conduit; EMT.

3. Underground Conduit outside the foundation wall: RNC, Schedule 80 PVC, direct buried. Convert nonmetallic conduit to rigid steel conduit before rising through earth.
4. Underground Conduit within building confines: RMC, direct buried or RNC, Schedule 80 PVC, direct buried. Convert nonmetallic conduit to rigid steel conduit before rising through earth.
5. Exposed or underground conduit to sewage ejector pump chamber: PVC coated rigid steel conduit.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
7. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed, Subject to Physical Damage: EMT.
    a. Conduits run installed in exposed Cross-laminated timber (CLT) ceilings shall be submitted for approval prior to installation.

2. Exposed, Subject to Severe Physical Damage: Rigid steel conduit.
    a. Includes raceways in the following locations:
        1) Loading dock.
        2) Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
        3) Mechanical rooms.
        4) Fire pump room.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: Rigid steel conduit; EMT (All supports, bolts, straps, strews, and so forth shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials).
6. Raceways for Optical Fiber or Communications Cable: EMT.

7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
8. Exposed or underground conduit to sewage ejector pump chamber: PVC coated rigid steel conduit.
9. Exposed or underground conduit to acid neutralization chamber: PVC coated rigid steel conduit.

C. Minimum Raceway Size: 3/4-inch (16-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project. Run conduits under floor slab as if exposed.

I. Restrictions Applicable to EMT

1. Do not use in areas subject to severe physical damage.
2. Do not use in fire pump rooms.

J. Restrictions Applicable to Nonmetallic Conduit

1. PVC Schedule 40 and PVC Schedule 80

a. Do not use in areas where subject to severe physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, and other such areas.

b. Do not use in hazardous (classified) areas.

c. Do not use in fire pump rooms.

d. Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

e. Do not use above grade.

f. Convert nonmetallic conduit, to rigid steel conduit before rising through floor slab.

K. Restrictions Applicable to Flexible Conduit

1. Use only as specified in paragraph FLEXIBLE CONNECTIONS. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

L. Service Entrance Conduit, Underground

1. PVC, Type-EPC 40, galvanized rigid steel.

2. Convert nonmetallic conduit to rigid steel conduit before rising through floor slab.

M. Underground Conduit Other Than Service Entrance

1. Tape Wrapped rigid steel; PVC, Type EPC-40. Convert nonmetallic conduit to rigid steel conduit before rising through floor slab. Ten mil tape shall be 1/2 lapped and extend a minimum of 6 inches above floor.
2. Convert nonmetallic conduit to rigid steel conduit before rising through floor slab.

N. Conduit Installed Under Floor Slabs

1. Conduit run under floor slab shall be located a minimum of 12 inches below the vapor barrier. Seal around conduits at penetrations thru vapor barrier.
2. The Electrical Subcontractor will provide and pay for excavations and backfill for under grade slab conduit runs and coordinate the same with other utilities.
3. All structural fill/bedding material must be installed in accordance with the earthwork specifications, including compaction.

O. Conduit Through Floor Slabs

1. Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.
2. Convert nonmetallic conduit to rigid steel conduit before rising through floor slab.

P. Conduit Installed in Concrete Floor Slabs

1. Rigid steel; PVC, Type EPC-40. Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab. Do not stack conduits.
2. Space conduits horizontally not closer than three diameters, except at cabinet locations. Curved portions of bends shall not be visible above finish slab.
3. Increase slab thickness as necessary to provide minimum one-inch cover over conduit.
4. Where embedded conduits cross building and/or expansion joints, provide suitable watertight expansion/deflection fittings and bonding jumpers. Expansion/deflection fittings shall allow horizontal and vertical movement of raceway.

5. Conduit larger than one-inch trade size shall be parallel with or at right angles to main reinforcement; when at right angles to reinforcement, conduit shall be close to one of supports of slab.
6. Where nonmetallic conduit is used, raceway shall be converted to rigid steel before rising above floor, unless specifically indicated.

Q. Stub-Ups

1. Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.
2. Convert nonmetallic conduit to rigid steel conduit before rising through floor slab.

R. Conduit Support

1. Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work.
2. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load.
3. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant.
4. Holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints shall not cut main reinforcing bars. Fill unused holes.
5. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system.
6. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts.

7. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems.
8. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Support exposed risers in wire shafts of multistory buildings by U-clamp hangers at each floor level and at 10 foot maximum intervals.
9. Where conduit crosses building expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means.
10. For conduits greater than 2 1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

S. Directional Changes in Conduit Runs

1. Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

T. Locknuts and Bushings

1. Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits and provide insulating type where required by NFPA 70.

U. Flexible Connections

1. Provide flexible steel conduit between 3 and 6 feet in length for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be 1/2-inch diameter. Provide liquid tight flexible conduit in wet and damp locations and in fire pump

rooms for equipment subject to vibration, noise transmission, movement, or motors. Provide separate ground conductor across flexible connections.

V. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

W. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

X. Raceways for Optical Fiber and Communications Cable: Install as follows:

1. 1-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

Y. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

Z. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) change.

b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.

c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.

d. Attics: 135 deg F (75 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

AA. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi recessed lighting fixtures,]equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

End of Section

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacle Outlets.
2. Switches.
3. Wall Plates.
4. Contactors.
5. Conductors and Cables.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 WARRANTY

A. Comply with Section 260001.

B. The Electrical Trade Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.6 WIRING DEVICES

I. Approved Manufacturers

1. Legrand; Wiring Devices & Accessories (Legrand).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Or approved equal.

2.7 Basis of Design

A. Basis of design based upon products by Legrand.

2.8 RECEPTACLE OUTLETS

A. Range Outlet: Straight Blade Devices, Single, 50A 125/250V, 3-Pole 4-Wire Grounding, 14-50R, Flush Mount, Black.

1. Legrand: 3894.

B. Finishes

1. Wiring Devices Connected to Normal Power System: Color by Architect.
2. Wiring Devices Connected to Emergency (Life Safety) Power System: Red.
3. Controlled outlets: Color by Architect.

2.9 SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Pass & Seymour; CSB20AC1 (single pole), PT20AC1 (single pole – use with PTS6STR3 prewired pigtail connector), CSB20AC2 (two pole), CSB20AC3 (three way), PT20AC3 (three way – use with PTS6STR4 prewired pigtail connector), CSB20AC4 (four way).

C. Finishes

1. Color by Architect.

2.10 WALL PLATES

A. Single and combination types:

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Stainless Steel.

3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at the proper heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign material from outlet boxes.

3.3 INSTALLATION

A. Perform work in a neat and workmanship manner in accordance with NECA 1 and where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

C. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

D. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail or replace all damaged conductors.

    b. Straighten conductors that remain and remove corrosion and foreign matter.

    c. Pig-tailing existing conductors is permitted provided the outlet box is large enough.

E. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 COMMISSIONING

A. Comply with requirements specified in Division 1.

B. Engage a factory-authorized service representative to supervise and assist with startup service. Complete installation and startup checks according to the approved manufacturer's written instructions.

3.8 TRAINING AND SERVICE

A. Comply with Section 26 00 01.

End of Section

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Molded-case circuit breakers.

1.3 SUBMITTALS

A. Product Data: For each type of circuit breaker, accessory, and component indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 WARRANTY

A. Comply with Section 260001.

B. The Electrical Trade Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MOLDED-CASE CIRCUIT BREAKERS

A. Approved Manufacturers

1. Siemens
2. Eaton Corporation; Cutler-Hammer Products.
3. General Electric Co.; Electrical Distribution & Control Division.
4. Square D/Group Schneider.
5. Or approved equal.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30]-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 and concrete materials are specified in Division 03.

C. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

D. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

E. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

G. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26.

3.2 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

End of Section

SECTION 26 51 00

INTERIOR LIGHTING

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 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes:

1. Interior Lighting fixtures
2. LED Luminaires and Light Sources
3. Emergency Lighting
4. Exit Signs
5. Lamps
6. Drivers
7. Miscellaneous

B. Related Sections include the following:

1. Division 01 Section "General Commissioning Requirements.”
2. Division 01 Section “Facility Exterior Enclosure Commissioning.

1.3 DESCRIPTION OF WORK

A. Description of Work: Provide and install all lighting fixtures, complete with lamps, drivers, wiring, and control.

1. All materials, accessories, and any other equipment necessary for the complete and proper installation of all lighting fixtures included in this Contract shall be furnished by the Contractor, including those not usually indicated on the drawings or specified, but that are necessary for the proper installation and operation of the fixtures.
2. Specifications and drawings are intended to convey the salient features, function, and character of the fixtures only, and do not necessarily illustrate or set forth every item or detail necessary for completion of the work.
3. Verify final ceiling type with final architectural reflected ceiling plans prior to ordering fixture. Provide mounting accessories for proper installation in ceiling type.
4. Minor details not usually indicated on the drawings nor specified, but that are necessary for the proper execution and completion of the fixtures, shall be included, the same as if they were herein specified or indicated on the Drawings.
5. Conformance: Fixtures shall be manufactured and installed in strict accordance with the Contract Documents. The Contractor shall be held responsible for the omission or absence of any detail, construction feature, etc. which may be required in the manufacture and installation of the fixtures. The responsibility of accurately fabricating and installing the fixtures to the fulfillment of this specification rests with the Contractor.
6. Support: Fixtures shall be securely attached to support system to meet all code requirements.
7. Codes: Materials and installation shall be in accordance with the applicable edition of the National Electrical Code (NKC) and any applicable Federal, State, and local codes and regulations.
8. UL Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the Underwriters Laboratories, Inc. "Standards for Safety," and others as they may be applicable. A UL listing shall be provided for each fixture type, and the appropriate label or labels shall be affixed to each fixture or components in a position concealing it from normal view.

B. Definitions:

1. CCT: Correlated color temperature
2. CRI: Color-rendering index
3. LER: Luminaire efficacy rating
4. Lumen: Measured output of lamp and luminaire, or both.
5. Luminaire: Complete lighting fixture, including remote driver housing (if required)
6. SDCM: Standard Deviation of Color Matching

1.4 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ANSI/ASHRAE/IES - Standard 90.1
2. ANSI C78.377 - Chromaticity
3. ANSI C62.41 - Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
4. CIE TC1-69 - Color Rendering
5. IESNA LM-79 - Approved Method for Electrical & Photometric Measurement of SSL Products
6. IESNA LM 80 - Approved Method for Lumen Maintenance of LED Light Source
7. IESNA RP1605 - Nomenclature and Definitions for Illuminating Engineering
8. NEMA LE 4 - Ceiling Compatibility for Recessed Fixtures
9. NFPA 70 -National Electrical Code (NEC)
10. NFPA 101-Life Safety Code
11. UL 57 - Electric Lighting Fixtures
12. UL 924 - Emergency Lighting and Power Equipment
13. UL 1598 - Luminaires
14. UL 8750 - LED Equipment for Use in Lighting Products

1.5 SUBMITTALS

A. Submit the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.

    a. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.

    b. Reference catalog cuts to the applicable specification article.

2. Photometric layouts are required prior to the approval of the product data. Provide point-by-point calculations for the entire building. Calculations showing typical areas shall not be acceptable.

    a. Provide photometric layout using industry approved lighting software.

3. For standard catalog items with no modifications, submit cut sheets that clearly show all elements to be supplied, and all corresponding product data. If a cut sheet shows more than one (1) fixture type, all non-applicable information shall be crossed out. Submittals must be prepared by the manufacturer or manufacturer's local representative agency and include a cover sheet for each fixture type which clearly indicates the following:

    a. Lighting fixture physical description, type, size including all dimensions, material, indoor/outdoor, diffusers/lenses, baffles, finishes, and means and methods of attachment.

    b. Manufacturer and model of fixtures (inclusive of drivers, dimming modules, power supplies, lamps, etc.).

    c. Lighting fixture performance including system wattage, system lumen output, light quality including color temperature and color rendering index .

    d. Project name.

    e. Name of manufacturer's representative agency.

f. Complete catalog number for the lighting fixture including accessories and options and any miscellaneous items detailed in the written description of the specification.

g. Where applicable, LED driver information including manufacturer, characteristics, type, model number and voltage. Provide manufacturer's test report for electronic drivers and test data for drivers regarding the tripping class P units based on the specified criteria.

4. For some lighting fixtures, annotated catalog cuts will not be sufficient, and detailed factory shop drawings will be required. For linear lighting systems, provide factory shop drawings showing all run lengths and patterns, with reference to location in the project by drawing number or room number. For architecturally integrated lighting fixtures, verify field dimensions and include them on shop drawings showing exact locations of fixtures.
5. Where applicable, shop drawings shall include wiring diagrams, scale plans, and details showing the method of installation of LEDs and LED boards, reflectors, track, suspension hardware, transformers, drivers, and secondary feeds, as well as a complete bill of materials.
6. All changes to shop drawings are to be "clouded" and dated prior to resubmission. No variation from the general arrangement and details indicated in the Contract Documents shall be made on the shop drawings, unless required to suit the actual conditions on the premises, and then only with the written acceptance of the Architect and Lighting Designer. All variations must be clearly marked as such on drawings submitted for approval.
7. Provide alphabetized index of all submitted items, listing manufacturer, catalog #, LED or lamp manufacturer, and LED or lamp catalog number.
8. Photometric test report for each luminaire type and lamp combination listed on the Fixture Schedule/Catalog cuts. Test reports shall be based on Illuminating Engineering Society published test procedures and shall contain candlepower distribution curves in five lateral planes for fixtures with asymmetric distributions and fixture luminance data for vertical angles above 45 degrees from nadir.
9. Shop drawings:

   a. Suspension details for all fixtures recessed in, mounted on, or suspended from hung ceilings. Details shall clearly illustrate proposed

fixing methods for fixtures requiring support independent of the suspended ceiling system.

10. Review of shop drawings or samples does not waive contract requirements. Approval of the shop drawings or samples does not relieve the Contractor from responsibility for deviations from the specifications or drawings, unless he has provided a letter noting such deviations at time of submission, and received written approval for such deviations from the Architect and Lighting Designer.
11. Approval of shop drawings or samples does not relieve the Contractor from responsibility for errors in the shop drawings or samples. Contractor shall be fully responsible for lighting fixtures that are manufactured or installed without approved shop drawings, and for fixtures not manufactured in accordance with the requirements of the Architect's and Lighting Designer's shop drawing reviews.
12. If requested by the Lighting Designer or Architect, submit samples of any fixture type for approval prior to manufacture.

    a. The samples shall be complete with specified LEDs or lamps and driver ready for hanging, energizing, and examining, and shall be shipped to the Lighting Designer, or as otherwise advised.

    b. Samples must be actual working units of fixtures to be supplied. For linear lighting fixtures, specified by the foot, provide a minimum length of four feet.

    c. Samples will be returned but shall not be included in quantities listed for a project.

    d. All costs to provide samples, including all shipping, shall be borne by the Contractor.

13. The Contractor shall identify any long lead times or lighting fixture delivery issues that may adversely affect the project schedule, and immediately bring them to the attention of the Owner's Representative.
14. Unit Cost Data: For each type of lighting fixture included in the fixture schedule, submit separate unit costs for materials and for labor for all components of a specified luminaire.
15. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

16. Submit manufacturer's installation instructions.
17. Complete bill of material listing all lighting fixtures and components.
18. Warranties.

B. Operation and Maintenance manuals submittals shall include the following:

1. A detailed description and catalog cut of each lighting fixture type.
2. Instructions for routine maintenance and tools required.
3. Pictorial parts list and part numbers.
4. Types of cleaners to be used.
5. Final, as-built shop drawings.
6. Telephone numbers for the authorized parts and service distributors.
7. Warranties.

1.6 SUBSTITUTIONS

A. The light fixture package specified on the drawings has been certified by a third party employed by the Owner/Utility Company for the purpose of computing utility company rebates to the owner.

1. The Electrical Contractor will employ and pay for the services of the third party designated by the Utility Company to evaluate the substituted fixture package and to compute utility company rebates to the owner.
2. The Utility Company rebates to the Owner shall be equal to or greater than the specified fixture package.
3. Once the substituted package is certified it shall be submitted to the Engineer for approval.
    a. Provide point-by-point lighting calculations of the entire building and site.
    b. Provide Total Light Power Density (LPD) per floor and for the whole building.
    c. The LPD of the substituted luminaires shall be less than or equal to the specified luminaires.

4. Provide a side-by-side comparison between the specified and the substituted fixtures include the following criteria:

   a. Input Watts

   b. Voltage

   c. Output Lumens

   d. Energy Star Rating

   e. DLC approval

   f. Total Light Power Density (LPD) per floor and for the whole building.

1.7 DRAWINGS

A. The drawings, which constitute a part of these specifications, indicate the general location of the luminaires.

B. Specifications and drawings are for assistance and guidance, but exact locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.8 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new.

B. Materials, equipment and appurtenances as well as workmanship provided under this Section shall conform to the highest commercial standard as specified.

C. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing and Calculation Guides.

Alternatively, photometric testing data can be provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

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.

E. Comply with NFPA 70.

F. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

G. Materials, equipment, and accessories as well as workmanship provided under this section shall conform to the highest commercial standards and as specified and as indicated on drawings. Luminaire parts and components not specifically identified or indicated shall be made of materials most appropriate to their use or function and as such resistant to corrosion and thermal and mechanical stresses encountered in the normal application and function of the luminaires.

H. All luminaires shall be manufactured to a consistent level of quality. Size, color and components parts shall be identical for all Luminaires.

I. All new luminaires and related materials shall be new.

J. The Contractor shall coordinate all luminaires, mounting hardware, and trim with ceiling system and other items, including work of other trades.

K. Mockups; Will be specified prior to fixtures procurement.

1. Obtain Architect's approval of fixtures for mockups before starting installations.
2. Provide interior lighting fixtures for mock-ups, complete with power and control connections.

3. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work unless the Architect or Lighting Consultant stipulates otherwise.

1.9 WARRANTY

A. Comply with Section 260001.

B. The Electrical Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

C. Luminaires shall be provided with a 5-year warranty covering, LEDs, drivers and paint finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers

1. Cooper Lighting
2. Signify
3. Acuity Brands
4. Or approved equal

2.2 LIGHT FIXTURES

A. Provide and wire lighting fixtures scheduled or indicated by type designation on the drawings. If type designation is omitted, fixtures shall be of the same type as shown for rooms of similar usage. Verify before purchase and installation. No alternative fixtures will be accepted.

B. Locations of fixtures on electrical drawings are diagrammatic. Verify location and spacing with architectural reflected ceiling plans and other reference data before purchasing. Coordinate space conditions, including headroom clearances and interferences with ceiling components such as ducts, openings, beams and piping prior to installation. Allow for movement of up to 9 feet from indicative location on plans.

C. Check the architectural finishes and, regardless of the catalog prefixes and suffixes shown, furnish fixtures with the proper trim, frames, supports, hangers and other miscellaneous appurtenances or properly coordinate with said finishes. Where required, furnish reinforcing for ceiling construction to support the weight of the fixtures.

D. Fixtures shall be free of light leaks and designed to provide sufficient ventilation of LEDs and drivers, including vent holes where required. Outdoor fixtures with vent holes shall have wire mesh screens in the vent holes.

E. Light shields and lens shall be as specified under individual fixture types.

F. Replace blemished, damaged, or unsatisfactory fixtures at no additional cost and in a manner satisfactory to the Owner's Representative.

G. Reflector cones, baffles and decorative elements of fixtures shall not be installed until completion of plastering, ceiling tile work, hanging and general cleanup in the area unless fully protected from dust ingress.

H. Provide labor and materials for final targeting of adjustable fixtures under supervision of the Owner's Representative Targeting shall take place immediately before building is turned over to the Owner and after regular working hours where required.

I. In fixtures with asymmetrical beams, adjustment devices shall be set to ensure permanent orientation of light beam and shall not be affected by servicing LEDs, lamps, or drivers.

J. Surface and stem mounted fixtures: Provide auxiliary supports for mounting fixtures in areas without suspended ceilings. Luminaires shall be independently supported with dedicated fixings (unless it is agreed otherwise) from the soffit. Do not mount fixtures to piping, ducts or other mechanical equipment.

K. Complete units and all electrical components for light fixtures shall bear the UL label. Labels shall not be placed on fixtures at locations where installation of unit labels is visible.

L. Reflectors, cones or baffles shall be free of spinning lines, ripples or any marks or indentations caused by riveting or other assembly techniques. No rivets, springs or other hardware shall be visible after installation.

M. All exposed metal parts of exterior lighting fixtures shall be stainless steel, anodized aluminum or have 4 mil zinc coating applied after fabrication and before finish. Screws and fastening shall be stainless steel. Painted finishes shall be as specified in schedules.

N. If ceiling system requires, each recessed and semi-recessed fixture shall be furnished with a mounting frame or ring compatible with the ceiling in which they are to be installed. The frames and rings shall be one-piece or constructed with electrically welded butt joints, and of sufficient size and strength to sustain the weight of the fixture. Yokes, brackets and supplementary supporting members, needed to mount lighting fixtures to carrier channels or other suitable ceiling members, shall be furnished and installed by the Contractor. There should be no light leaks between ceiling trims of recessed lighting equipment and ceilings, or when fixtures arc installed in partially transparent ceilings. Verify the ceiling type and suspension method prior to ordering fixtures. The Architect's favorable review of shop drawings for both the ceiling system and the lighting fixtures will not relieve the Contractor of the ceiling/lighting fixture compatibility requirement.

O. Plastic for lenses and diffusers shall be formed of colorless 100% virgin acrylic, as manufactured by Rohm & Haas, DuPont. or equally acceptable manufacturers. The quality of the raw material must meet American Society of Testing Materials (ASTM) standards, as tested by an independent testing laboratory. Acrylic plastic lenses and diffusers shall be properly cast, molded, or

extruded, as specified, and shall remain free of any dimensional instability, discoloration, embrittlement, or loss of light transmittance for at least 15 years. Glass used for lenses, refractors, and diffusers shall be crystal clear in quality with a transmittance of no less than 88%. Exterior fixtures shall use tempered Borosilicate glass, Corning #7740 or equal. For fixtures directly exposed to the elements and aimed above the horizontal, use Corning Vycor glass or equal. Where optical lenses are used, they shall be free from spherical and chromatic aberrations and other imperfections that may hinder their functional performance.

2.3 LED LUMINAIRES AND LIGHT SOURCES

A. Only LED boards and modules supplied by [he original fixture manufacturer shall be offered for submittal.

B. For all LFO products specified the Contractor shall submit the fixture specified with the current LED technology available within the specified fixture range at the time of submittal, ensuring that the required lumen output is achieved. If the specified fixture has been updated the revised fixture shall achieve a minimum light output ratio equal to the luminaire specified.

1. Color Tolerance: Unless otherwise specified, all LED light sources shall achieve a minimum color tolerance of at least 3-stcp ellipse, measured for both initial and at 25% of rated life. Color tolerance beyond this is unacceptable.
2. Color Rendering Index: Color rendering index (CRI) of all LED light sources shall achieve the minimum CRI specified initially and at 25% of rated life. No variation in CRI between initial and 25% rated life is acceptable.
3. Life Expectancy: Lifetime testing of LED light sources shall be carried out in accordance with LM-80-08. All LED light sources shall achieve a minimum performance of L70, where rated life of the LED light source is defined as the time taken to reach 70% of the initial lumen output.
4. All LED light sources shall achieve a minimum lifetime of 50,000 hours at L70.
5. All LED light sources shall not exceed a failure fraction of 10% (F10) at rated life (L70).

6. Lumen Depreciation: Unless otherwise specified, all LED light sources shall provide a maximum lumen depreciation of 30% over the rated life of the product.
7. Power Factor: LED drivers shall achieve a minimum power factor of 0.9.
8. LED system shall use 16-bit or greater nonlinear scaling techniques for high-resolution output.
9. Visible blinking, flickering or strobing shall not be acceptable at full lumen output, nor at any dimming level should dimming be specified.
10. Audible noise when at full lumen output or at any dimming level shall not be acceptable.
11. The Contractor shall ensure the LED driver is fully compatible with the proposed lighting control system as to ensure correct smooth operation of LED output at all dimming outputs without flicker, strobing, or other noticeable effect on lighting performance.

C. Luminaire Testing: The following tests shall be undertaken for all LED products specified, including those identified as custom products. Confirmation that these tests have been carried out and passed is required during submittal.

1. Temperature cycling shock test: The non-energized LED luminaire shall be stored firstly at -20°C for 1 hour. The luminaire shall then be immediately moved into a cabinet having a temperature of+35°C and stored for 1 hour. Five such cycles shall be carried out. At the end of the test the LED luminaire shall operate and remain alight for 15 min.
2. Supply voltage switching test: At test voltage the luminaire shall be switched on and off for 30 seconds. The cycling shall be repeated for a number equal to half the rated luminaire life in hours (example: 10K cycles if rated luminaire life is 20 000 hours). At the end of the test the LED luminaire shall operate and remain alight for 15 min.
3. Thermal endurance test. The LED luminaire shall be operated at nominal voltage and at an ambient temperature of (plus) +35°C for outdoor luminaires, (plus) +25°C for indoor luminaires and (plus) +35°C for recessed luminaires until a test period equal to 25 % of the rated luminaire life (with a maximum of 6 000 hours) has passed. At the end of this time, and after cooling down to room temperature, the luminaire shall remain alight for at least 15 min.

D. LED Light Source and Luminaire Data: The following data for LED light sources shall be submitted for approval with all luminaires equipped with LED light sources:

1. Initial Luminaire Lumen Output at 1,000 hours (LI000).
2. Ral4 color rendering data, in addition to the general color rendering index Ra. Provide initial and data at 25% of rated life.
3. Color tolerance data, initial and at 25% of rated life, including the chromaticity coordinates of the bin.
4. Rated power of the luminaire including driver.
5. Power factor of the luminaire including driver, initial and at 25% of rated life.
6. Absolute photometry report in accordance with LM-79-08.
7. LED light source lest reports in accordance with LM-80-08.

E. WHITE LED UNITS

1. Usable life shall be 50,000 hours minimum, defined by the point in which the lamp output has decreased by 30% from its initial output.
2. Base CCT shall be per specification. All LEDs supplied must be within a tolerance of+/-100K from base color temperature. Additionally, all LEDs shall be sourced from the same bin.
3. Chromaticity Tolerance shall be no more than 0.03 on the CIE chromaticity diagram from the black body curve.
4. Lamp CRI shall be a minimum of 80, unless otherwise specified.

2.4 LED EXIT LIGHT FIXTURES

A. Description; Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction, dual circuit.

B. Internally Lighted Signs: Lamps for AC Operation: LEDs, 70.000 hours minimum rated lamp life.

C. Exit light fixtures shall meet applicable requirements of NFPA and UL.

D. Exit signs shall be edge-lit, white or mirror panel (clear panel exit sign shall not be permitted) with 90-minute backup battery power.

E. There shall be no radioactive material used in the fixtures.

F. Directional Arrows: Provide directional arrows as part of the inscription panel where required or as shown on drawings. Directional arrows shall be the "chevron-type" of similar size and width as the letters and meet the requirements of NFPA 101.

2.5 DRIVERS

A. LED Drivers and Dimming Controllers

1. Acceptable means of dimming unless otherwise noted in Fixture Schedule:
    a. Pulse Width Modulation and hybrid Pulse Width Modulation with Constant Current.
    b. All drivers shall comply with IEC Standard 62386, Parts 101 & 102.
2. Dimming: continuously from 100% to 1% unless otherwise noted in the fixture schedule and the specified performance requirements.
3. Driver shall start LED at any dimming position.
4. Life:
    a. 70,000 hours lifetime, minimum.
    b. Driver failure rate per 1000 hours operating at 60 degrees Celsius ambient, shall be 0.2 percent or less.
5. Input: 120-277 V, 50-60 Hz.
6. Supply: 24VDC constant current (unless otherwise specified).
7. Operation:
    a. Driver shall automatically shut down in case of LED failure condition.
    b. Driver shall be provided with miss-wire protection circuitry.

c. Driver shall be provided with short circuit and open circuit protection circuitry.

d. Driver shall contain automatic restart circuitry in order to restart LEDs after LED replacement.

e. Driver Power Factor at full light output shall be greater than 0.98.

f. Driver Power Factor across dimming range shall be greater than 0.90.

B. Control

1. Refer to the fixture schedule and lighting control specification for full driver control requirements.

a. Provide fixtures with correct drivers as specified within the fixture schedule and coordinate with the lighting control system to ensure compatibility.

b. Standard dimming protocol for static white light to use 0-10v control signal.

c. Standard dimming protocol for tunable white to use DALI control signal.

d. Standard dimming protocol for color changing RGB light to use DMX control signal.

2.6 MISCELLANEOUS

A. General LED Requirements:

1. Life: Rated Lumen Maintenance Life (per LM-80-08) shall be minimum 50,000 hours at L70 with Forward Phase Control
2. Maintenance

a. Provide plug-n-play connectors (e.g. Molex, Wago) in lieu of soldered connections so that LED boards can be removed and replaced with minimal tools in the event of a failure.

b. All LED boards and drivers shall be accessible for maintenance without the use of special tools.

3. Protection

a. Protective circuitry - Power/data supply outputs shall have current limiting protection. Power/data supply shall provide mis-wiring protection.

b. All hardwired connections to LED fixtures shall be reverse polarity protected and provide high voltage protection in the event connections arc reversed or shorted during the installation process.

c. Power/data supply shall have power factor correction.

B. Disconnect Means

1. Provide disconnecting means for the following fixture types:

a. Light fixtures with multiple drivers and multi-wire circuits.

b. Occupancy sensor-controlled lighting without multiple override switches.

c. Remote lighting control without overrides within sight of the lighting.

2. Disconnect means is required internal or external to the fixture, for each fixture and in sight of the fixture. Acceptable means include a switch integral to the luminaire or a quick-disconnect between driver and branch circuit wiring connection internal to the luminaire.
3. Complete wiring disconnection including the ground wire is required for multi-wire circuits to fixtures.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Luminaires are shown diagrammatical on drawings. Coordinate luminaire installation with other trade drawings and reflected ceiling drawings. Provide luminaires. supports and accessories needed to meet space or ceiling arrangement constraints.

B. Prior to ordering suspended or surface mounted continuous row luminaires for walls, coves, soffits, valances, or cabinets, verify overall lengths with the Architectural drawing layouts and details or specialty craft shop drawings.

C. Recessed Downlights: Review Architectural drawings for insulation details and provide luminaires suitable for use in direct contact with insulation where required.

3.2 INSTALLATION

A. Installation shall be in accordance with the NEC, manufacturer's instructions, and as shown on the drawings or specified.

B. Lighting fixtures: Set level, plumb, and square with ceilings and walls.

C. Install suspended exit signs using stem pendants from swivel hangers.

D. Install suspended luminaries using stem pendants from swivel hangers, aircraft cable, and chain in accordance with the intended design. Provide stem pendants, aircraft cable, and chain lengths required to suspend luminaires at indicated height.

E. Wall-mounted fixtures shall be attached to the studs in the walls, or to a 20-gauge metal backing plate that is attached to the studs in the walls. Lighting fixtures shall not be attached directly to gypsum board.

F. Lighting Fixture Supports:

1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
2. Shall maintain the fixture positions after cleaning and re-lamping.
3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
4. Hardware for troffers:

    a. Hardware devices shall independently support the fixture from the building structure at two opposite points.

5. Stem hung fixtures shall be provided with ball swivels, located at the canopies, and rockers, at the fixtures, allowing a minimum 45-degree swing from the vertical. Stems shall be of 3/8-inch ID minimum pipe and shall be finished to match the lighting fixture.
6. For fixtures mounted in continuous rows where individual fixtures are mounted on common mounting channels, or otherwise rigidly fastened together, install one support (stem, AC cable or chain) for each 4-foot lamp length and 2 for each 8-foot lamp length.

G. Backing for surface mounted or stem hung linear fixtures shall be structural channel or angle iron with 5/16" bolts, except where mounted directly to concrete structures, in which case anchors and suspension shall be used. The exact method of support shall be determined in conjunction with the Owner's Representative.

H. All light fixtures installed in gypsum board ceilings or plaster soffits shall be provided with metal frames. Fixtures in concrete shall be steel housing with bitumastic paint finish and approved for use in concrete. Fixtures shall be compatible with type of ceiling.

I. Light fixtures which are to be mounted in continuous rows of two or more fixtures shall have at least two bolts or other interlocking devices, as approved by the Architect, at each connection to provide for positive and true alignment of the fixtures.

J. All light fixtures contained within architectural details (i.e., cove, slots, valances, etc.) shall be continuous with fixtures tightly butted up against each other to reduce shadows. Actual illuminated length shall be centered in overall detail with equal spacing at each end. All concealed lighting of this nature shall be closely coordinated with architectural details where indicated in lighting fixture schedules.

K. Recessed light fixtures shall be independently supported by #10 AWG wires to specified anchors in the slab above.

L. Provide all lighting fixtures recessed in a ceiling which has a fire-resistant rating of one hour or more with box enclosures which have a fire rating equal to that of the ceiling. The space from the fixture to the enclosure shall be 3" for fixtures with 120V screw base sockets and 1" for other light fixtures.

M. Verify weights and recommended mounting methods of all decorative fixtures with manufacturers and furnish and install supports. Fixtures weighing more than 10 pounds shall be supported independently of the outlet box.

N. Luminous ceiling and wall cavities shall be completely enclosed with gypsum board and shall be painted with 90% reflecting white paint. Cavities shall be free of all obstructions including piping and ductwork, except for branch circuit wiring to fixtures in luminous ceiling. Branch circuit wiring in luminous ceiling shall not extend to fixtures outside luminous ceiling. The installation of luminous ceiling diffusers shall be in accordance with drawing details and as described in these specifications.

O. Locale recessed ceiling luminaires as indicated on the Architect's reflected ceiling plan.

P. Install wall mounted luminaires and exit signs at height as indicated on Architectural Drawings.

Q. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

R. Lighting fixtures in mechanical spaces and machine rooms are shown in their approximate locations only. Do not install light outlets or fixtures until mechanical piping and ductwork are installed; then lighting fixtures shall be installed in locations best suited for equipment arrangement and as approved by the Architect. Verify locations of fixtures in elevator machine rooms before installation.

S. Exterior fixtures requiring exposed exterior boxes shall be mounted on east boxes equipped with gaskets.

T. Replace luminaires that have failed LEDs, lamps, drivers at Substantial Completion.

U. Louvers, diffusers or lenses shall not be installed in lighting fixtures until such time as all glazing has been completed and all construction work involving plastering, grinding, sanding, painting, etc., and final clean-up sweeping and dusting have been completed.

V. Clean all lamps, lenses, and optical chambers after installation.

W. After the installation is completed, remove, and replace any driver which is judged by the Owner's Representative to be excessively noisy.

X. Clean up and repair any damage to the finished building caused by installation of the light fixtures.

Y. The electrical contractor and ceiling trades shall coordinate to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges, etc.), to match the ceiling system being installed.

Z. Bond lighting fixtures to the grounding system as specified in Division 26.

AA. At completion of project, replace all defective components of the lighting fixtures at no cost to the Owner.

3.3 ACCEPTANCE CHECKS AND TESTS

A. Perform the following:

1. Visual Inspection:

   a. Verify proper operation by operating the lighting controls.

   b. Visually inspect for damage to fixtures, lenses, reflectors, diffusers, and louvers. Clean fixtures, lenses, reflectors, diffusers, and louvers that have accumulated dust, dirt, or fingerprints during construction.

2. Electrical tests:

   a. Exercise dimming components of the lighting fixtures over full range of dimming capability by operating the control devices(s) in the presence of the Engineer/Commissioning Agent. Observe for visually detectable flicker over full dimming range and replace defective components at no cost to the Owner.

   b. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by the Owner. Burn-in period to be 40 hours minimum, unless specifically recommended otherwise by the lamp manufacturer. Burn-in dimmed fluorescent and compact fluorescent lamps for at least 100 hours at full voltage, unless specifically recommended otherwise by the lamp manufacturer.

   c. Replace any lamps and ballasts which fail during burn-in.

3.4 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks and tests, the Electrical Subcontractor shall show by demonstration in service that the lighting systems are in good operating condition and properly performing the intended function.

3.5 TRAINING AND SERVICE

A. Comply with Section 260001.

B. Conduct two 4-hour training sessions. Train the Owner's maintenance personnel on procedures and schedules related to start up and shutdown, troubleshooting, servicing, and preventive maintenance.

End of Section

SECTION 28 31 11

ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

1.2 SCOPE OF WORK

A. It is the intent of these specifications that the Contractor, Manufacturer and/or its Authorized System Integrator expeditiously furnishes and installs a system complete in every respect and ready to operate. All miscellaneous items and accessories required for such installation, whether or not each such item or accessory as shown on the plans or mentioned in these specifications, shall be furnished and installed.

B. The work covered by this Section of the Specification shall include all labor, equipment, materials and services to furnish and install a complete fire alarm system of the addressable, non-coded type. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer. The system shall consist of, but not be limited to, the following:

1. Visual notification appliances - strobes.
2. Audiovisual notification appliances – horn strobes.

C. Existing Fire Alarm Network:

1. Perform software and firmware upgrades to the existing Simplex panel in the building.

1.3 RELATED WORK

A. The Contractor shall coordinate work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:

1. Sprinkler waterflow and supervisory switches shall be furnished and installed by the fire protection contractor but wired and connected by the electrical contractor. Modification of existing sprinkler devices to accommodate monitoring by the new fire alarm system shall be the responsibility of the fire alarm system installing contractor.
2. Duct smoke detectors shall be furnished, wired and connected by the electrical contractor. The HVAC contractor shall furnish necessary duct opening to install the duct smoke detectors.
3. New air handling and smoke exhaust system fan control circuits and status contacts to be furnished by the HVAC control equipment.
4. Elevator recall control circuits to be provided by the elevator control equipment. Modifications to the existing elevator controls to accommodate ANSI A17.1 shunt trip activation shall be provided by the elevator controls contractor. Any shunt trip circuit breakers and related wiring required for ANSI A17.1 compliance shall be provided by the electrical contractor (see power riser for more details).
5. Security/Access Control. Provide control relays to all lock power supplies as required per code.
6. Dry pipe/deluge sprinkler system release valve control circuits and supervision contacts shall be provided by the dry pipe/deluge sprinkler system control equipment.

B. Installing dedicated outgoing RJ-31X telephone lines (2) shall be the responsibility of the Installing Electrical Contractor. Establishment of central station monitoring account shall be the responsibility of the fire alarm equipment vendor.

C. Secure permits and approvals prior to installation.

D. Prior to commencement and after completion of work notify Authorities Having Jurisdiction.

E. Submit letter of approval for installation before requesting acceptance of system.

1.4 APPLICABLE CODES AND STANDARDS

A. All equipment shall be UL listed for its intended use and conform to the latest UL Standards.

B. Underwriters Laboratories Inc.: The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:

1. UL 864/UOJZ, APOUControl Units for Fire Protective Signaling Systems.
2. UL 268 Smoke Detectors for Fire Protective Signaling Systems.
3. UL 268A Smoke Detectors for Duct Applications.
4. UL 217 Smoke Detectors Single Station.
5. UL 521 Heat Detectors for Fire Protective Signaling Systems.
6. UL 228 Door Holders for Fire Protective Signaling Systems.
7. UL 464 Audible Signaling Appliances.
8. UL 1638 Visual Signaling Appliances.
9. UL 38 Manually Activated Signaling Boxes.
10. UL 346 Waterflow Indicators for Fire Protective Signaling Systems.
11. UL 1971 Standard for Signaling Devices for the Hearing Impaired
12. UL 1481 Power Supplies for Fire Protective Signaling Systems.
13. UL 1711 Amplifiers for Fire Protective Signaling Systems.
14. UUKL The Fire Alarm system shall be UUKL for Smoke Control.

C. This installation shall comply with:

1. Americans with Disabilities Act (ADA)
2. National Electric Code, Article 760.
3. National Fire Protection Association Standards: NFPA72
4. Local and State Building Codes and the Local Authorities Having Jurisdiction.
5. International Standards Organization (ISO): ISO-9001

1.5 SUBMITTALS

A. Provide list of all types of equipment and components provided. This shall be incorporated as part of a Table of Contents, which will also indicate the manufacturer’s

part number, the description of the part, and the part number of the manufacturer's product datasheet on which the information can be found.

B. Provide description of operation of the system (Sequence of Operation), similar to that provided in Part 2 of this Section of the Specifications, to include any and all exceptions, variances or substitutions listed at the time of bid. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. The sequence of operation shall be project specific and shall provide individual sequences for every type of alarm, supervisory, or trouble condition, which may occur as part of normal or off-normal system use.

C. Provide manufacturer's ORIGINAL printed product data, catalog cuts and description of any special installation procedures. Photocopied and/or illegible product data sheets shall not be acceptable. All product datasheets shall be highlighted or stamped with arrows to indicate the specific components being submitted for approval.

D. Provide manufacturer's installation instruction manual for specified system.

E. Provide samples of various items when requested.

F. Provide copy of State License to perform such work.

G. Provide copies of NICET Level IV Fire Alarm certifications for a minimum of two (2) technicians assigned to this project.

H. Provide shop drawings as follows:

1. Coversheet with project name, address and drawing index.
2. General notes drawing with peripheral device backbox size information, part numbers, device mounting height information, and the names, addresses, point of contact, and telephone numbers of all contract project team members.
3. Device riser diagram that individually depicts all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed point descriptor above each addressable device. Shall include a specific, discrete point address that shall correspond to addresses depicted on the device layout floor

plans. Drawing shall provide wire specifications, and wire tags shown on all conductors depicted on the riser diagram. All circuits shall have designations that shall correspond with those require on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.

4. Control panel termination drawing(s). Shall depict internal component placement and all internal and field termination points. Drawing shall provide a detail indicating where conduit penetrations shall be made, so as to avoid conflicts with internally mounted batteries. For each additional data gathering panel, a separate control panel drawing shall be provided, which clearly indicated the designation, service and location of the control enclosure. End-of-line resistors (and values) shall be depicted.
5. Device typical wiring diagram drawing(s) shall be provided which depict all system components, and their respective field wiring termination points. Wire type, gauge, and jacket shall also be indicated. When an addressable module is used in multiple configurations for monitoring or controlling various types of equipment, different device typical diagrams shall be provided. End-of-line resistors (and values) shall be depicted.
6. Device layout floor plans shall be created for every area served by the fire alarm system. CAD Files (AutoCAD latest version) shall be provided by the consulting engineer for the use of the fire alarm system equipment vendor in the preparation of the floor plans. Floor plans shall indicate accurate locations for all control and peripheral devices. Drawings shall be NO LESS THAN 1/8 INCH SCALE. All addressable devices shall be depicted with a discrete address which corresponds with that indicated on the Riser Diagram. All notification appliances shall also be provided with a circuit address which corresponds to that depicted on the Riser Diagram. If individual floors need to be segmented to accommodate the 1/8” scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner. End-of-line resistors (and values) shall be depicted.
7. Contained in the title block of each drawing shall be symbol legends with device counts, wire tag legends, circuit schedules for all addressable and notification appliance circuits, the project name/address, and a drawing description which corresponds to that indicated in the drawing index on the coversheet drawing. A section of each drawing title block shall be reserved for revision numbers and notes. The initial submission shall be Revision 0, with Revision A, B, or C as project modifications require.

I. Battery calculations shall be provided on a per power supply/charger basis. These calculations shall clearly indicate the quantity of devices, the device part numbers, the supervisory current draw, the alarm current draw, totals for all categories, and the calculated battery requirements (which reflect a 20% DEGRADE, for 24 Hour supervisory, 15 minute alarm operation). Battery calculations shall also reflect all control panel component, remote annunciator, and auxiliary relay current draws. Failure to provide these calculations shall be grounds for the complete rejection of the submittal package.

J. Table of contents, product data sheets, sequences of operation, battery calculations, installation instructions, licenses, NICET certifications and B-Size (blackline) reduced shop drawings shall be provided by the fire alarm vendor as part of a single, spiral bound submittal book. The submittal book shall have laminated covers indicating the project address, project number, system type, and contractor. The book shall consist of labeled dividers, and shall not exceed 9 ½" in width, and 11 ½" in height. No less than three (3) sets of submittal booklets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.

K. Scale drawing sets shall be submitted along with the submittal booklets. These drawings may be either D-Size or E-Size Blueline drawings and of a sufficient resolution to be completely read. Sets shall be bound and folded so that is does not take up more than 100 square inches of space. No less than three (3) sets of scale drawing sets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.

L. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

M. Field quality-control reports.

N. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.

    b. Frequency of inspection of installed components.

    c. Requirements and recommendations related to results of maintenance.

    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Retain subparagraph below if Project contains water-based sprinkler or standpipe systems.
8. Copy of NFPA 25.

O. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 AS-BUILT DRAWINGS

A. At the conclusion of the project, the Contractor shall provide “as built” drawings. The “as built” drawings shall be a continuation of the Contractors shop drawings as modified, augmented, and reviewed during the installation, check out and acceptance phases of the project. All drawings shall be fully dimensioned and prepared in DWG format using the latest version of AutoCAD.

B. The as-built drawings shall incorporate all updated system riser diagrams prepared in DWG format using the latest version of AutoCAD.

C. The as-built drawings shall show point-to-point wiring of all devices.

1.7 OPERATION AND MAINTANANCE MANUALS

A. Manuals

1. At the conclusion of the project, the contractor shall provide copies of the manuals as described herein. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each system integrator installing equipment and systems and the nearest service representatives for each item of equipment for each system. The manuals shall have a table of contents and labeled sections. The manuals shall include all modifications made during installation, checkout, and acceptance. The manuals shall contain the following:
2. Operators Manual
    a. The operator's manual shall fully explain all procedures and instructions for the operation of the system including:
        1) Computers and peripherals
        2) System start up and shut down procedures
        3) Use of system, command, and applications software
        4) Recovery and restart procedures
        5) Graphic alarm presentation
        6) Use of report generator and generation of reports
        7) Data entry
        8) Operator commands
        9) Alarm messages and reprinting formats
        10) System access requirements
3. Maintenance Manual

a. The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician. Provide certification with the submittal package.

C. System Engineering and Shop Drawings Qualifications: System engineering and shop drawings shall be by performed by a NICET fire-alarm Level IV technician. Provide certification with the submittal package.

D. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer.

E. 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.

1.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.10 WARRANTY

A. Comply with Section 260001.

B. The Electrical Contractor shall warranty that all materials furnished shall be free from defects of material for a period of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The fire alarm control panel is Simplex 4000 ES addressable panel.

1. New initiating and signaling devices to new initiating and signaling circuits.
2. Furnish and install all necessary hardware for a complete functioning system.
    a. Provide notification appliance circuit (NAC) panel as required.
    b. Provide SLC card as required.
3. Connection to existing initiating and signaling circuits:
    a. The electrical subcontractor may connect new devices to the existing initiating and signaling circuits should calculations and field testing permit it. The electrical subcontractor shall qualify the existing fire alarm initiating and signaling circuits for installation of additional devices (load considerations) prior to connecting new devices. Provide battery calculations to ensure new devices can be connected to existing loops.
4. Existing fire alarm devices on the floor are to remain until the new devices are commissioned and operational.

5. Coordinate with FSU Facilities for shut down/FFD notification before ANY alarm system work.

2.2 FIRE ALARM SYSTEM SEQUENCE OF OPERATION

A. The system shall identify any off normal condition and log each condition into the system database as an event.

1. The system shall automatically display on the control panel Liquid Crystal Display the first event of the highest priority by type. The priorities and types shall be alarm, supervisory, trouble, and monitor.
2. The system shall have a Queue operation and shall not require event acknowledgment by the system operator. The system shall have a labeled color-coded indicator for each type of event; alarm - red, supervisory - yellow, trouble - yellow, monitor - yellow. When an unseen event exists for a given type, the indicator shall be lit.
3. For each event, the display shall include the current time, the total number of events, the type of event, the time the event occurred and up to a 42-character custom user description.
4. The user shall be able to review each event by simply selecting scrolling keys (up-down) for each event type.
5. New alarm, supervisory, or trouble events shall sound a silencing audible signal at the control panel.

B. Operation of any alarm initiating device shall automatically:

1. Update the control/display as described above (A.1.)
2. Sound all audible speaker appliances with a prerecorded message. Audible devices shall have the ability to be silenced.
3. Activate all strobe appliances throughout the facility. All strobe appliances shall be synchronized with each other in any location with two or more devices in a common field of view. Visual devices shall be non-silenced unless the system is successfully reset.
4. Operate control relay contacts to shut down all HVAC units serving the floor of alarm initiation.
5. Operate control relay contacts to return all elevators that serve the floor of alarm initiation to the ground floor. If the alarm originates from the ground floor, operate

control circuits contacts to return all elevators to the floor above or to a level as directed by the local fire department.

6. Operate control relay contacts to release all magnetically held smoke doors throughout the building.
7. Visually annunciate the individual point of alarm on all remote annunciator panels. The visual indication shall remain on until the alarm condition is reset to normal.
8. Transmit an alarm condition to Local Fire Department (as required by the AHJ).

C. Elevator smoke and heat detector sequences shall comply with the ANSI A17.1 requirement for main/alternate floor recalls.

D. Activation of a sprinkler supervisory initiating device shall:

1. Update the control/display as described above.
2. Transmit a supervisory condition to Local Fire Department (as required by the AHJ).
3. Visually annunciate the individual point of alarm on all remote annunciator panels. The visual indication shall remain on until the alarm condition is reset to normal.

E. The entire fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the fire alarm control panel. Any opens, grounds or disarrangement of system wiring and shorts across alarm signaling wiring shall automatically:

1. Update the control/display as described above.
2. Transmit a trouble condition to Local Fire Department (as required by the AHJ).
3. Visually and audibly annunciate a general trouble condition, on the remote annunciator panels. The visual indication shall remain on until the trouble condition is repaired.

2.3 INTELLIGENT MANUAL PULL STATIONS

A. General: The manual stations shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A red LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. Input circuit wiring shall be supervised for open and ground faults. The

fire alarm pull station shall be suitable for operation in the following environment: Temperature: 32F to 120F, Humidity: 0-93% RH, non-condensing.

B. Manual Pull Station: Provide intelligent dual action, single stage fire alarm stations at locations shown on the drawings. The fire alarm station shall be of metal construction with an internal toggle switch. Provide a locked test feature. Finish the station in red with silver "PULL IN CASE OF FIRE" English lettering. The manual station shall be suitable for mounting on North American 2 ½" deep 1-gang boxes and 1 ½" deep 4" square boxes with 1-gang covers.

C. Parking or outdoor area Pull Stations shall be NEMA 4X rated for outdoor use and key operated. Matching weatherproof back box to be included. Addressable monitor module for monitoring of pull station to be installed in environmentally controlled area.

2.4 NOTIFICATION APPLIANCES

A. Notification Appliances

1. Visual Appliance: shall be listed to UL 1971 listed for indoor applications. The device shall consist of a xenon flash tube with clear lens/reflector, cover shall have the lettering "FIRE", and a mounting plate. For ease of installation the mounting plate shall mount directly to a vertically mounted four gang electrical box, without the use of special adapters or trim rings. When the appliance is connected to an active circuit, the front cover of the appliance shall be removable without causing a trouble indication on the fire alarm control unit. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. The device shall be provided with multiple minimum flash intensities of 15cd, 30cd, 75cd, 110cd, 135cd and 185cd. The candela levels shall be settable from the fire alarm control unit or by using a hardware selector on the appliance.
2. Weatherproof Visual Appliances: shall be UL 1638 listed for outdoor applications with strobe rated at 75 cd (WP75) or 185 cd (WP185). The devices shall be acceptable for indoor and outdoor, extended temperature and extended humidity applications. The device shall consist of two xenon flash tubes one clear lens/reflector and one amber lens/reflector, cover shall have the lettering "FIRE" for the clear lens and "ALERT" for the amber lens, weatherproof cover and weatherproof mounting

box. The Candela levels shall be settable from the fire alarm control unit or by using a hardware selector on the appliance.

B. Audible Notification Appliance: shall be listed to UL 1480. Individual device level supervision and activation control shall be provided by the fire alarm control unit.

1. Speakers shall be individually powered, addressed, and controlled from a compatible fire alarm control unit Signaling Line Circuit (SLC) using Unshielded Twisted Pair (UTP) cable and T-taps shall be allowed for Class B installation reducing wiring costs and wiring distances. Shielded cable shall not be required.
2. Speakers shall provide for Fire Alarm and General Signaling functionality in a single unit, eliminating additional devices. Device "Self-Test" shall be supported by a compatible fire alarm control unit and shall be UL listed and NFPA 72 compliant. Speakers shall be UL listed to provide a 520Hz audio tone in compliance with NFPA 72 for sleeping areas.
3. The speaker audio shall be provided by a standard 25VRMS or 70.7VRMS audio circuit using Unshielded Twisted Pair (UTP) cable. Shielded cable shall not be required.
4. Speaker power taps shall be at a minimum of 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker shall have a minimum UL rated sound pressure level of 86dBA at 10 feet for the Standard Output version and 84dBA at 10 feet for the High Fidelity version.
5. Speakers shall be available in either "Standard Output" with a minimum frequency response of 400 to 4000 Hz or in "High Fidelity Output" with a minimum frequency response of 200 to 10,000 Hz. Standard Output speakers shall use a multi-tapped speaker for audio/tone notification. Provide High Fidelity Speakers for this project.
6. Wall mount appliances shall be available in White and Red and ceiling mount appliances shall be available in White, Red, and Black. Labeling shall be available as either "FIRE", "ALERT" or no labeling.
7. The speaker shall install directly to a 4" square, 2 1/8" deep electrical box. Extensions for these boxes shall not be required. Units shall be modular in design to allow for easy installation and for easy changing of device color and labeling.

C. Combination Notifications Appliance: Combination appliances combine the speaker and visual functions into a common housing. The combination appliance shall be listed to UL 1971 and UL 1480.

1. Operational functions and features of the Speaker above shall apply to this section. Operational functions and features of the Strobe above shall apply to this section.
2. Wall mount appliances shall be available in White and Red and ceiling mount appliances shall be available in White, Red, and Black. Labeling shall be available as either “FIRE”, “ALERT” or no labeling.
3. The speaker shall install directly to a 4" square, 2 1/8" deep electrical box. Extensions for these boxes shall not be required. Units shall be modular in design to allow for easy installation and for easy changing of device color and labeling.
4. Notification appliance operation shall provide power, supervision and separate control of speakers/horns/strobes and combination devices over a single pair of wires. The controlling channel (SLC) digitally communicates with each appliance and receives a response to verify the appliance's presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.

D. All Notification Appliances shall operate as a completely independent device allowing for specific location alerting of both fire alarm and Mass Notification functions. Each visible device (both clear fire alarm and amber mass notification) shall be capable of operating on multiple notification zones or completely separate from all other notification devices, this allows “On the fly” program operation changes for Mass Notification alerting and fire alarm notification.

E. All Notification Appliances shall operate as a completely independent device allowing for appliances in handicap accessible rooms and other locations to operate on the same SLC and to activate individually based on an alarm condition in a room or as part of a general alarm condition where all appliances activate together.

1. Individual Notification Appliances shall be able to be grouped into zones (or operational groups) by central programming at the main fire alarm control unit.
2. Notification Appliances shall provide for “unobtrusive” testing. Each Notification Appliance shall be tested for audible and visible operation on an individual basis at the device or from the main fire alarm control unit, allowing for minimal invasive impact.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the local Fire Department and specified with in.

B. End of Line Resistors shall be furnished as required for mounting as directed by the manufacturer. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled so removal of the device is not required to identify the EOL device.

C. All manual pull stations shall be mounted 48 inches above the finished floor, as measured to the handle.

D. All audio/visual devices shall be mounted 80 inches above the finished floor, as measured to the lens. Devices shall be mounted no less than 6 inches from the ceiling. All audiovisual devices shall have Lexan covers in all areas subject to mechanical damage.

E. In areas with concealed ceiling spaces all device plenum rated wiring shall be mechanically protected with conduit or shall be Type MC Listed fire alarm cable.

F. All low voltage wiring terminated to the fire alarm system shall be PLENUM RATED with no exceptions and no less than No. 18 AWG in size, and solid copper.

G. All wiring shall be color-coded throughout, to National Electrical Code standards.

H. Power-limited/Non-power-limited NEC wiring standards SHALL BE OBSERVED.

I. All junction box covers shall be painted federal safety red and labeled FIRE ALARM SYSTEM ONLY in black letters.

J. Fire alarm system wiring shall not co-mingle with any other system wiring in the facility. Conduits shall not be shared under any circumstance. Only when fire alarm wiring enters the enclosure of a monitored or controlled system will co-habitation be permitted (i.e. at fan starters or elevator controllers).

K. All fire alarm wiring shall be continuous and un-spliced. Terminations shall only occur at fire alarm devices or control panel enclosures under terminal screws. All other splicing methods are specifically disallowed (i.e. plastic wire nuts).

L. All fire alarm wiring shall be installed using a dedicated system of supports (i.e. bridle rings). Fire alarm wiring shall not be bundled or strapped to existing conduit, pipe or wire in the facility.

M. All fire alarm wiring shall be sleeved when passing through any wall, using conduit sleeves (1” min.) with bushings, and fire stopped in accordance with Code.

N. All fire alarm devices shall be accessible for periodic maintenance. Should a device location indicated on the Contract Drawings not meet this requirement, it shall be the responsibility of the installing contractor to bring it, in writing, to the attention of the Project Engineer. Failure to bring such issues to the attention of the Project Engineer shall be the exclusive liability of the installing Electrical Contractor.

O. The existing fire alarm system shall remain in operation until such time that approval has been granted for its removal. The installing Electrical Contractor shall be responsible for the upkeep of the existing system until such time that it can be removed.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

B. Install instructions frame in a location visible from the FACP.

3.3 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.4 FIELD QUALITY CONTROL

A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the function as specified.

B. The installing contractor or fire alarm equipment vendor shall have no less than two (2) NICET Level IV fire alarm technicians dedicated to this project.

C. The Installing Contract and the Fire Alarm System Vendor shall, upon the request of the Consulting Engineer or End-User, attend any and all project meetings for the purpose of accurately determining progress.

D. It shall be the responsibility of the installing contractor to assure that construction debris does not adversely affect any sensing devices installed as part of this project. Should it be deemed necessary by the Consulting Engineer, End-User or AHJ, the installing contractor shall be responsible for the cleaning of all smoke detectors prior to final acceptance.

3.5 TESTING AND ACCEPTANCE

A. The Contractor is responsible for giving all notices, filing all plans, obtaining all permits, fire alarm system testing and obtaining necessary approvals from authorities having jurisdiction.

B. The authority having jurisdiction, the Fire Department., requests periodic inspection of the fire alarm system during the installation period. The Contractor shall contact the Fire Dept. to schedule these inspections.

C. The Contractor shall schedule all fire alarm tests a minimum of 2 weeks in advance. Coordinate testing times with the Owner, Designers, and authorities having jurisdiction. Fire Alarm Testing will be performed before or after normal business hours or on weekends and holidays. Additional compensation will not be provided to the Contractor for non-business hours testing.

D. Initial Acceptance Testing

1. All new systems shall be inspected and tested in accordance with the requirements of NFPA 72, Chapter 14.
2. The authority having jurisdiction shall be notified prior to the initial acceptance test.

E. Reacceptance Testing

1. When an initiating device, notification appliance, or control relay is added, it shall be functionally tested.
2. When an initiating device, notification appliance, or control relay is deleted, another device, appliance, or control relay on the circuit shall be operated.
3. When modifications or repairs to control equipment hardware are made, the control equipment shall be tested in accordance with NFPA 72, Table 14.4.3.2, items 1 (a) and 1 (d).
4. When changes are made to site-specific software, the following shall apply:
    a. All functions known to be affected by the change, or identified by a means that indicates changes, shall be 100 percent tested.
    b. In addition, 10 percent of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, also shall be tested and correct system operation shall be verified.
    c. A revised record of completion in accordance with NFPA 72, 7.5.6 shall be prepared to reflect these changes.

F. Changes to the system executive software shall require a 10 percent, functional test of the system, including a test of at least one device on each input and output circuit to verify critical system functions such as notification appliances, control functions, and off-premises reporting.

3.6 Final acceptance test

A. This test is required for issuance of the Certificate of Occupancy by the Fire Department. The Electrical Trade Contractor shall submit to the Fire Department the following documentation prior to requesting the final fire alarm system acceptance test:

1. Affidavit from the fire alarm system designer letter certifying the system has been installed according to plans and specifications and the system is 100% operational and ready for the final testing.
2. Affidavit from the Electrical Trade Contractor letter certifying the fire alarm system has been installed according to the plans and specifications and is ready for final testing.
3. Fire alarm manufacturer completed and signed NFPA Record of Completion form.
4. Copy of the approved Fire Alarm Narrative, Matrix and English language device list.
5. Copy of the fire alarm manufacturer's program notes and approved shop drawings.
6. Copy of the stamped fire alarm drawings (as-built drawings if available).

B. The Contractor shall schedule the final fire alarm test with the Fire Department, the Owner and other required participants.

C. Required participants at the final acceptance test to include:

1. Fire Department
2. General Contractor's site Superintendent
3. Electrical Trade Contractor
4. Owner's Representative
5. If the final acceptance fire alarm test is successful, the Fire Department will issue a letter of acceptance. If the fire alarm test is not successful, the Contractor shall immediately provide the required changes and reschedule the fire alarm test.

3.7 COMMISSIONING

A. Engage a factory-authorized service representative to supervise and assist with startup service. Complete installation and startup checks according to the approved manufacturer's written instructions.

3.8 TRAINING AND SERVICE

A. Comply with Section 26 00 01.

B. Conduct two 4-hour training sessions. Train the Owner's maintenance personnel on procedures and schedules related to start up and shutdown, troubleshooting, servicing, and preventive maintenance.

C. Training shall include fire department personnel.

End of Section