SECTION 010100 - SUMMARY OF WORK

PART 1 – GENERAL

1.1 CONTRACT DOCUMENTS

A. The Contract Documents include the Drawings as enumerated on the Title Drawing, the general provisions of Contract, including General and Supplemental Conditions, and the provisions of this Project Manual and Addenda as a whole represent and describe the work and requirements of the Project.

1.2 GENERAL REQUIREMENTS

Attention is directed to the general and supplementary conditions and Division 1 including all sub-divisions therein attached in this document and drawings, which are made a part of this section.

1.3 SUBSTANTIAL COMPLETION

A. The Date of Substantial Completion shall be AUGUST 18, 2023 for Contract work.

1. The Date of Substantial Completion shall remain the same, as stated above, regardless of any alternate(s) chosen to be included in the Contract by the Owner.

B. The Contractor shall obtain a Certificate of Occupancy on or before the Date of Substantial Completion.

1.4 PROJECT DESCRIPTION

A. DCU Center Slab Repair

1. The work to be performed consists of partial depth reinforced concrete excavation of slab. The depth of removal of unsound concrete shall be 3 inches below the top of slab. Hydro-excavation shall be performed over the entire surface of the reinforced concrete slab (or as directed by the Engineer) to provide a highly roughened and clean bondable surface and to remove all unsound concrete.

2. The contractor shall clean the surface with a vacuum system capable of collecting loose and wet debris and water in the same pass leaving a clean surface prior to repair of the slab.

3. The contractor shall add new and adjust the existing reinforcing steel to the slab as shown on the contract documents

4. The contractor shall replace the removed 3” of concrete with a new 3” cast in place topping slab.

B. The contract shall protect the existing building surfaces while performing the work.

C. The Work of this project shall be performed by the general contractor.

D. The Work of this project also includes the requirements in the Contract, the Sub-Contract(s), Sections 0 and Division 1 Sections, in their entirety.

RELATED WORK UNDER OTHER CONTRACTS

Work by other contractors, which will be under separate contract, may take place during the work of this contract adjacent to and within work areas of this site.

B. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this contract.

1.5 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies; perform demolition work in accordance with applicable rules, regulations, codes, and ordinances of local, state and federal authorities.

B. Obtain and pay for necessary building permits, licenses and certificates and give notices as required during the performance of the Work.

C. Provide electronic files and if required, 4 copies, of shop drawings and literature for Architects review and approval for the items referenced in the specifications.

D. Provide schedule and work plan within one week of the contract signing.

E. Attend weekly meetings (or as scheduled) with the Architect and Owner's Representative as scheduled.

F. Provide all Closeout documents including, final acceptance, warranties, guaranties and bonds as hard copies and digitally.

1.6 RELATED WORK UNDER OTHER CONTRACTS

A. Work by other contractors, which will be under separate contract, may take place during the work of this contract adjacent to and within work areas of this site. This work, under other contract, shall be coordinated between the different General Contractors.

B. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this contract.

1.7 WORK SEQUENCE SCHEDULING AND COORDINATION

A. The Work shall be sequenced, scheduled, and coordinated to achieve the Date of Substantial Completion.

1. All deliveries must be scheduled at a minimum of 48-hours in advance with the Architect and Owner.

B. The General Contractor and each Sub-Contractor shall establish and increase or decrease as appropriate the workforce, days of work, number of shifts, work hours,

materials, tools and equipment needed to maintain and achieve the Date of Substantial Completion.

C. The General Contractor and each Sub-Contractor shall increase the workforce, days of work, number of shifts, work hours, materials, tools, and equipment needed to maintain the Date of Substantial Completion as necessary to accommodate any additional work authorized by Construction Change Directives and Change Orders modifications.

D. General Contractor will be responsible for the proper conduct of the work to ensure that all trades work together, and in harmony, to achieve substantial and final completion as specified.

1.8 WORK HOURS

A. Normal working hours are to be Monday thru Friday from 7:00 AM to 3:30 PM, except Legal Holidays. Any working hours outside of these times shall be considered "Extended Hours" and treated as described below.

Conduct Work during daylight hours on Monday through Friday, and within the time between 6:00 a.m. and 10:00 p.m. No work is to be done on outside of the work hours described above without prior approval by the Owner. Building will be occupied during the project. Coordinate schedule and areas of work with the arena operator (ASM Global). Work to be conducted outside the workdays and hours described above must be approved by the Owner with a minimum of 48-hour notice. No equipment or machinery may be started at the sites before 7:00 a.m. and all equipment must be shut off by 10:00 p.m. unless specifically requested and approved by owner.

The Contractor may request to work other than the work hours specified. However, approval to work other than normal hours is at the sole discretion of the Owner. If allowed, the Contractor shall be responsible for reimbursing the Owner for any expenses resulting from working outside of hours. Please note that events will be taking place on the third floor of the convention center on the following days, and may require additional noise control:

June 19-22, 2023 (Monday-Thursday
June 26-27, 2023 (Monday-Tuesday)
July 8, 2023 (Saturday)
July 29, 29, 2023 (Saturday)
August 11-13, 2023 (Friday-Sunday)
August 17-19, 2023 (Thursday-Saturday)

B. Extended work hours shall require prior scheduling and coordination with the Architect and Owner at a minimum of 48-hours in advance.

C. Any project related activities may not interfere with the enjoyment and use of abutting areas within the building or adjacent properties during any extended work hours.

1.9 CONTRACTOR USE OF THE PREMISES

A. General Contractor shall have use of the site from date of contract to the Date of Substantial Completion as described above in the Work Hours paragraph.

B. Construction vehicle access and deliveries to the project shall be made during working hours.

C. All contractor personnel shall enter and exit the construction area as required by the Owner based on an approved staging plan submitted by the general contractor. Access will be on the west side of the building along Commercial Street.

D. Do not close or obstruct the loading docks, driveways or sidewalks without the proper permit. Conduct operations with minimum traffic interference.

E. The General Contractor shall also be responsible for returning the public areas adjacent to each work area to their original state prior to the end of work in that area prior to owner reoccupying said location.

F. There will be no washing or washing out of any vehicles at the project site. The contractor shall make necessary provisions to accommodate this work off site.

G. All cleaning and wash-down of tools and/or equipment shall be performed in areas designated only by the Architect. This will be strictly enforced.

1.10 CONTRACTOR USE OF CITY STREETS

A. The General Contractor's personnel, and all other personnel employed on the project, shall limit their parking on the site, and when necessary, only within the areas designated for construction parking and as permitted by the Owner. Additionally, Contractor personnel may park as legally allowed within City Limits or the adjacent Major Taylor Garage. Parking on sidewalks is prohibited. Contractor parking and actual equipment staging, etc. may require use of Commercial Street and an associated DPW street permit. The contractor will have to pay for parking of all contractor vehicles and any associated permitting needed to accommodate their needs.

B. Driveway entrances, walks, and yards to abutting properties shall be kept unobstructed at all times.

1.11 WORK CONDITIONS

A. Neither the General Contractor, nor Sub-Contractors at any level, nor their employees shall bring illegal substances or alcoholic beverages on the premises.

B. Vulgar, abusive, obscene language or behavior will not be tolerated.

C. Contractor's personnel engaging in the above shall be removed from the job-site.

D. Radios or any type of “music” broadcasting systems are not allowed.

E. This site is smoke-free; therefore smoking is prohibited within the site limits.

1.12 PROJECT MANAGER, SUPERINTENDENTS, FIELD ENGINEER AND FOREMAN

A. The General Contractor shall provide a qualified General Superintendent, who shall be present, full time, on site daily during all work in progress until the Date of Substantial Completion, and for such additional time thereafter as the Architect may determine. Only under extenuating circumstances, with the approval of the Architect and Owner, will the Contractor be allowed to substitute for the General Superintendent prior to the date of Final Completion.

B. The General Superintendent shall supervise and direct the activities of other superintendents and foremen on site. He shall not perform the work of foremen, tradesmen, or home office staff.

C. Each subcontractor shall provide a Lead Foreman, responsible to be on site full time during the workday.

D. Each foreman, in addition to his regular duties shall be responsible for establishing, maintaining, and providing record drawings, which are required to be updated prior to submitting the current period's draft Application for Payment.

E. The General Superintendent and Lead Foreman shall not be discharged or changed without prior written consent of the Architect, which will not be unreasonably withheld. The Architect will require that all as-built information be updated and current prior to granting consent.

1.13 DAILY REPORTS AND WEEKLY OUTLINE SCHEDULE

A. The General Superintendent shall provide a "Daily Report" to the Owner containing the following:

1. Name and manpower of each Contractor and Sub Contractor.
2. Equipment used.
3. Delivery of products received on site.
4. Weather conditions at start and end of each day and any significant changes or events during the day.
5. Significant problems, hazards or accidental injury occurring during each shift.
6. Summary of progress made each day.

B. A photocopy may be made of the same "Daily Report," containing the information above, that is used by the General Superintendent. The General Superintendent may obscure confidential portions of his "Daily Report" if desired. Reports are due the following day.

C. The Superintendent shall provide the Owner a written “Two Week (look ahead) Outline Schedule” of work activities planned for each week. The “Two Week Outline Schedule” may be a simple listing of each trade’s activities delineating areas where work is to be scheduled. Note any significant milestones. This must be submitted on the Thursday preceding the two weeks so Owner has time to distribute any changes in schedule to the appropriate occupants on the following Monday

1.14 CERTIFICATE OF SUBSTANTIAL COMPLETION

A. The Architect shall issue a Certificate of Substantial Completion for the work when and if all of the following conditions have been met:

1. The work is sufficiently complete to allow the Owner beneficial use of the premises. The work remaining to be done is not a danger to the proposed occupants and is of a minor nature.

2. The work is sufficiently complete that the Architect may make affidavits to the Building Official as required by Controlled Construction provisions of the Building Code.

3. The Building Official has issued a Certificate of Occupancy without restrictions or conditions relating to the contractor's work.

1.15 CITY OF WORCESTER ORDINANCES, LICENSES, PERMITS, AND FEES

A. All Contractors shall comply with City Ordinances which may affect the work of this contract and which have not been previously covered in the Contract Documents. Requirements and fees listed are those in effect as of this writing and each Contractor shall be responsible for verifying the requirements and fee cost as currently in effect and throughout the duration of this project. This includes, but is not limited to, the following:

Worcester Police Department:

Police Details
Hourly rate for one-half day or full day.
Permits for Sunday and Holiday work
Fee Required.

Department of Inspectional Services

Building Permit
Based on total contract price.
Orders of Building Official under Chapter 1, 780 CMR.
Ticket violation under Chapter 33, 780 CMR.

Trash Control
Ticket for Violations

Environmental Control
Air, Water, Noise Pollution - Ticket for Violations
Conservation Commission Enforcement Officer

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 012000 - PROJECT MEETINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the 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 project meetings, including, but not limited to, the following:

1. Pre-Construction Conference.
2. Pre-Installation Conference.
3. Weekly Progress Meetings.
4. Coordination Meetings.
5. Project Closeout Conference.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section 01 2900 “Payment Procedures” for procedures on submitting requisitions.
2. Division 1 Section 01 3100 “Project Management and Coordination” for procedures for coordinating project meetings with other construction activities.
3. Division 1 Section 01 3300 “Submittal Procedures” for submitting the Contractor's Construction Schedule.
4. Division 1 Section 01 7700 “Closeout Procedures” for procedures and issues surrounding Project Completion.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference before starting construction, immediately after execution of the Agreement. Conference is to be held at the Project Site, or other agreed upon location, at a time convenient to both the Owner and Architect. Conduct the meeting to review responsibilities and personnel assignments. Submit agenda to Architect and Owner three (3) days prior to meeting date.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Introduction of All Project Members.
2. Distribution of Contract Documents.
3. Procedures Outlined for Contract Compliance Issues.
4. Tentative Construction Schedule; Making Notes of Critical Dates.
5. Critical Work Sequencing.
6. Pre-Installation Conferences.
7. Work Hours.
8. Use of the Premises.
9. Deliveries.
10. Security Procedures.
11. Parking and Site Access Issues.
12. Office, Work, and Storage Areas.
13. Housekeeping & Cleaning of Construction Areas.
14. Safety Procedures.
15. First Aid.
16. Procedures for Creating Monthly Cash Flow/Schedule.
17. Procedures for processing Draft Application for Payment Periodic Submittals Certification Statement.
18. Procedures for processing Applications for Payment.
19. Procedures for RFI's, SI's, RFP's, COP's, CCD's, CO's, etc…
20. Procedures for Keeping Logs on RFI's, SI's, RFP's, COP's, CCD's, CO's, etc…
21. Project Coordination Procedures & Drawings.
22. Project Meetings & Meeting Minutes.
23. Quality Control, Inspections, and Testing.
24. Temporary Facilities.
25. Preparation of Project Closeout Documents.

D. The Contractor shall record and promptly distribute minutes of this meeting to all project members (in attendance or not), including the Architect and Owner, and as additionally directed by the Architect.

1. Meeting Minutes shall be in a standard type-written format to remain consistent for every project meeting and include, but not limited to, the following items:

a. Detailed notes from all discussions of project business items in chronological order.
b. Updated Project Contractor, Subcontractor, Vendor List.
c. Updated Construction Schedule.

1.4 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction.

B. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related Change Orders.
    d. Purchases.
    e. Deliveries.
    f. Shop Drawings, Product Data, and quality-control samples.
    g. Review of mockups or finish samples.
    h. Possible conflicts.
    i. Compatibility problems.
    j. Time schedules.
    k. Weather limitations.
    l. Manufacturer's recommendations.
    m. Warranty requirements.
    n. Compatibility of materials.
    o. Acceptability of substrates.
    p. Temporary facilities.
    q. Existing Occupancies.
    r. Space and access limitations.
    s. Governing regulations.
    t. Safety.
    u. Inspecting and testing requirements.
    v. Required performance results.
    w. Recording requirements.
    x. Protection.

2. The Contractor shall record significant discussions and agreements and disagreements of each conference, and the approved schedule. The Contractor shall promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.

3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

A. Conduct progress meetings at the Project Site weekly. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request. General Contractor to record minutes of all meetings.

B. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier, or 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 the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including the following:

   a. Time & Project Progress.
   b. Work Hours.
   c. Updated Weekly Look-Ahead Schedule.
   d. Critical Work Sequencing.
   e. Off-Site Fabrication Problems.
   f. Deliveries.
   g. Use of the Premises.
   h. Security Procedures.
   i. Parking Issues.
   j. Office, Work, and Storage Areas.
   k. Housekeeping & Cleaning of Construction Areas.
   l. Safety Procedures.
   m. First Aid.
   n. Draft Application for Payment Periodic Submittals Certification Statement (At Appropriately Timed Meeting Each Month).
   o. Updated Submittal, RFI, SI, RFP, COP, CCD, and CO Logs.
   p. New Submittals, RFI’s, SI’s, RFP’s, COP’s, CCD’s, CO’s, etc…
   q. Any Project Coordination Issues or Drawings.
   r. Quality Control, Inspections, and Testing.
   s. Temporary Facilities.
   t. Preparation of Project Closeout Documents.

3. The Contractor shall record and promptly distribute minutes of this meeting to all project members (in attendance or not), including the Architect and Owner, and as additionally directed by the Architect.

   a. Meeting Minutes shall be in a standard type-written format to remain consistent for every project meeting and include, but not limited to, the following items:

      (i) Detailed notes from all discussions of project business items in chronological order.
      (ii) Updated Project Contractor, Subcontractor, Vendor List.
      (iii) Updated Construction Schedule.

(iv) Updated Weekly Look-Ahead Schedule.
(v) Updated Submittal, RFI, SI, RFP, COP, CCD, and CO Logs.

1.6 COORDINATION MEETINGS

A. Conduct coordination meetings with all trades convenient for all parties involved. In addition conduct coordination meetings when requested by the Architect or Clerk of Works.

1.7 TIME OF PROGRESS AND COORDINATION MEETINGS

A. Conduct both meetings weekly on a day agreeable to all parties, at a designated location at the site, or other agreed upon location.

1.8 PROJECT CLOSEOUT CONFERENCE

A. The Project Close-Out Conference shall be conducted at a time convenient for all parties involved prior to Substantial Completion. Refer to Section 01700 – Project Closeout for additional information for requirements.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings 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 handling and processing Contract modifications.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 1 Section 012900 “Payment Procedures” for administrative procedures governing applications for payment.

1.3 MINOR CHANGES IN THE WORK

A. Supplemental instructions authorizing minor changes in the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Architect on the City's Form of Supplemental Instructions.

1.4 REQUEST FOR PROPOSAL

A. Owner initiated Request for Proposal: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Architect, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.

1. Proposal requests issued by the Architect are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.

1.5 PROPOSED CHANGE ORDER

A. Proposed Change Order: Using the form at the end of this section submit your proposal for the adjustment to the Contract Sum or Contract Time in response to a Request for Proposal or for Contractor initiated request for a change with Proposed Change Order.

1. Unless otherwise indicated in the Request for Proposal, within Seven (7) days of receipt of the proposal request, submit to the Architect for the Owner's review an estimate of cost necessary to execute the proposed change.

    a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
    b. Indicate delivery charges, equipment rental, and amounts of trade discounts.
    c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

B. Contractor initiated request for change with Proposed Change Order: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

    1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.

        a. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
        b. Indicate delivery charges, equipment rental, and amounts of trade discounts.
        c. Include labor cost breakdowns, that include hours and hourly personal rates.

1.6 ALLOWANCES

A. Allowance Adjustment: Base each Change Order Proposal Request for an allowance cost adjustment solely on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

    1. Include installation costs in the purchase amount only where indicated as part of the allowance.
    2. When requested, prepare explanations and documentation to substantiate the margins claimed.
    3. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit, within seven (7) days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Claims submitted later than seven (7) days will be rejected.

    1. The Change Order cost amount shall not include the Contractor's indirect expense except when it is clearly demonstrated that either the nature or scope of

work required was changed from that which could have been foreseen from information in Contract Documents.
2. No change to the Contractor's indirect expense is permitted for selection of higher or lower priced materials or systems of the same scope and nature as originally indicated.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. A Construction Change Directive shall be issued for all work involving a change in contract cost or time. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time, or is for a lump sum amount approved by the Architect.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive, if so directed by the Architect.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.8 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and Contractor.

1.9 OVERHEAD AND PROFIT

A. Overhead and Profit will be as noted elsewhere in these specifications.

B. In reviewing Change Orders, the Architect will exercise his right to request a complete breakdown from the contractor showing exact costs for labor and material, as well as delivery slips and invoices from suppliers and other subcontractors.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 012900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections: Sections which contain requirements that relate to this Section include, but are not limited to the following:

1. Section 013300

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Progress Schedule, Schedule of Values, and Contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.

B. The Contractor's Construction Schedule and Submittal Schedule are included in Section 013300 "Submittals".

1.3 PROGRESS SCHEDULE

A. Prepare the Progress Schedule in accordance with Article 8, Paragraphs 8.2.3 and 8.2.4 of the General Conditions for approval by the Architect.

1. The Progress Schedule shall conform to the requirements in Section 013300, paragraph 1.4, Contractor’s Progress Schedule and the sample bound in the aforementioned paragraph.

1.4 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Progress Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:

a. Contractor's Progress Schedule.
b. Application for Payment forms.
c. List of products.
d. Schedule of allowances, if any.
e. Schedule of alternates, if any.
f. Schedule of unit prices, if any.

g. List of products.
h. List of principal suppliers and fabricators.
i. Schedule of submittals.

2. Submit the Schedule of Values to the Architect at the earliest possible date, but no later than five (5) days before the date scheduled for submittal of the initial Application for Payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values. Provide at least one (1) line item for each Specification Section. Coordinate with the Architect for exact breakdown of major categories of work including, but not limited to major equipment and project closeout submittals.

1. Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of the Architect.
c. Project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

a. Generic name.
b. Related Specification Section.
c. Description of Work.
d. Name of subcontractor.
e. Name of manufacturer or fabricator.
f. Name of supplier.
g. Change Orders (numbers) that have affected value.
h. Dollar value to nearest dollar.
i. Percentage of Contract Sum to the nearest percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Breakdown shall be done by sequence. Coordinate with the Project Manual Table of Contents. Break principal subcontract amounts down into several line items, including but not limited to major equipment and project closeout submittals.

4. Do not round amounts off to the nearest whole dollar; carry all amounts out to the two (2) decimal places and the totals shall equal the Contract Sum.

5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for

each subsequent stage of completion, and for total installed value of that part of the Work.

6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete, including its total cost and proportionate share of general overhead and profit margin for each item.

    a. Temporary facilities, project closeout submittals, and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.

7. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Application for Payment when Change Orders or Construction Change Directives result in a change to the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Draft Application Preparation: Submit electronically and if required three (3) **draft** copies of the (current) Application for Payment at the weekly project meeting for Architect's review seven (7) days in advance of the "Payment Application Time" as indicated in the Agreement.

1. Draft Application for Payment transmittal shall include the a fully executed Draft Cover Sheet or **Periodic Submittal Certification Statement** on Contractor letterhead (bound at the end of this section hereafter) certifying that the following Periodic Submittals are current for the appropriate period:

    a. Originals of All Waivers of Mechanics Lien & Corresponding Logs Covering Status of All Waivers
    b. Certified payrolls
    c. Contract Compliance Submittals
    d. Insurance and transfer title certificates for any material stored off site
    e. Updated as-built drawings of record reflecting Work for the current Application period

B. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

C. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

D. Payment Application Cover Sheet Form: Complete the enclosed **Application and Certification for Payment Cover Sheet** on Contractor letterhead (bound at the end of this Section hereafter) and transmit with each Payment Application Form submittal.

E. Payment Application Forms: Use AIA Document G 702 and Continuation Sheets G 703 as the form for Application for Payment. **No exceptions will be made.**

F. Application Preparation: Complete every entry on the form, including notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
2. Include only amounts of approved and fully executed Change Orders. Obtain approval from the Architect prior to inclusion into the Application.
3. Each Application for Payment **must** be accompanied by an updated Progress Schedule. The format to which is subject to the Architect's approval.

G. Payment for materials and/or equipment stored off site shall be considered upon the Owner's approved submission by the Contractor bill(s) of sale or such other documentation or procedures satisfactory to the Owner to establish the Owner's clear and legal title to such materials and/or equipment or otherwise provided to protect the Owner's interest. This shall include applicable insurance and transportation to the project site for those materials and/or equipment suitably stored off site under consideration for payment.

1. Any Contractor making an application for payment pursuant to Section 00200 – General Conditions, paragraph 9.3.2, shall provide the following written documentation to the Architect through the General Contractor as delineated below and as otherwise maybe reasonably requested by the Owner:

a. Bill of Material, Purchase Order or Invoice Number.
b. Product Description Listing.
c. Serial Numbers (If Applicable)
d. Materials and/or Equipment (wares) shall be segregated from all other stock or equipment and clearly labeled and/or marked as City of Worcester Property.
e. Wares shall be available for inspection at all times and in any event within twenty-four (24) hours after receiving prior notice from the Owner/Architect.
f. Provide written directions from the project site to the location of the stored wares.
g. Name of contact person at the storage site and applicable telephone numbers.
h. Method and mode of transportation from off-site storage location to the job site.

H. Retainage: In accordance with the Supplemental General Conditions, the Awarding Authority (Owner) shall deduct a retainage not exceeding five (5) percent of the approved amount of the periodic payment. The aforesaid five (5) percent retainage deduction by the Owner is the only retainage authorized hereunder. The contractor shall not deduct any amounts from payments received on behalf of subcontractors,

except those deductions specifically authorized by M.G.L. Chapter 30, Section 39(1)(a).

1. Upon the initial and any subsequent Application for Payment; requesting or reflecting a “Release of Retainage” provide a Summary cover sheet indicating the derivation arithmetically, by each line item, of the total released to date and the of the current total retainage sum.

I. Transmittal: Upon receipt of the required periodic submittals enumerated above and upon approval of the "Draft Application", submit six (6) fully executed and notarized original copies with Cover Sheet of the current Application for Payment to the Architect by means ensuring receipt within twenty-four (24) hours. One (1) copy shall be complete, including waivers of lien and similar attachments. Color scans of “wet signed” and notarized Application for Payment in PDF format are acceptable in lieu of hard copies.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.
2. With each requisition, after the first requisition, submit one (1) copy of up-dated as-built drawings for all underground and concealed work, showing locations, depths, or elevations. Include work that may be concealed prior to the next payment application.

J. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics lien from every entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, and related to the Work covered by the payment.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Delays: Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the previously paid application.

    a. Submit final Application for Payment with, or preceded by, final waivers from every entity involved with performance of Work covered by the application that could lawfully be entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.

K. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

1. List of subcontractors; at all tiers.

2. List of principal suppliers and fabricators.
3. Approved Schedule of Values.
4. Approved Contractor’s Progress Schedule see Section 01300, Paragraph 1.4.
5. Contractor's Construction Schedule (preliminary if not final).
6. Schedule of principal products.
7. Submittal Schedule (preliminary, if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations, permits and licenses from governing authorities for performance of the Work.
12. Initial progress report.
13. Report of pre-construction meeting.
14. Schedule of Pre-installation meetings.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.
18. Initial settlement survey and damage report, if required.
19. List of Contractor's personnel names and titles assigned on the project and emergency telephone numbers.

L. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
2. Administrative actions and Submittals that shall precede or coincide with this application include:

    a. Occupancy permits and similar approvals.
    b. Warranties (guarantees) and maintenance agreements.
    c. Test/adjust/balance records.
    d. Maintenance instructions.
    e. Meter readings.
    f. Start-up performance reports.
    g. Changeover information related to Owner's occupancy, use, operation and maintenance.
    h. Final cleaning.
    i. Application for reduction of retainage, and consent of surety
    j. Advice on shifting insurance coverage.
    k. Final progress photographs.
    l. List of incomplete work, recognized as exceptions to Architect's Certificate of Substantial Completion.

M. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Completion of Project closeout requirements.

2. Completion of items specified for completion after Substantial Completion
3. Assurance that unsettled claims will be settled.
4. Assurance that incomplete Work and Work not accepted will be completed without undue delay.
5. Transmittal of required Project construction records to the Owner.
6. Certified property survey.
7. Proof that taxes, fees and similar obligations have been paid.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish and similar elements.
10. Change of door locks to Owner's access.
11. Order of Conditions Certificate of Compliance, if applicable.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

CONTRACTOR LETTER HEAD

APPLICATION AND CERTIFICATION FOR PAYMENT COVER SHEET

PROJECT:_____ APPLICATION NO: _____

For
Period
Ending: _____ AMOUNT CERTIFIED: $_____

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents; and the current Payment shown herein is now due.

The Contractor further certifies that the entire amount of all previous Payments received for labor performed and materials furnished have been promptly paid to all Subcontractors whose work was certified for payment on previous applications, less, where applicable, only an amount specified in any court proceeding barring such payment and/or an amount claimed due from the Subcontractor by the Contractor as expressly authorized by M.G. L. Chapter 30, Section 39F (1) (a). No other amounts have been deducted or retained from such payments by the contractor.

Contractor: _____ **STATE OF:** _____

Signed by: _____ **COUNTY OF:** _____

Date: _____ Subscribed and sworn to before me on this _____ Day of _____ 20__.

Notary public:
_____
My Commission Expires:
_____

APPROVED FOR PAYMENT:

Signed:_____ Signed:_____
By Owner: By Architect :

Date:_____ Date:_____

CONTRACTOR LETTER HEAD

DRAFT APPLICATION FOR PAYMENT
PERIODIC SUBMITTAL CERTIFICATION STATEMENT

Project Name:
Draft Application Date: _____
Draft Application No._____ (Requisition No.)
For Period: Starting _____
Through Period Ending _____

_____ _____(Name of Contractor), certifies that the "Draft Application for Payment" as herein submitted with all of the following Periodic Submittals fully and completely executed and current for the appropriate time period(s) as required.

FURNISH THE FOLLOWING PERIODIC SUBMITTALS AND PROVIDE ALL REQUIRED INFORMATION FOR THE APPROPRIATE TIME PERIOD(S) AS REQUESTED. PLEASE SUBMIT ON **SEPARATE** SHEETS:

I. **Original Waivers of Mechanic Lien:** List every entity who may be lawfully entitled to file a lien resulting out of this Contract, including but not limited to; contractors/subcontractors, at all tiers, vendors, and suppliers. Submit current originals of all Waivers covering all WORK completed through the period ending thirty (30) days prior to this periods "Application" date and as further required in I above.

II. **Certified Payrolls:** All payroll reports have been submitted as required by the Contract Compliance Office.

III. **Contract Compliance Reports:** All contract compliance reports have been submitted as required by the Contract Compliance Office.

IV. **Insurance & Title Transfer Certificates** for material stored off site, if applicable.

V. **Updated As-Built Drawings:** Record drawings have been submitted reflecting the work completed up to the time of Application.

This Draft Application for Payment Certification Statement and corresponding Periodic Submittals (attached) shall be reviewed by the Awarding Authority for completeness. Any deficiency, discrepancies or missing items shall cause this Draft Application for Payment to be returned to the Contractor with no action taken.

I, _____ (Name of contractor) hereby certify, that the Periodic Submittals indicated herein have been reviewed by the undersigned and are complete and current as required under provisions of this Contract.

_____
(Name of Authorized Person) (Date)

_____
(Title)

END OF SECTION

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the 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 supervisory requirements necessary for project coordination including, but not limited to the following:

1. General installation provisions.
2. Administrative and supervisory personnel.
3. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Project meetings, coordination meetings, and pre-installation conferences are included in Section “Project Meetings.”
2. Requirements for preparing and submitting the Contractor's Construction Schedule are included in Section “Submittals.”

1.3 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the specifications that depend on each other for proper installation, connection, and operation.

1. Where installation of one part of the Work depends on installation of other components, either before or after its own installation, schedule construction operations in the sequence required to obtain the best results.
2. Where availability of space is limited coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.
4. The General Contractor shall as part of his work provide for all cutting, patching and drilling, not specified to be the work of others.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare coordination Drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Indicate required installation sequences.
2. Format to be as directed by the Architect.

B. Staff Names: Within fifteen (15) days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers. Provide twenty-four (24) hour Emergency telephone numbers listed separately.

1. Post copies of the list in the Project meeting room.
2. The Contractor shall provide a copy of the list, and updates as its changes, to the Worcester Police Department and other City Departments as directed by the Architect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's written instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent the requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Re-check measurements and dimensions, before starting each installation.

G. Install each component during weather conditions that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decision to the Architect for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation clean and protect construction in progress and adjoining materials in place. Apply protective covering where required and as necessary to assure protection from damage or deterioration.

B. Clean and maintain all completed construction as frequently as necessary through the remainder of the construction period.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in-progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive vibration.
2. Excessive static or dynamic loading.
3. Excessive internal or external pressures.
4. Excessively high or low temperatures.
5. Thermal shock.
6. Excessively high or low humidity.
7. Air contamination or pollution.

8. Air borne debris/dust or construction particulates.
9. Water or ice.
10. Solvents.
11. Chemicals.
12. Light.
13. Puncture.
14. Abrasion.
15. Heavy traffic.
16. Soiling, staining, and corrosion.
17. Bacteria.
18. Rodent and insect infestation.
19. Combustion.
20. Electrical current.
21. High-speed operation.
22. Improper lubrication.
23. Unusual wear or other misuse.
24. Contact between incompatible materials.
25. Destructive testing.
26. Misalignment.
27. Excessive weathering.
28. Unprotected storage.
29. Improper shipping or handling.
30. Theft.
31. Vandalism.

END OF SECTION 01 3100

SECTION 013300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1. The submittals enumerated below shall require review and/or approval by the Architect.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including:

1. Contractor's Progress Schedule.
2. Major delivery schedule.
3. Existing utility tie-in's schedule.
4. Submittal schedule.
5. Pre-Installation Conference Schedule (By Specification Section).
6. Daily construction reports.
7. Shop drawings.
8. Product data.
9. Samples.
10. Coordination Drawings.
11. Quality assurance submittals.
12. Submittal of three (3) sets of plans and specifications, complete with all addendums posted, to the City of Worcester Building Department to obtain building permit.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Product Substitution.
2. Periodic Submittals.
3. Permits.
4. Applications for Payment.
5. Performance and payment bonds.
6. Insurance Certificates.
7. List of Project Contractors, Subcontractors, Vendors, etc.
8. List of Personnel and Emergency Telephone Numbers.
9. City Ordinance Program Forms.

C. The Schedule of Values submittal is included in Section 01027 "Applications for Payment".

D. "Project Closeout", Section 01700, specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.3 SUBMITTAL PROCEDURES/SHOP DRAWINGS

A. Submittal procedures shall be electronic for all submittals for approval and distribution unless otherwise noted. Provide to the owner one copy of all approved submittals in an organized manner with a submittal log. All color samples must be distributed as hard copies, and also electronically filed in order to track. Electronic files shall be clean, clear and readable. Plan

files to be PDF and/or AutoCAD and be to scale as appropriate. Contractor to transmit and update each submittal and process electronically, maintain a log that is distributed and updated weekly. All e-mails to clearly identify the submittal number and shall include the log, Or the contactor to maintain a web-based system used for submittals, and the construction process.

B. Distribution: Distribution of submittals shall be distributed as follows unless otherwise noted:

1. Architect.
2. Construction Manager
3. Owner – electronic and paper copy.
4. A minimum of Three (3) copies for the Contractor as necessary for distribution to subcontractors, suppliers, installers, manufacturers, fabricators, and any other applicable parties.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

D. Processing: All Contractors are directed to the timeliness and critical importance of expediting the submittal process. Any lead times, which may impact sequencing, should be prioritized to meet the project schedule. Architect must be notified if any delays arise that will impact lead times.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that requires sequential activity.
2. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
3. To avoid the need to delay installation as a result of the time required to process submittals and to allow sufficient time for submittal review, all contractors' submittals shall be submitted for processing and have received final Architect's approval within 45 days from the date of Contract.

    a. Allow ample time for initial review to achieve efficient construction sequencing. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
    b. If an intermediate submittal is necessary, process the same as the initial submittal.
    c. Allow ample time for reprocessing each submittal to achieve efficient construction sequencing.
    d. No extension of Contract Time will be authorized because of the contractor's failure to transmit submittals to the Architect for processing sufficiently in advance of the scheduled Work.

E. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
2. Include the following information on the label for processing and recording action taken.

    a. Project name.
    b. Date.
    c. Name and address of the Architect.

d. Name and address of the Contractor.
e. Name and address of the subcontractor.
f. Name and address of the supplier.
g. Name of the manufacturer.
h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.

F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from sources other than the Contractor.

G. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.4 CONTRACTOR'S PROGRESS SCHEDULE

A. Bar (Gantt) Chart Schedule: Meeting the requirements of Section 00200 Paragraphs 4.10, 4.10.1, 8.2.3 through 8.2.9. Prepare a fully developed, horizontal bar type of chart titled: “Progress Schedule”. A sample is attached at the end of this section, some requirements specified here are not shown in the sample.

B. Time, the horizontal (x) axis in this schedule shall show the start of on site work through the Date of Substantial Completion, show the time for completion of punch list items, and show the time for general warranty and completion of commissioning.

C. Provide a separate time bar for each line in the approved “Schedule of Values” with the incremental value of work in place for each month. Work Completed (in place) must be 99% of contract value to achieve Substantial Completion. Provide a continuous vertical line to identify the first working day of each month.

D. At the bottom of the progress schedule provide:
1. a first line showing the total value of the work planned to be completed (in place) for each month,
2. a second line showing the cumulative total value of the work planned to be completed (in place) to date,
3. a third line showing the actual total value of the work certified as completed (in place) on the Application and Certificate for Payment for the month, and
4. a fourth line showing the actual total cumulative value of the work certified as completed (in place) on the Application and Certificate for payment to date.
5. Refer to Division 1 Section 01027 "Applications for Payment" for cost reporting and payment procedures.

E. Distribution: Following approval of the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to provide actual work in place and conform to schedule.

F. Revisions: Revisions to values and or time shown in the Progress Schedule may only be made to reflect a Change Order and in accordance with Section 00200 Paragraph 8.2.7. When revisions are made, distribute to the same parties and post at the job-site. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

G. Progress Schedule Updating: Revise the schedule after each meeting, where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

Progress Schedule (as required by Article 8, Paragraphs 8.2.3 & 8.2.4 of the General Conditions)

(Project Name)	(Architect)	(Date)
(City of Worcester Dept. or Facility)	(Construction Manager)	(Revision Date)
(Project Address)	(Contractor)	(Revised Through)

(Approved by Architect)

Section Number	Section or Filed Sub-bid Section	Mar-98 1	Apr-98 2	May-98 3	Jun-98 4	Jul-98 5	Oct-98 6	Nov-98 7	Dec-98 8	Totals
01000	General Requirements	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$32,000
02000	Sitework	$10,000	$10,000						$10,000	$30,000
03000	Concrete		$4,000	$12,000			$8,000			$24,000
04000	Masonry			$8,000	$10,000	$12,000				$30,000
05000	Metals			$20,000						$20,000
05500	Metal Fabrications							$7,000		$7,000
06000	Wood & Plastics								$4,000	$4,000
07100	Waterproofing & Caulking				$3,000					$3,000
07600	Roofing & Flashing					$12,000				$12,000
08000	Doors & Windows						$4,000			$4,000
08520	Alum. Windows							$8,000		$8,000
08800	Glass & Glazing								$1,000	$1,000
09250	Gypsum Drywall						$6,000	$5,000		$11,000
09310	Ceramic Tile							$2,000		$2,000
09511	Accoustical Ceilings							$1,000	$1,000	$2,000
09650	Resilient Flooring								$3,000	$3,000
09900	Painting								$2,000	$2,000
10000	Specialties								$14,000	$14,000
14204	Hydraulic Elevators						$8,000	$8,000	$8,000	$24,000
15400	Plumbing			$1,000	$2,000			$3,000	$5,000	$11,000
15600	HVAC					$4,000	$5,000		$4,000	$13,000
16000	Electrical			$1,000	$3,000			$4,000	$4,000	$12,000
	Total Planned to be Completed This Month	$14,000	$18,000	$46,000	$22,000	$32,000	$35,000	$42,000	$60,000	
	Total planned to be Completed To Date	$14,000	$32,000	$78,000	$100,000	$132,000	$167,000	$209,000	$269,000	$269,000
	Actual Total Completed This Month	$11,000	$22,000	$38,000						
	Actual Total Completed To Date	$11,000	$33,000	$71,000	$71,000	$71,000	$71,000	$71,000	$71,000	$470,000

1.5 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's Progress Schedule, prepare a complete Submittal Schedule and promptly submit the schedule to the Architect.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates.

C. Submittal Schedule Updating: Revise the Submittal Schedule after each meeting or activity where revisions have been recognized or made. Issue the updated project schedule concurrently with each Application for Payment.

1.6 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at the site, and submit copies to the Architect and Clerk of Works at weekly intervals:

1. List of subcontractors at the site.
2. Count of personnel at the site.
3. Accidents and unusual events.
4. Meetings and significant decisions.
5. Stoppages, delays, shortages, and losses.
6. Emergency procedures.
7. Services connected, disconnected.
8. Equipment or system tests and startups.
9. General daily work tasks and progress.

1.7 SHOP DRAWINGS

A. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples that relate to construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

B. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

C. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.

1.8 PRODUCT DATA

A. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples that relate to construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

B. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as “Shop Drawings”.
2. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:

    a. Manufacturer's printed recommendations.
    b. Compliance with trade association standards.
    c. Compliance with recognized testing agency standards.
    d. Application of testing agency labels and seals.
    e. Notation of dimensions verified by field measurement.
    f. Notation of coordination requirements.

C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

D. Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

E. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

1. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.9 SAMPLES

A. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples that relate to construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

B. Mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Architect's sample. Include the following:

1. Specification Section number and reference.
2. Generic description of the sample.
3. Sample source.
4. Product name or name of the manufacturer.
5. Compliance with recognized standards.
6. Availability and delivery time.

C. Submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

D. Preliminary Submittals: Submit a full set of choices where samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.

1. Preliminary submittals will be reviewed and returned with the Architect's mark, indicating selection and other action.

E. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three (3) sets. One (1) set will be returned marked with the action taken.

1. Maintain sets of samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.

F. Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

1. Sample sets may be used to obtain final acceptance of the construction associated with each set.

1.10 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements; submit a notarized certification from the manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

1.11 ARCHITECT'S ACTION

A. Except for submittals of record or information, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return as noted in Paragraph 1.3A.

B. Compliance with specified characteristics is the Contractor's responsibility.

C. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The Architect will mark the stamp appropriately to indicate the action taken:

D. Final Unrestricted Release: When submittals are marked "Approved", the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend on that compliance.

1. Final-But-Restricted Release: When submittals are marked "Approved as Noted", that Work covered by the submittal may proceed provided it complies with markings or corrections on the submittal and requirements
2. of the Contract Documents; final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked “Approved as Noted - Revise and Resubmit” or “Not Approved, Revise and Resubmit", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the markings and resubmit without delay. Repeat if necessary to obtain different action mark.

E. The Contractor shall not use, or permit to be used submittals marked “Approved as Noted - Revise and Resubmit” or "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

F. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned marked "Action Not Required".

1.12 DRAWINGS TO BUILDING DEPARTMENT

A. Contractor shall submit three (3) sets of fully addenderized plans and specification to the City of Worcester Building Department upon application for the building permit.

1. Submit drawings to architect prior to permit application for "wet stamping" of architect and engineers professional seal to the drawings. Allow up to three (3) days for this process.

2. Any reduction in addenda plan must be legible.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.

C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.

D. Approved: The term approved, when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations to the location within the project where the product will finally be installed.

G. Install: The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. Provide: The term provide means to furnish and install, complete and ready for the intended use.

I. Installer: An Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term experienced, when used with the term Installer, means having a minimum of five (5) previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
2. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no choice or option. However, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

    a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

J. Project site is the space available to the Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is located.

K. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16 Division format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated, as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

    a. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two (2) or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Architect for a decision before proceeding.

    1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

    1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the Text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.

1.5 GOVERNING REGULATIONS AND AUTHORITIES

A. Copies of Regulations: Obtain copies of governing regulations and retain at the Project site to be available for reference by parties who have a reasonable need, if requested by the Architect.

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 014500 – QUALITY ASSURANCE: STRUCTURAL TESTING AND INSPECTION

PART 1 - GENERAL

1.1 GENERAL

A. Quality assurance is testing and inspection to assist the Owner in evaluating the Contractor's performance and quality control in the fabrication shop and field. It is not a substitute for the testing and inspection which is required as part of the Contractor's quality control program.

B. Cost: Except as specifically noted otherwise, the testing agency for quality assurance shall be engaged and paid by the Owner.

1. The Owner has negotiated inspection services based upon the assumption that all fabrication work shall be performed at one single fabrication shop. Costs associated with work being performed in additional shops will require reimbursement to the Owner.

C. Definitions:

2. See Sections 033000.
3. The term “Testing Agency” in this Specification section is defined as an independent testing and inspection service engaged by the Owner for quality assurance testing and inspection of structural construction in accordance with applicable building code provisions and any additional activities listed in the Contract Documents.
4. The term “Geotechnical Engineer” in this Specification section is defined as an independent geotechnical engineering service engaged by the Owner for quality assurance testing and inspection of the actual soil conditions to verify compliance with the geotechnical conditions, recommendations and design values described in the Project Geotechnical Report and used as the basis of design for the most current Contract Documents.

1.2 SCOPE

A. Testing Agency shall provide qualified personnel at the site to test and inspect materials installed by and work performed by the Contractor, for the following structural items as indicated in Part 3 of this Specification section:

1. **Section 032000 Concrete Reinforcement and Embedded Assemblies**
2. **Section 033000 Cast-In-Place Concrete**

B. Refer to the drawings for Special Inspections requirements for the Project. The Special Inspections shown on the drawings may contain additional testing and inspection that is not listed in this specification section.

1.3 TESTING AGENCY QUALIFICATIONS

A. Testing Agency shall be an independent agency with the experience and capability to conduct testing, inspection and sampling as indicated in accordance with ASTM E 329.

B. Testing Agency shall be an agency approved by the local building official to perform Special Inspections and other related services as outlined in the governing project Building Code.

C. Testing, inspection, and sampling shall be done in accordance with the applicable ASTM standards.

D. Personnel performing visual inspection and non-destructive testing of welds shall meet the requirements of AWS D1.1 for weld inspectors and shall have current certification as an AWS Certified Welding Inspector.

1.4 TESTING AGENCY RESPONSIBILITIES

A. Provide qualified personnel at the site to test and inspect structural construction as the work progresses using the most current Contract Documents and approved shop drawings.

B. Provide additional testing and inspection as needed due to the following:

1. Work performed contrary to Drawings and Specifications
2. Work performed with improper supervision
3. Work performed without prior notice

C. Report deficiencies to Contractor, Owner, Design Professionals within 24 hours.

D. Rejection: The Testing Agency has the right to reject any material at any time, when it is determined that the material or workmanship does not conform to the Contract Documents and shall immediately notify the Owner, Design Professionals, and Contractor of deficiencies. Failure to detect any defective work or material shall not prevent later rejection when such a defect is discovered nor shall it obligate Design Professionals for final acceptance.

E. Noncompliance Log: Indicate to the Contractor where remedial work must be performed and maintain a current log of work not in compliance with the Contract Documents. This noncompliance log shall be submitted to the Design Professionals and Owner on a weekly basis.

F. Reports: Prepare daily inspection, observation, and/or test reports as required herein and provide an evaluation statement in each report stating whether or not the work conforms to requirements of Specifications and Drawings and shall specifically note deviations from them. The daily reports shall be collected and submitted for record to the Design Professionals and Owner weekly.

G. Certification: Upon completion of work and resolution of remedial items, certify in a letter to the Design Professionals and Owner, that the installation is in accordance with the requirements of the Drawings and Specifications.

1.5 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall have sole responsibility for coordinating their work with the Testing Agency to assure that all test and inspection procedures required by the Contract Documents and Public Agencies are provided. The Contractor shall cooperate fully with the Testing Agency in the performance of their work and shall provide the following:

1. Information as to time and place of starting shop fabrication and field construction/erection, at least one week prior to the beginning of the work.
2. The most up to date construction schedule.
3. At least 24 hours advance notice of work requiring testing and inspection.
4. Access to areas as required for testing and inspection.

5. Site File: At least one copy of the most current Contract Documents and approved shop drawings shall be kept available in the contractor's field office. Drawings not bearing evidence of approval and release for construction by the Design Professionals shall not be kept on the job. Provide drawings for the work to be performed in the shop or field one week prior to the start of work.
6. Representative material samples requested by the Testing Agency for testing, if necessary.
7. Full and ample means of assistance for testing and inspection of material.
8. Facilities for proper storage of material samples as required.
9. Proper facilities, including scaffolding, temporary work platforms, safety equipment etc., for inspection of the work in shop and field.

B. Immediately notify the Owner's Testing Agency and Design Professionals in writing of conditions that will adversely affect the work.

C. Materials and installed work may require testing and retesting at any time during progress of work, as directed by Design Professionals. Tests, including retesting of rejected materials for installed work will be done at Contractor's expense.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Testing Agency shall provide qualified personnel at site to test and inspect structural construction using the latest Contract Documents and approved submittals as indicated in the following sections.

3.2 CONCRETE REINFORCEMENT AND EMBEDDED ITEMS

A. Quality Assurance:

1. Prior to placement, inspect reinforcement and embeds for grade, quality of material, absence of foreign matter, and for suitable storage.
2. Provide continuous inspection of reinforcement and embedded assemblies during placement and immediately prior to concreting operations for: size, quantity, vertical and horizontal spacing and location, correctness of bends and splices, mechanical splices, clearances, compliance with specified tolerances, security of supports and ties, concrete cover, and absence of foreign matter.
3. Inspect epoxy-coated reinforcement for coating damage and required applied coatings.
4. Provide continuous inspection of adhesive anchors installed in horizontal or upwardly inclined orientations and those marked (CERT) on the latest Drawings.
5. Adhesive anchors shall be proof tested in tension as follows:

    a) Testing Agency shall submit an adhesive anchorage proof testing plan to the SER for review and approval prior to performing the anchor proof testing. The anchorage testing plan shall meet the requirements as specified in this section and indicate which anchors have been selected for testing.
    b) Proof testing shall be performed as a confined tension test in accordance with the guidelines of ASTM E488 and the requirements of ACI 355.4.

c) Testing shall be performed after the minimum curing period specified by the manufacturer.
d) 5 percent of each type and size of an adhesive anchor assembly and 100 percent of anchors marked (CERT) shall be proof tested in tension by the Owner's Testing Agency.
e) All anchors selected for proof testing shall be production anchors. Sacrificial anchors are not acceptable for inclusion in the proof testing plan unless specifically approved by the SER prior to performance of the testing.
f) The adhesive anchors proof tension loads shall be as specified in the general notes of the structural drawings.
g) Anchors shall have no visible indications of displacement or damage during or after proof load application. Concrete cracking in the vicinity of the anchor after loading shall be considered a failure.
h) If more than 10% of the tested adhesive anchors fail to achieve the specified proof load, 100% of the anchors of the same diameter and type as the failed anchor shall be proof tested, unless otherwise direct in writing by the SER. Immediately notify the SER of all failed proof tests.

6. Mechanical post-installed anchors shall be proof tested as follows:

a) Testing Agency shall submit a mechanical anchorage proof testing plan to the SER for review and approval prior to performing the anchor proof testing. The anchorage testing plan shall meet the requirements as specified in this section and indicate which anchors have been selected for testing.
b) 5 percent of each type and size of mechanical anchor shall be proof tested by the Owner's Testing Agency. The required proof test for the anchors is as follows:
c) For torque-controlled mechanical anchors, a proof torque shall be applied to the anchor using a calibrated torque wrench and the proof torque shall be achieved with no more than one-half turn of the anchor nut.
d) The required proof torque load for torque-controlled mechanical anchors shall be as specified in the general notes of the structural drawings.
e) All anchors selected for proof testing shall be production anchors. Sacrificial anchors are not acceptable for inclusion in the proof testing plan unless specifically approved by the SER prior to performance of the testing.
f) Concrete cracking in the vicinity of the anchor during or after proof torque load application shall be considered a failure.
g) If more than 10% of the tested mechanical anchors fail to achieve the specified proof torque load or set**,** 100% of the anchors of the same diameter and type as the failed anchor shall be proof tested, unless otherwise direct in writing by the SER. Immediately notify the SER of all failed proof tests.

7. Periodic inspection for post-installed adhesive and mechanical anchors shall be provided in accordance with the building code except that continuous inspection shall be provided for the conditions identified in section A.4. The inspector shall observe all aspects of the anchor installation and shall, at a minimum, verify the following items:

a) Hole drilling method in accordance with the Manufacturer's Published Installation Instructions (MPII) and these installation requirements.

b) Anchor spacing and edge distance.
c) Hole diameter and depth.
d) Hole cleaning in accordance with the MPII.
e) Anchor element type, material, diameter, and length.
f) For adhesive anchors, adhesive identification and expiration date.
g) For adhesive anchors, adhesive installation in accordance with the MPII.
h) For torque-controlled mechanical anchors, the number of turns required to achieve the anchor set torque per the MPII.

3.3 CAST-IN-PLACE CONCRETE

A. Quality Assurance:

1. Monitor concrete placement as follows:

a) Verify use of required design mix
b) Record location of point of concrete discharge of each batch truck tested, cross referenced to grid lines.
c) Record temperature of concrete at time of placement.
d) Record weather conditions at time of placement, including temperature, wind speed, relative humidity, and precipitation.
e) Record types and amounts of admixtures added to concrete at the project site.
f) Record amount of water added at the site and verify that total water content does not exceed amount specified in the mix design. Addition of water at the site is subject to prior approval by the Design Professional.
g) Monitor consistency and uniformity of concrete.
h) Monitor preparation for concreting operations, placement of concrete, and subsequent curing period for conformance with Specifications for following procedures:

i. Concrete curing.
ii. Hot weather concreting operations.
iii. Cold weather concreting operations.

2. Conduct tests of concrete as follows and in accordance with ASTM C 1077:

a) Testing frequency: Sample sets for all tests listed below of each concrete design mix placed each day shall be taken not less than once a day, nor less than once for each 50 cubic yards. (40 cubic meters) of concrete, nor less than once for each 2500 square feet (250 square meters) of surface area for slabs or walls. Additional tests shall be performed if deemed necessary by the Owner’s Testing Agency and Design Professionals.
b) Obtain each test sample from different batches selected on a strictly random basis before commencement of concrete placement. Record location in structure of sampled concrete.
c) Determine air content of normalweight concrete in accordance with either ASTM C 231 or ASTM C 138. Determine air content of lightweight concrete in accordance with ASTM C 173. Conduct one test for air content for each strength test required or for every 50 cubic yards (40 cubic meters) of fly ash concrete placed, whichever is less.
d) Determine unit weight of lightweight concrete in accordance with ASTM C 567.

e) Test water content of freshly mixed concrete on a random basis, a minimum of once per 100 cubic yards (75 cubic meters) or every 5000 square feet (500 square meters) of concrete placement, during placement in accordance with AASHTO T 318 for the following concrete types:

i. Hard troweled slabs exposed to view
ii. Slab to receive a bonded finish floor material
iii. Slabs with specified concrete compressive strength exceeding 6000 psi (42MPa)

f) Conduct slump tests in accordance with ASTM C 143.

g) Slump indicated in mix designs shall be achieved at point of placement. Correlation between slump at point of initial discharge from truck and point of placement must be established to determine amount of slump loss which occurs between initial discharge and point of placement. Adjustment may be necessary to achieve slump indicated in mix designs at point of placement.

h) Conduct slump tests for Self Consolidating Concrete (SCC) as follows

i. In accordance with ACI 237, where SCC is used, perform slump flow and visual stability index tests in accordance with ASTM C1611 on the first batch of SCC, and then consecutive batches until two consecutively produced batches are within specification. SCC with a visual stability index value of 2 or 3 shall be stabilized, where possible, with a viscosity modifying admixture or rejected at the discretion of the Engineer and Ready Mix Quality Control Representative. The Ready Mix Producer shall be responsible for adjusting the mix to provide desired flow and stability. After establishing the consistency of the SCC mix, testing shall continue in accordance with the requirements of the above paragraph.
ii. In accordance with ACI 237, where SCC is used, perform slump flow tests in accordance with ASTM C1621 using a J-ring to determine the passing ability of the SCC mix around reinforcement. If the reinforcing bars retain the coarse aggregates inside the ring, the mixture has a high potential for blocking and should be reproportioned at the direction of the Engineer and Ready Mix Quality Control Representative.

i) Conduct strength tests of concrete as follows:

i. Secure sample sets in accordance with ASTM C 172.
ii. Mold cylinders in accordance with ASTM C 31 and cure under standard moisture and temperature conditions in accordance with ASTM C 31, Section 7 (a). Quantity of cylinders listed below is based on a cylinder size of 4 inch (100mm) diameter x 8 inches (200mm) long. If 6 inch (150mm) diameter by 12 inch (300mm) long cylinders are used, the total quantity of cylinders may be reduced by one with two cylinders instead of three tested at the age designated for determination of f'c.
iii. Test cylinders in accordance with ASTM C 39. For specified concrete strength of 10,000 psi (70MPa) and above, cylinders shall be ground and not capped.
iv. For 28 day mixes mold six cylinders. Test two cylinders at seven days and three cylinders at 28 days. The 28 day strength shall

be the average of the three 28 day cylinders. One cylinder shall be retained in reserve for later testing if required.

v. For 56 day mixes mold seven cylinders. Test one cylinder at seven days, two cylinders at 28 days, and three cylinders at 56 days. The 56 day strength shall be the average of the three 56 day cylinders. One cylinder shall be retained in reserve for later testing if required.

vi. For 90 day mixes mold eight cylinders. Test one cylinder at seven days, one at cylinder at 28 days, two cylinders at 56 days, and three cylinders at 90 days. The 90 day strength shall be the average of the three 90 day cylinders. One cylinder shall be retained in reserve for later testing if required.

vii. When early age concrete strength verification is required by the Contractor for formwork removal or stressing of post-tensioning tendons, strength shall be verified, at the Contractor's expense, by additional compression tests of field-cured cylinders or by the maturity method in accordance with ASTM C1074.

viii. If one cylinder in a test manifests evidence of improper sampling, molding or other damage, discard cylinder and base test results on that of remaining cylinder.

3. Evaluate concrete for conformance with Specifications as follows:

a) Strength test:

i. Maintain a compressive strength moving average, comprised of three (3) consecutive strength test results, for each mix design used in work.

ii. Strength level of concrete will be considered satisfactory provided averages of all sets of three (3) consecutive strength test results (i.e. moving average) equal or exceed specified 28-day strength, and no individual strength test result falls below specified 28-day strength by more than 500 psi (3.5MPa).

iii. If strength tests fail to meet minimum requirements, concrete represented by such tests shall be considered questionable and shall, if deemed appropriate by the SER, be subject to further evaluation by core testing as specified herein or other testing methods.

iv. Maintain a log that contains the results of all concrete strength tests. The log shall include the results of each test performed, be in electronic spreadsheet format, and updated and submitted along with concrete test data. See example log attached at the end of this Specification Section.

b) Conduct core tests on questionable concrete in accordance with ACI 318 and ASTM C 42.

i. Location of cores shall be coordinated with Design Professionals so as to least impair strength of structure. Before testing cores, discard and replace any that show evidence of having been damaged subsequent to or during removal from structure or which have reinforcement present.

ii. Cores from structure exposed to soil or constant moisture in service (e.g. basement walls, retaining walls, slab-on-grade, piers, footings, etc.) shall be tested in a fully saturated condition. Cores for all other concrete may be tested dry. Prior to

commencement of coring, verify with Design Professionals whether cores are to be tested wet or dry.

iii. Fill core holes with low slump concrete or mortar with a strength equal to or greater than that specified for area cored.

c) Concrete in area represented by core test will be considered adequate if average strength of cores is equal to at least 85% of, and if no single core is less than 75% of specified strength.

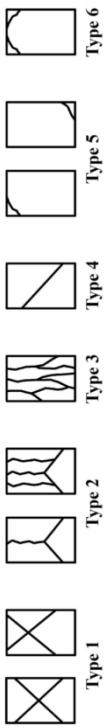
4. Floor flatness and levelness tolerance compliance testing is to be performed within 72 hours of concrete placement by Testing Agency, and prior to the removal of shores and forms.

A) Testing Agency to test and report flatness (F_F), levelness (F_L) prior to shoring removal. For slabs that include camber, do not test for levelness (F_L). Perform F_F/F_L testing in accordance with ASTM E 1155 requirements.

EXAMPLE CONCRETE STRENGTH SPREADSHEET LOG

MIX I.D.	CURE TYPE *	DATE TESTED	AGE AT TEST (DAY	AVERAGE DIAMETER	AVERAGE CROSS-SECTIO	BREAKING LOAD (LB)	BREAK TYPE **	AVERAGE COMPRESSIVE STRENGT
H3651	I, CA	3/8/2106	7	4	12.56	165990	Type 1	13210
			14					
			28					
			56					

*FIELD CURING CONDITIONS: NCB=NO CURING BOX, CB=CURING BOX, I=INSULATED, CO=COOLED, HE=HEATED, CA=CAPPED, IC=ICED, O=OTHER
**BREAK TYPES (AS CLASSIFIED BY ASTM C39):



ENGINEER:

PLACEMENT LOCATION	First Floor Slabs and							
TICKET NUMBER	1234							
SPECIMEN I.D.	S0002							

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the 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 requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary construction and support facilities required include, but are not limited to:

1. Waste disposal services.
2. Temporary yard and storage on and off-site.
3. Construction aids and miscellaneous services and facilities.
4. Sweeping compound.
5. Emergency portable generators of size required, if permanent power is temporarily unavailable.
6. Water service and distribution, if water supply to adjacent occupied spaces is temporarily unavailable.
7. Parking

C. Security and protection facilities required include, but are not limited to:

1. Temporary weather protection, enclosures, and covers.
2. Temporary fire protection and fire watch if required by Worcester Fire Department.
3. Barricades, warning signs, lights.
4. Temporary partitions between occupied areas and construction areas, STC 48 or better.

D. Where a distinction is made in this specification section between temporary services to be provided by a General Contractor and those to be provided by a Subcontractor, the purpose is only to clarify which costs are to be included by the applicable parties for inclusion in the applicable bids and contracts that would follow. These distinctions have no bearing upon the Contract between the Owner and General Contractor and do not limit in any way the General Contractor's responsibility to provide all such temporary services without additional cost to the Owner. For the sake of clarity in this specification section, the term General Contractor has been used for the person called the Contractor in other specification sections, when the intent is that that person shall provide a service directly at his own expense rather than at the expense of one of the Subcontractors from whom the Owner has taken filed sub-bids.

E. The temporary services described in this specification section may not be adequate to provide for all of the needs of the General Contractor or all Subcontractors, but are

intended only to provide a basis for obtaining filed sub-bids. The General Contractor or any Subcontractor requiring additional temporary services for the proper execution of his work or because of climatic conditions shall arrange for and obtain such services at his own expense without further compensation by the Owner.

F. The Contractor shall be responsible for restoring all landscaped areas affected by the work of this project to their original “like-new” state that existed prior to work commencing. This restoration work shall include, but not be limited to, planting beds with mulch, trees, shrubs, and lawn areas. Great care should be taken during the course of the work to not damage nor destroy any landscaping impacted by this work. Any landscaping disturbed, damaged, or destroyed shall be restored, repaired, or replaced in-kind at no cost to the Owner.

1.3 SUBMITTALS

A. Schedule: Submit a schedule indicating implementation and termination of each temporary utility within fifteen (15) days of date established for Commencement of the Work.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Commonwealth of Massachusetts State Building Code requirements; 9th Edition.
2. Federal, State and City Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.

B. Standards: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. NFPA Code 241.
2. NFPA 70.
3. ANSI A10.
4. NECA NJG-6.

C. Electric Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

D. Inspections: Arrange for authorities having jurisdiction to inspect and test temporary utilities prior to use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Conditions of Use: Maintain temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload temporary facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on the site.

B. Maintain the continuity of all utility services at all times across all Phases of the Construction Project, unless otherwise directed by the Architect or Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials suitable for the use intended, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

2.2 TEMPORARY WATER

A. Charges: The General Contractor shall pay for all facilities to provide water during construction. Sufficient quantities of water for the hydro-demolition process may not be accessible within the "Project Area". General Contractor may have to process separate connection at a fire hydrant and coordinate and apply for permit via City Water Department for the temporary use and metering of the hydrant..

B. Temporary Water: The General Contractor shall be responsible for all facilities to provide water during construction as defined above and further specified as follows:

1. Except under unusual circumstances, when otherwise specified or approved by the Architect, all water shall be of potable quality.
2. The General Contractor shall provide all necessary piping, valving, hose bibbs, hosing, etc. to provide temporary water during construction from a water access point determined by the Owner’s Representative. Any facilities running within the building are required not to leak. Any damage incurred due to leaks shall be repaired at the expense of the General Contractor.
3. The General Contractor shall pay for and be responsible for the protection of Temporary Water, which he installs, from freezing and other damage.

2.3 TEMPORARY HEAT

A. Definitions:

B. Charges:
1. The furnishing of electrical energy by the Owner shall be conditional upon being conservative and prudent in its use. In the event that any contractor is repeatedly wasteful in the use of electrical energy thus provided, the Owner reserves the right to charge the General Contractor at an equitable rate for the additional portion of electrical energy used.

2.4 TEMPORARY SANITARY FACILITIES

a. Contractor Personnel may use the building's toilet facilities as approved by the building operator and Owner.

2.5 TEMPORARY FIRE PROTECTION

A. The General Contractor shall take all necessary precautions for the prevention of fire during construction. The General Contractor shall be responsible that the area within the contract limits is kept orderly and clean and that combustible rubbish is promptly removed from the site. Combustible materials shall be stored on site in a manner and at locations approved by the Architect. The General Contractor shall comply with all suggestions regarding fire protection made by the Insurance Company with which the Owner maintains his fire insurance.

B. The General Contractor shall provide and maintain in good working order, under all conditions, readily available to all portions of the site and work, suitable and adequate fire protection equipment and services. Such facilities shall include, but are not limited to, the furnishing and maintaining in good working order a minimum of two (2) standard, Underwriters' Laboratories labeled, 2-1/2 gallon capacity fire extinguishers per floor.

C. Smoking shall be prohibited on the premises and signs to this effect shall be posted conspicuously.

D. Fires shall not be built on the premises.

2.6 TEMPORARY CRANES, LIFTS, DERRICKS, AND HOISTING SERVICES

A. The General Contractor shall furnish, install, operate, and maintain in safe condition all crane services outside of the building for his own use and for the use of all Subcontractors on the project to properly carry out and complete the work, except as may otherwise be specifically provided for in any of the trade sections of the Specifications.

B. All crane services shall be provided at no cost to the Subcontractors for their work.

C. Each Subcontractor shall, however, provide their own lifts, derricks, hoisting services, etc. (excluding crane services outside the building) for their own work outside and inside the building to properly complete their work.

D. All cranes, lifts, derricks, and hoisting equipment, machinery, and operation shall comply in all respects to the governing laws and codes.

2.7 TEMPORARY STORAGE FACILITIES

A. Space for storage of materials shall be confined to the construction areas outside the building and as designated and/or approved by the Architect, Owner or Building Operator.

B. Locations where construction equipment may be stored during non-working hours shall be as acceptable to the Owner. Construction equipment shall not present a hazard when stored.

2.8 NOISE, DUST, AND POLLUTION CONTROL

A. All work performed under the Contract shall conform to the requirements of Chapter III, Section 31C and Section 142D of the General Laws, Commonwealth of Massachusetts and Rules and Regulations adopted thereto by the Commonwealth of Massachusetts, Department of Public Health, and the requirements of local noise, dust, and pollution control laws, ordinances, and regulative agencies applicable to the work.

B. The General Contractor shall provide temporary partitions to prevent noise, dust, pollution or order from entering occupied spaces. Temporary partitions shall have STC of 50. Submit location plan and type of construction for temporary partitions for approval.

C. Contractor to identify interior building HVAC systems and submit requests for the building operator (through Owner's representative) to coordinate recommended and approved shutdowns, as needed to control work area dust and/or pollution.

D. Control of air borne dust or pollution from the site with spray or as otherwise may be necessary to prevent the migration of any dust or pollutants.

E. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, or pollution.
2. Vacuum equipment shall be equipped with HEPA filters.
3. Vacuum carpeted areas.
4. Wet mop floors to eliminate trackable dirt.
5. Sweeping shall be allowed only with the use of a non-oil based sweeping compound followed by vacuuming any remaining residue.
6. Wipe down walls and doors of demolition enclosure.

F. Disposal: Remove and transport debris, in a manner that will prevent spillage on adjacent surfaces and areas, to the construction dumpster(s).

G. Cleaning: Clean areas adjacent to the work area of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

2.9 WATER CONTROL

A. The General Contractor shall be responsible for site drainage and snow removal within the limit-of-work lines and shall maintain such drainage and removal during the life of the Contract in a manner approved by the Owner and Architect, and so as not to adversely affect the adjacent areas.

B. Water from the Work of this Project shall be disposed of in such a manner as not to be a threat to public health nor cause damage to public or private property. It shall not be disposed of over surfaces of roads, walks, and streets, nor be permitted to cause any interference with the normal use of the same.

C. Removal of snow and ice from within the limit-of-work lines at the site as required to maintain the continual progress of the work, including that required to keep work areas, access roads, and storage areas clear, free, and in use, and as required to prevent damage to existing construction and new work in places.

2.10 CONSTRUCTION CLEANING AND CONSTRUCTION DUMPSTERS

A. The General Contractor shall provide and pay for temporary dumpster type trash containers outside the building for use by all Subcontractors, and shall have the containers replaced, hauled away, and the contents legally disposed of at sufficient intervals to maintain them at all times in sufficiently empty condition that they are ready to receive trash and debris.

B. Recycle all cardboard, paper, and metal materials to the greatest degree possible. Provide separate trash receptacles as required.

C. All construction dumpsters shall be located in the parking lot within the construction staging area and where permitted by the Owner.

D. Each Contractor on the project shall be responsible for removing their own trash and debris from the building to the construction dumpster(s).

E. Waste materials and rubbish, which might otherwise raise dust, shall be sprinkled during handling and loading to minimize this effect. Debris shall be carried out of the structure in containers or dropped in fully enclosed chutes and shall not be passed through, or thrown from, windows or other wall openings, and in no case shall the debris or trash be permitted to drop freely from the openings.

F. The Work Areas shall be inspected daily and all debris, waste, rubbish, etc. shall be removed and placed in a dumpster.

G. All waste materials and rubbish shall be disposed of legally, off the site.

2.11 WATCHMEN, FLAGMEN, AND POLICE DETAILS

A. The General Contractor shall provide the services of flagmen, traffic directors, and police details as necessary and as required by authorities having jurisdiction. Please refer to Section 01 0100 – Summary of Work for additional information regarding the police details.

2.12 PARKING

A. Limited parking will be permitted on site and only as approved by the owner and as stipulated in Section 01 0100 1.8 Work Hours.

PART 3 - EXECUTION

3.1 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition, until removal. Protect from damage. If damage occurs, repair immediately upon discovery. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour per day basis.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended. Clean and renovate permanent facilities that have been used during construction period, including:

1. Replace air filters and clean inside of ductwork and housings.
2. Replace worn parts.
3. Replace lamps.

END OF SECTION

SECTION 017700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the 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 includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Contractor's monetized punchlist.
3. Project Record Document Submittal.
4. Project Closeout Manual Submittal.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request for which the architect shall review and/or approve.

1. The contractor shall prepare and submit a monetized punchlist. No exceptions will be considered.
2. In the Application for Payment that coincides with, or first allows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

    a. If 100 percent completion cannot be shown, the contractor shall provide his monetized punchlist including, but not limited to, the following:

        1) A list of incomplete items.
        2) The value of each incomplete item.
        3) A Reason each item is not complete.

3. Advise the Owner of pending insurance changeover requirements.
4. Submit application for reduction of retainage.
5. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents, as further described below.

6. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
7. Submit record drawings, maintenance manuals, damage or settlement surveys, and similar final record information, as further described below.
8. Deliver tools, spare parts, extra stock, and similar items.
9. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
10. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
11. Complete final cleanup requirements, including touch-up painting.
12. Touch-up and otherwise repair and restore, marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work has been substantially completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. Submit consent to surety of final payment.
5. Submit a final liquidated damages settlement statement.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
2. If necessary, re-inspection will be repeated.

1.5 RECORD DOCUMENTS

A. General: Maintain a complete set of Record Documents at the site. Do not use Record Documents for construction purposes. Provide access to Record Documents for Architect and Owner's reference. Generally, without limitation, Record Documents shall include the following:

1. Record Drawings: Maintain a clean set of Contract Drawings and shop drawings, updated weekly to show actual installation. Give particular attention to concealed items.
2. Record Project Manual: Maintain a clean Project Manual, including Addenda, Change Orders, Architect Field Orders, and other modifications, updated weekly to show changes in actual work performed. Give particular attention to substitutions, selection of options, and similar information.
3. Record Product Data: Maintain one copy of each approved Product Data submittal, updated weekly to show changes from products delivered, work performed, and from manufacturer's recommended installation instructions.
4. Record Samples: Maintain one copy of each approved Sample submitted.
5. Record Field Test Reports: Maintain one copy of each Field Test Report.
6. Daily Progress Reports: Maintain one copy of each Daily Progress Report.

B. Maintenance of Documents and Samples: Store documents and samples in Contractor's field office apart from documents used for construction. Provide files and racks for document storage. Provide locked cabinet or secure storage space for storage of samples. File documents and samples in accordance with CSI format. Maintain documents in clean, dry, legible condition and in good order. Do not use Record Documents for construction purposes. Make documents and samples available at all times for inspection by Architect.

C. Recording: Label each document "PROJECT RECORD" in neat large printed letters. Record all information concurrently with the progress of construction. Do not conceal any work until required information is recorded.

D. Drawings: Legibly update all Drawings to record actual construction, including the following:

1. Field changes of dimension and detail.
2. Changes made by Field Order or Change Order.
3. Details not in original Contract Documents.

E. Specifications and Addenda: Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
2. Changes made by Field Order or by Change Order.

F. Submittal: At Contract Closeout, deliver Record Documents to Architect. Accompany submittal with transmittal letter in duplicate, indicating the date, Project title and number, Contractor's name and address, title and number of Record Document, and signature of Contractor or his authorized representative.

1.6 PROJECT CLOSEOUT MANUAL

A. General: Prepare and submit Project Closeout Manual as specified in this Section and as approved by the Architect for format. Organize data into suitable sets, bound and indexed using the specification's Table of Contents as a guide. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Contact Persons' Names
2. Telephone Numbers
3. Pager or Beeper Numbers
4. Cellular Phone Numbers
5. Description of each warranty items covered.
6. Instructions Describing Protocol for Requesting Warranty Service.
7. Emergency Numbers – 911, Fire, Rescue, Police.
8. Utility Company Contacts.

B. Instruct Owner's personnel in use and layout of manual.

C. Format of Data: Prepare data in form of user's guide-type manual for use by Owner's personnel. Format shall be 8-1/2 in. x 11 in., 20-pound minimum, white, typed pages. Text shall be printed or neatly typewritten. Drawings shall be bound with text, with reinforced punched binder tabs. Fold larger drawings to size of text pages. Provide flyleaf for each separate section. Provide typed descriptions of each product and piece of major equipment. Provide indexed tabs to divide sections. Provide reference in each section to other binders for actual Operating and Maintenance Data. Coordinate Project Closeout Manual with Operating and Maintenance Data.

1. Binders: Provide commercial quality three-ring binders with durable and cleanable plastic covers, with maximum ring size of three (3) inches. Only use one (1) binder for this manual.
2. Binder Cover: Identify each volume with typed or printed title "PROJECT CLOSEOUT MANUAL". List title of Project, identity of separate structure as applicable, and identity of general subject matter covered in the manual.

D. Submittal of Project Closeout Manual: Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of Work.

1. Architect will review draft and return one copy with comments.
2. Submit one copy of complete data in final form 15 days prior to final inspection or acceptance. Copy will be returned after final inspection or acceptance, with comments.
3. Submit three copies of approved data in final form ten days after final inspection or acceptance.

1.7 OPERATING AND MAINTENANCE DATA

A. General: Prepare and submit Operating and Maintenance Data as specified in this Section and referenced in other pertinent Sections of Specifications. Organize Operating and Maintenance Data into suitable sets, bound and indexed. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Inspection procedures.

B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

C. Preparation of data shall be done by personnel trained and experienced in maintenance and operation of described products.

D. Format of Data: Prepare data in form of instructional manual for use by Owner's personnel. Format shall be 8-1/2 in. x 11 in., 20-pound minimum, white, typed pages. Text shall be manufacturer's printed data, or neatly typewritten. Drawings shall be bound with text, with reinforced punched binder tabs. Fold larger drawings to size of text pages. Provide flyleaf for each separate product or each piece of operating equipment. Provide typed description of product and major component parts of equipment. Provide indexed tabs.

1. Binders: Provide commercial quality three-ring binders with durable and cleanable plastic covers, with maximum ring size of two (2) inches. When multiple binders are used, correlate the data into related consistent groupings.
2. Binder Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List title of Project, identity of separate structure as applicable, and identity of general subject matter covered in the manual.

E. Content of Manual: Neatly typewritten table of contents for each volume, arranged in systematic order, indicating Contractor name and address, and a list of each product, indexed to content of the volume. Provide a separate list with each product, name, address, and telephone number of subcontractor or installer, and local source of supply for parts and replacement.

1. Provide in each volume a copy of each warranty, bond, and service contract issued.

F. Submittal of Maintenance and Operating Manual: Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of Work. Electronic versions in PDF format are acceptable for draft copies.

1. Architect will review draft and return one copy with comments.
2. Submit one copy of complete data in final form 15 days prior to final inspection or acceptance. Copy will be returned after final inspection or acceptance, with comments. Electronic versions in PDF format are acceptable
3. Submit three copies of approved data in final form ten days after final inspection or acceptance. Also submit an electronic version in PDF format.

1.8 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.

1. Review contents of manual with personnel in full detail to explain all aspects of operation and maintenance.

1.9 WARRANTIES AND BONDS

A. General: Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors into the Project Closeout Manual.

B. Refer to Section 01 7400 – Warranties and Bonds for additional requirements.

1.10 FINAL CLEANING

A. General: General cleaning during construction operations is specified as Work of Section 01 5000 – Temporary Facilities & Controls.

B. Employ experienced workers or professional cleaners for Final Cleaning. Clean each surface to the condition expected in a normal building cleaning and maintenance program. Comply with manufacturer's instructions and recommendations.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. General: Provide cleaning materials that will not create hazards to health nor property, and will not damage surfaces or finishes.
B. Use cleaning materials and methods recommended by manufacturer of surface to be cleaned.
C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. Employ skilled workers for final cleaning.

B. Clean and restore general work areas and adjoining surfaces and other work soiled or damaged during installation; replace work damaged beyond successful restoration. Where performance of subsequent work could result in damage to complete unit or element, provide protective covering and other provisions to minimize potential for damage.

C. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

D. Special Cleaning for Windows: New glass installed as part of this project shall be thoroughly cleaned inside and out by professional window cleaners at the conclusion of all other work and prior substantial completion. All damaged, broken, or scratched items shall be replaced without costs to Owner, as described under the appropriate Trade Section(s).

E. Complete the following cleaning operations prior to requesting inspection for Certification of Substantial Completion:

1. Concrete and masonry shall be cleaned free of all foreign matter. If, in opinion of the Architect, further cleaning of specific areas is required they shall be scrubbed with water or other cleaning agents. Acid cleaners shall not be used, except as may otherwise specifically be permitted in the trade sections.
2. Metal surfaces, hardware, fixtures, appliances, equipment, and similar items shall be cleaned free of all foreign matter and, if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed and wiped with clean, soft white rags. Abrasive cleaners shall not be used.
3. Architectural woodwork shall be thoroughly dusted and cleaned of all stains, spots, etc., using methods and cleaning agents, which will not damage the various finishes.
4. Ceramic tile, porcelain, and other surfaces with integral finishes, shall be washed with clean water, mild soap and soft rags, thoroughly rinsed, and then wiped with clean, soft white rags. Abrasive cleaners shall not be used.
5. Resilient flooring shall be given final cleaning and buffing.

6. Carpeting shall be vacuum cleaned and shall have all spots and stains removed.
7. Painted surfaces shall be cleaned free of all foreign matter, and if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed, and wiped with clean, soft white rags.
8. All advertising matter and temporary instructional material shall be removed from exposed surfaces throughout.
9. Remove labels that are not permanent.
10. Clean interior and exterior finishes to a clean, dust-free condition. Remove stains, films, and similar foreign substances.
11. Vacuum and mop hard floor surfaces.
12. Clean plumbing fixtures to a sanitary condition.
13. Clean site areas of rubbish, litter, and other foreign substances.
14. Sweep paved areas broom clean; rake ground surfaces clean.

F. Before final completion and Owner-occupancy, inspect sight-exposed interior and exterior surfaces and work areas to verify that Work is clean.

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Partial depth reinforced concrete excavation of slab. The depth of removal of unsound concrete shall be 3 inches below the top of slab. There are areas where sound concrete shall be removed as mentioned below or as directed by the Engineer.
2. Hydro-excavation shall be performed over the entire surface of the reinforced concrete slab (or as directed by the Engineer) to provide a highly roughened and clean bondable surface and to remove all unsound concrete. Areas that have had previous concrete repairs shall have the repair material removed. The intent in these areas of previous patches is to remove sound and unsound concrete to the levels indicated.
3. When performing hydro-excavation adjacent to interior walls, columns, or other building elements, the Contractor shall install shielding to prevent water and debris from going onto the protected elements.
4. The contractor shall clean the surface with a vacuum system capable of collecting loose and wet debris and water in the same pass leaving a clean surface prior to repair of the slab.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.3 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.
1. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review requirements of work performed by other trades.
3. Review areas where existing construction is to remain and requires protection.
4. Review any items to be salvaged by the Owner if not already removed.
5. Review cleaning and waste-water disposal procedures.

1.4 INFORMATIONAL SUBMITTALS

A. Submittals for approval shall include complete manufacturer’s data for equipment proposed for use, equipment operator’s qualifications to perform the work, placement of machinery, means of shielding, means of controlling runoff, source of water, and any other means and methods necessary for completing the work. No work shall begin until these are approved.

B. Proposed Protection Measures: Submit report, including Drawings, which indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination of Owner's continuing occupancy of portions of existing building.

D. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, which might be misconstrued as damage caused by demolition operations.

1.5 QUALITY ASSURANCE

A. Firm Qualifications: Engage an experienced firm that has successfully completed Work similar to that indicated for this Project. The hydro excavation equipment shall only be operated by individuals who have received rigorous training as required by the equipment manufacturer.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.7 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations and events schedule.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EQUIPMENT

3.1 HYDRO-EXCAVATION

A. The hydro-excavation equipment shall be a computerized, self-propelled robotic machine that utilizes a high-pressure water jet stream capable of attaining pressures in the range of

10,000 to 40,000 PSI and removing all unsound, or otherwise designated, concrete to the depth specified. The equipment shall be capable of providing a highly roughened and clean bondable surface. The equipment shall only be operated by individuals who have received rigorous training as required by the equipment manufacturer.

B. Handheld high-pressure wands or 35 lb. maximum jackhammers operated at no more than a 45-degree angle from horizontal shall be used in areas that are inaccessible to the hydro-excavation equipment or in preparing slab repair areas or areas that require minor trim work to remove remaining concrete.

C. The contractor shall take steps to prevent damage to existing reinforcing steel and shall not place wheels from heavy equipment, such as vacuum trucks, on slab areas where top layer of slab reinforcement has been left unsupported by the hydro-excavation process. Equipment shall be operated at speeds and in a manner that will not cause damage to the slab.

PART 4 - EXECUTION

4.1 EXAMINATION

A. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

B. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

4.2 PROTECTION

A. Temporary Protection:

1. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent existing building areas.
2. The contractor shall provide shielding, as necessary, to insure containment of all dislodged concrete within the removal area in order to protect the building from flying debris both on and around the work site.
3. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
4. Protect walls, ceilings, floors, and other existing finish work that are to remain.
5. Comply with requirements for temporary enclosures and dust control specified in Section 01 50 00 "Temporary Facilities and Controls."
6. The contractor shall take necessary precautions during Hydro-excavation to prevent damage to the remaining structure and property because of runoff. All floor drains shall be temporarily blocked.
7. Remove temporary barricades and protections where hazards no longer exist.

4.3 SPECIAL CONDITIONS

A. Potable water shall be used and shall be provided by the contractor. If planning to access hydrants, it is the contractor’s responsibility to contact and make the appropriate arrangements with the proper city/town water departments.

B. The contractor shall control dust and run-off.

C. The contractor is responsible for the disposal of all material removed, including but not limited to, material collected by vacuuming the slab.

D. The contractor shall take necessary precautions during Hydro-excavation to prevent damage to the remaining structure and property because of runoff. All floor drains shall be temporarily blocked.

E. Potable water shall be used and shall be provided by the contractor. If planning to access hydrants, it is the contractor's responsibility to contact and make the appropriate arrangements with the proper city/town water departments.

F. The contractor shall control dust and run-off.

G. The contractor is responsible for the disposal of all material removed, including but not limited to, material collected by vacuuming the slab.

4.4 TEST AREA

A. Test areas will be required to establish the operating parameters and to demonstrate that the equipment, personnel, and methods of operation are capable of producing satisfactory concrete removal results. Two test areas will be required, one on the concrete slab in an area of sound concrete and the other in an area of previous concrete repair. Each area shall be approximately 50 square feet. The intent is the removal of the concrete to a depth of 3 inches below the top of slab.

B. Once satisfactory results are obtained, the quality and depth of removal will become the standard for the project. If hand lances are to be used to perform concrete removals, they should also be demonstrated to show satisfactory results.

C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

D. The Contractor shall take all steps necessary to ensure that pedestrian and vehicular traffic is protected from harm at all times.

4.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

4.6 PREPARATION FOR PLACEMENT OF NEW CONCRETE

A. Before placing new concrete, the existing surface must be cleaned with oil-free compressed air. After the surface preparation has been accepted, every effort should be made to thoroughly wet the concrete surface, and all porous surfaces to be in contact with new concrete, for 12 hours. This may be accomplished by continuous wetting with soaker hoses or the use of burlap/burlene, etc. where moisture can be maintained. If, in the opinion of the Engineer, conditions or the situation prohibits this, then the surfaces should be wetted for as long as possible. Surfaces must be wetted by a means acceptable to the Engineer using potable water.

B. The Contractor shall remove any puddles of free-standing water with oil-free compressed air, and protect the surfaces from drying, so the existing concrete remains in a clean, saturated surface dry condition until placement of the new concrete.

4.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 032000 - CONCRETE REINFORCEMENT AND EMBEDDED ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL

Work of this Section shall conform to requirements of Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections.

1.2 SCOPE

Provide all labor, materials, equipment, services and transportation for reinforcing steel, accessories, embedments and miscellaneous anchorage accessories, and joint fillers, for cast-in-place concrete work as shown on Drawings, as specified herein, and as required by the job conditions.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

Submittals	Division 1
Quality Control	Division 1
Quality Assurance: Structural Testing and Inspection	Section 014500
Cast-In-Place Concrete	Section 033000

1.4 CODES AND STANDARDS

A. Building Code: Concrete work shall conform to the requirements of the Building Code identified on the Structural General Notes, and OSHA requirements, except where more stringent conditions or criteria occur in the standards referenced below and on the Drawings.

B. Standards:

1. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 –Specifications for Structural Concrete.
3. ACI 315 – Details and Detailing of Concrete Reinforcement.
4. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.
5. ACI 355.2 – Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary
6. ACI 355.4 – Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary
7. American Society for Testing and Materials "ASTM Standards in Building Codes", various standards as referenced herein.
8. AWS D1.1 – Structural Welding Code-Steel.
9. AWS D1.4 – Structural Welding Code-Reinforcing Steel.
10. CRD C 572 – Specification for Polyvinylchloride Waterstops.
11. Concrete Reinforcing Steel Institute ”Manual of Standard Practice”
12. ASTM D3963 Fabrication and Jobsite Handling of epoxy Coated Steel Reinforcing Bars.

C. Definitions:

1. See Section 033000.

1.5 CONTRACTOR QUALIFICATIONS

A. The work of this section shall be performed by a fabricator specializing in the type of reinforcement fabrication required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts.

1. Welders shall be qualified in accordance with applicable AWS Code within 12 months before starting the work.

a) Make qualification records available to the Design Professionals upon request.

B. Manufacturers shall specialize in manufacturing the types of concrete accessories required for cast-in-place concrete work, with a minimum of 10 years of documented successful experience and shall have the facilities capable of meeting all requirements of Contract Documents as a single-source responsibility and warranty for each type of accessory.

1.6 SUBMITTALS

A. Required Submittals - Where the SUBMITTALS section of this Specification is in conflict with Division 1 Submittals, the more stringent requirements for the Contractor apply. Required submittal items are listed here; see below for detailed requirements. Do not submit items not requested. Reproduction of Contract Drawings as shop drawings is not permitted.

(1) Submittal Schedule
(2) Shop Drawings
(3) Product Data
(4) Mill Reports
(5) Reinforcement Strain Test
(6) Hazardous Materials Notification

1. Submittal **Schedule**: See Section 033000.
2. **Shop Drawings**: Submit for action shop drawings that shall clearly indicate, but not be limited to:

a) All details, dimensions and information required for fabrication and placement of concrete reinforcement in accordance with Contract Documents, prepared in accordance with ACI 315 recommendations.
b) Elevations, plans, sections, and dimensions of concrete work with required reinforcement clearances.
c) Ledges, brackets, openings, sleeves, anchor rods, embedments, prefabricated bent-in dowel keyway systems, electrical conduit and items of other trades including interference with reinforcing materials.
d) Sizes, grade designations, spacing, locations, and quantities of wire fabric, reinforcement bars, temperature and shrinkage reinforcement dowels.

i. Do not use dimensions scaled from Contract Drawings to determine bar lengths.

ii. Hooks and bends not specifically dimensioned shall be detailed per ACI 318.

e) Bending and cutting schedules, assembly diagrams, splicing and connection requirements, details, and laps.

f) Each type of supporting and spacing devices, including miscellaneous accessories.

g) Construction joint type, details, and locations. Contractor shall coordinate construction joint type, details, and locations with concrete pour schedule. Submittal shall include details for each type of construction joint in accordance with Contract Documents.

h) Locations and dimensions of openings in structural members including floor slab, shear walls, columns and beams. See SUBMITTALS Section of Specification 033000.

i) Concrete accessories and embedded items. See SUBMITTALS Section of Specification 033000.

3. **Product Data**: Submit for action for each type of product identified in Part 2. Product Data shall be clearly marked to indicate all technical information which specifies full compliance with this section and Contract Documents, including published installation instructions and I.C.C reports, where applicable, for products of each manufacturer specified in this section.
4. **Mill Reports**: Submit for record.
5. **Reinforcement Strain Test**: For Grade 75 reinforcement, submit for record certification that steel has a yield strength of no less than 75 ksi as measured by both ASTM A615 and ACI 318 Section 3.5.3.2 procedures.
6. **Hazardous Materials Notification**: Submit for record. In the event no product or material is available that does not contain hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

B. Submittal Process: See Section 033000.

C. SER Submittal Review: See Section 033000.

D. Substitution Request: See Section 033000.

E. Request for Information (RFI): See Section 033000.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with General Conditions and Division 1, including the following:

1. Deliver reinforcing steel to Project site bundled, tagged and marked.

a) Use weatherproof tags indicating bar sizes, lengths and other information corresponding to markings shown on placement diagrams.

2. Deliver welded wire fabric in sheets. Do not deliver in rolls.
3. During construction period, properly store reinforcing steel and accessories to assure uniformity throughout the Project.
4. Deliver and store welding electrodes in accordance with AWS D1.4.
5. Immediately remove from site materials not complying with Contract Documents or determined to be damaged.

6. Store reinforcing steel above ground so that it remains clean.

    a) Maintain steel surfaces free from materials and coatings that might impair bond.
    b) Keep covered.
    c) Protect against corrosion or deterioration of any kind.

1.8 QUALITY ASSURANCE BY OWNER'S TESTING AGENCY

A. See Section 014500.

1.9 QUALITY CONTROL BY CONTRACTOR

A. See Section 033000.

1.10 OBSERVATIONS AND CORRECTIONS BY DESIGN PROFESSIONALS

A. See Section 033000.

1.11 PERMITS AND WARRANTY

A. Permits: See Section 033000.

B. Warranty: See Section 033000. Failures include but are not limited to the following:

1. Bars with kinks or bends not indicated on Drawings or on approved shop drawings.
2. Bars damaged due to bending, straightening or cutting.
3. Bars heated for bending.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel:

1. Type: Reinforcing steel shall be hot-dipped galvanized after fabrication in accordance with ASTM A 767, Class II, with galvanizing material protected from embrittlement during galvanizing process in accordance with ASTM A 143.

    a) Galvanized finish shall meet the bend and shear test requirements of ASTM A 615.

2. Size: As indicated on structural Drawings.

2.2 ACCESSORIES

A. Tie Wire:

1. Type: Minimum 16 gauge (1.5mm) annealed steel wire, ASTM A 510 and ASTM A 853.
2. Wire Bar Type: Comply with CRSI.

B. Mechanical Splicing Systems:

1. Mechanical tension and compression splicing systems shall be used where indicated on Drawings or at contractor's option. For seismic design categories D, E and F, in plastic hinge regions, only Type 2 mechanical splices are permitted.
2. Splices shall be installed in accordance with manufacturer's requirements.
3. Acceptable Products:

    a) Bartec Couplers by Dextra
    b) Griptec Couplers by Dextra
    c) Unitec Couplers by Dextra
    d) Lenton Couplers by Erico
    e) Lenton Cadweld by Erico
    f) Bar Lock Couplers by Dayton Superior
    g) Taper-Lock Couplers by Dayton Superior
    h) Grip-Twist by BarSplice
    i) ZAP Screwlok by BarSplice
    j) BPI Barsplicer by BarSplice
    k) BarGrip by BarSplice
    l) 400 and 500 Series by Headed Reinforcement Corp

4. Mechanical and welded tensile mechanical splicing systems shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength (Type 1) except where indicated as Type 2 (100% of specified tensile strength).
5. Mechanical compression splices shall be such that the compression stress is transmitted by end bearing held in concentric contact.

C. Headed Bars:

1. For bar sizes #11 (ø36) or smaller where specifically detailed on Drawings, mechanical bar terminators shall be used.
2. Headed bars shall meet the requirements of ASTM A970, Class HA.
3. Acceptable Products:

    a) Headed Bars by Dextra
    b) Lenton Terminator by Erico
    c) Grip-Twist Doughnut by Bar-Splice
    d) BPI ButtonHead by BarSplice
    e) Zap T-Lok by BarSplice
    f) Taper-Lock End Anchor Disc by Dayton Superior
    g) 100, 550 and 670 Series by Headed Reinforcement Corp

D. Weldable Bar Couplers:

1. Acceptable Products:

    a) Lenton Weldable Couplers by Erico
    b) DBDI Weldable Coupler by Dayton Superior
    c) BPI Structural Connector by BarSplice

E. Slip Dowel Bar/Plate Systems for Slab on Grade Joints

1. Acceptable Products:

    a) Speed Dowel or Speed Plate by Sika Corporation

b) QuicDowel or QuicPlate by BoMetals, Inc.
c) Diamond Dowel System by PNA Construction Technologies

F. Supports for Reinforcement:

1. Types: Bolsters, chairs, spacers, clips, chair bars, and other devices for properly placing, spacing, supporting, and fastening the reinforcement, plastic, plastic protected steel, or epoxy coated to match supported reinforcement.
2. For Contact with Forms: Use types with not less than 3/32" (2.5mm) of plastic between metal and concrete surface.

a) Plastic tips shall extend not less than ½" (12mm) on metal legs.

3. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound (1.5kN) load without damage or permanent distortion.
4. Unless otherwise indicated on Drawings, bottom reinforcing bars in footings shall be supported by precast concrete bricks or individual high chairs with welded sand plates on bottom.
5. For Slabs on Grade: Use supports with sand plates or horizontal runners where base material will not support chair legs.

G. Deformed Bar Anchors:

1. Type: Automatic end welded, ASTM A 496 quality.
2. Size and Grade: As indicated on structural Drawings by Nelson Stud Welding.

H. Anchor rods and dowels:

1. Types and Sizes: Provide sizes and types of anchor rods and dowels as indicated on the Drawings. Each type of anchor shall be manufactured of structural quality steel, designed for cast-in-place concrete applications and be of sizes as indicated on Drawings, complete with washers, nuts, plates and miscellaneous accessories required to meet Contract Document requirements.
2. Adhesive Anchors for anchor rods and dowels in existing concrete: See Anchorage Accessories.

2.3 ANCHORAGE ACCESSORIES

A. General: Miscellaneous anchorage accessories for anchoring structural, architectural, electrical, and mechanical items to poured concrete shall include but not be limited to the following:

1. Concrete Anchors: Headed or bent studs ASTM A 108/Grade 1015 through 1020, minimum yield strength of 50,000 psi (345MPa), minimum tensile strength of 60,000 psi (415MPa).
2. Anchor Rods: ASTM F1554, Grade as noted on Drawings.
3. Shallow Embedment Internally Threaded Inserts with ¾" maximum embedment.

a) Acceptable Products:

i. Mini Undercut + by DeWalt (for post-tensioned slabs and precast hollow core slabs)
ii. HDI-P TZ by Hilti (for post-tensioned slabs)

4. Adhesive Anchors:

   a) Basis of Design: See General Notes
   b) Substitution Request: As anchor capacities vary by manufacturer, the following anchors will be considered as a Substitution Request. Refer to project specifications for Substitution Request procedure

      i. HIT-RE 500-V3 by Hilti, Inc.
      ii. Epcon C6+ by ITW Red Head
      iii. Epcon G5 by ITW Red Head
      iv. Pure 110+ by DeWalt
      v. SET-3G by Simpson Strong-Tie Co.

   c) The adhesive anchor system used for post-installed anchorage to concrete shall conform to the requirements of ACI 355.4 and commentary and shall possess a current ICC- ES report demonstrating compliance with ACI 318.

5. Expansion Anchors:

   a) Basis of Design: See General Notes
   b) Substitution Request: As anchor capacities vary by manufacturer, the following anchors will be considered as a Substitution Request. Refer to project specifications for Substitution Request procedure.

      i. Kwik Bolt TZ2 by Hilti, Inc.
      ii. Power Stud+ SD1 or SD2 by DeWalt
      iii. Power Stud + SD6 (SS) by DeWalt
      iv. Trubolt by ITW CCNA
      v. Strong-Bolt 2 by Simpson Strong-Tie Co.

   c) The expansion anchors used for post-installed anchorage to concrete shall conform to the requirements of ACI 355.2 and commentary and shall possess a current ICC- ES or IAPMO UES report demonstrating compliance with ACI 318.

6. Threaded Screw Anchors:

   a) Basis of Design: See General Notes
   b) Substitution Request: As anchor capacities vary by manufacturer, the following anchors will be considered as a Substitution Request. Refer to project specifications for Substitution Request procedure.

      i. Screw-Bolt + by DeWalt
      ii. Tapcon + by ITW Red Head
      iii. Titan HD by Simpson Strong-Tie Co., Pleasanton, CA

7. Inserts and Coil Rods: Yield strength 65,000 psi (450MPa), ASTM B 633, manufactured by Acrow-Richmond Limited or Dayton Superior
8. Welding Electrodes: AWS 5.5, Series E70.
9. Welded Deformed Bar Anchors: Welded by full-fusion process, as furnished by TRW Nelson Stud Welding Division or equivalent.

2.4 JOINT FILLERS

A. Permanent Compressible Joint Filler:

1. Acceptable Product: W. R. Meadows: “Ceramar” closed-cell expansion joint filler, ultraviolet stable, minimal moisture absorption, non-impregnated, nonstaining and nonbleeding, inert and compatible with cold-applied sealants.
2. Location of Use: Slabs and curbs as indicated on Drawings or required.
3. Thickness: As indicated on Drawings or required.

B. Temporary Compressible Joint Filler:

1. Type: White molded polystyrene beadboard.
2. Location of Use:

a) In slabs, curbs, and walls which must be removed prior to joint sealant installation.
b) Vertically to isolate walls from columns or other walls.

C. Semi Rigid Joint Filler:

1. Acceptable Product: Euclid Chemical Company “Euco 700” or “Euco QWIKjoint 200”
2. Acceptable Product: Sika Corporation “Sikadur 51 SL”
3. Acceptable Product: W.R. Meadows Sealtight “Rezi-Weld Flex”

D. Noncompressible Joint Filler:

1. Acceptable Product: Dow Chemical's "STYROFOAM 40" rigid closed-cell extruded polystyrene board, square edges, 40 psi (275kPa) compressive strength, ASTM C 578, Type IV.
2. Thickness: As indicated on Drawings.
3. Location of Use: As indicated on Drawings or required.

E. Asphalt-Impregnated Joint Filler:

1. Acceptable Product: W.R. Meadows Asphalt Expansion Joint Filler, preformed, ASTM D 994.
2. Thickness: ½” (12mm) maximum, as indicated on Drawings or required.
3. Location of Use: Sidewalks at foundation walls and as indicated on Drawings or required.

F. Asphalt-impregnated fiberboard expansion joint filler for interior work:

1. Type: ASTM D1751.

G. Self-expanding cork board expansion joint filler for exterior work:

1. Type: ASTM D1752.

H. Construction Joints:

1. Type: Tongue and groove type profile of galvanized steel, with knock-out holes at 6" (150mm) on center to receive dowelling, complete with anchorage.

PART 3 - EXECUTION

3.1 FABRICATION

A. Reinforcing Steel Fabrication:

1. Fabricate in accordance with approved shop Drawings, ACI 315 and Contract Documents.
2. Heating of Reinforcement: Will be permitted only with specific prior approval of the SER.
3. Welding: Comply with ANSI/AWS D1.4; use E9018 electrodes or approved electrodes.
4. Tolerances: Comply with ACI 117.
5. Unacceptable Materials: Reinforcement with any of following defects will not be permitted in Work.

    a) Bar lengths, depths, and bends exceeding ACI fabrication tolerances.
    b) Bends or kinks not indicated on Drawings or final shop drawings.
    c) Bars with reduced cross-section due to excessive rusting or other cause.

B. Templates:

1. Where required for proper alignment of reinforcing.

C. Assemblies:

1. Fabricate and assemble structural steel items in shop in conformance with AISC and AWS D1.1. Shearing, flame cutting, and chipping shall be done carefully and accurately. Cut, drill, or punch holes at right angles to the surface of the metal. Do not make or enlarge holes by burning. Holes shall be clean-cut without torn or ragged edges.
2. Welding of deformed bar anchors and headed stud anchors shall be installed by full-fusion process equivalent to TRW Nelson Stud Welding Division or KSM Welding Services Division, Omark Industries or Tru-Weld Stud Welding, Medina, OH.
3. Welding of reinforcement shall be done in accordance with AWS requirements. Welding shall be performed subject to the observance and testing by Testing Agency.
4. Galvanizing where required, shall be applied after fabrication and prior to casting concrete.
5. Welding of crossing bars (tack welding) for assembly of reinforcement is not permitted without use of weldable reinforcement and express written consent of SER.

3.2 INSTALLATION OF REINFORCEMENT

A. General:

1. Perform the work of this section in accordance with approved shop drawings, ACI 318 and CRSI recommended practice for “Placing Reinforcing Bars”, for details and methods of reinforcement placement and supports, and as specified.
2. Before placing reinforcement steel, inspect forms for proper fitting and compliance with allowable tolerances.

3. Reinforcement shall be free of form coatings, sealers, powdered and scaled rust, loose mill scale, earth, ice, and other materials which will reduce or destroy bond with concrete.
4. Do not place concrete until the completed reinforcement steel work has been observed and accepted by Owner's Testing Laboratory.
5. Reinforcement steel is not permitted to be "floated into position".
6. Bend bars cold.

    a) Do not heat or flame cut bars.
    b) No field bending of bars partially embedded in concrete is permitted, unless specifically approved by the SER and tested by Testing Agency for cracks.

7. Weld only as indicated.

    a) Perform welding per ANSI/AWS D12.1 and/or ANSI/AWS D1.4.
    b) See structural Drawings for additional requirements.

8. Tag reinforcement steel for easy identification.

B. Placement of Reinforcement Bars:

1. Comply with approved shop drawings, ACI 318 and Contract Documents.
2. Accurately position, support and secure reinforcement in a manner to prevent displacement before and during placement of concrete.

    a) Place reinforcement bars within tolerances specified in ACI 117.
    b) Locate and support reinforcement by metal chairs, runners, bolsters, spacers, hangers and other accessories for fastening reinforcing bars and welded wire reinforcement in place.

3. If bars are displaced beyond specified tolerance when relocating the bars to avoid interference with other reinforcement or embedded items, immediately notify the Design Professionals for approval prior to concrete placement.
4. Avoid cutting or puncturing vapor retarder during reinforcement placement.

    a) Repair damages before placing concrete.

5. Concrete Coverage: Maintain concrete cover around reinforcement as indicated on Drawings.
6. Bar Supports: Use type specified in this section.
7. Tie Wires: After cutting, turn tie wires to the inside of section and bend so that concrete placement will not force ends to be exposed at face of concrete.

C. At Construction Joints:

1. Reinforcement bars and wire reinforcement shall be continuous through construction joints, unless otherwise indicated on Drawings. See Drawings for scheduled lap splices.

D. Splicing:

1. Unless otherwise indicated on Drawings provide lap splices for bar sizes #11 (ø36) and smaller by lapping ends, placing bars in contact, and tying tightly with

wire in accordance with requirements of ACI 318 for lap lengths indicated on Drawings.

2. At all #14 (ø43) and #18 (ø57) bars and where mechanical splices are specifically indicated on Drawings, comply with requirements specified in this Specification section under “Mechanical Splicing Systems”.
3. Do not splice reinforcement except as indicated on structural Drawings.
4. Tension couplers may be used and installed per manufacturer’s specifications where indicated on Drawings or as approved by Engineer.

E. Dowels in Existing Concrete:

1. Install dowels and dowel adhesive in accordance with manufacturer’s recommendations.
2. Minimum embedment length shall be 12 bar diameters, unless noted otherwise.

3.3 INSTALLATION OF POST-INSTALLED ADHESIVE ANCHORS

A. General:

1. Post-installed adhesive anchors shall be installed in accordance with the Manufacturer’s Printed Installation Instructions (MPII).
2. The adhesive anchors shall be supplied as an entire system. The contractor shall provide all equipment required to install the adhesive anchor in accordance with the MPII.
3. Anchors shall be installed in holes drilled with a rotary impact hammer drill with carbide bit. Contractor shall obtain prior written approval from SER before using rock drilling or core drilling installation methods.
4. Anchor holes shall be thoroughly cleaned and dry prior to adhesive injection, in accordance with the MPII. Anchors to be installed in the adhesive shall be clean, oil-free, and free of loose rust, paint, or other coatings.
5. Concrete shall have a minimum compressive strength of 2500 psi (17MPa).
6. Concrete at time of adhesive anchor installation shall have a minimum of 21 days.
7. Concrete temperature at the time of adhesive anchor installation shall be at least equal to manufacture's requirements, or 50° F (10°C) if no requirement exists.
8. Support the anchor and protect it from disturbance or loading for the full cure time stated by the manufacturer at that base material temperature.
9. Unless specified otherwise in the contract documents, anchors shall be installed perpendicular to the concrete surface. Anchors displaced or disturbed prior to the adhesive cure time shall be considered damaged and reported to the SER (see Observations and Corrections section of 033000).
10. Locate, by non-destructive means, and avoid all existing reinforcement prior to installation of anchors. If existing reinforcement layout prohibits the installation of anchors as indicated in the drawings the contractor shall immediately notify the Design Professionals.
11. Reinforcement bars or all-threaded bars shall not be bent after being adhesively embedded in hardened, sound concrete, unless written approval is given by the SER.
12. All personnel installing anchors shall be trained by the manufacturer on proper installation techniques. Submit for record certificate from training documentation from the manufacturer for each installer on this Project
13. Installation of adhesive anchors horizontally or upwardly inclined and anchors that are designated with a (CERT) after the anchor call-out, shall be performed by personnel certified by the ACI/CRSI Adhesive Anchor Installer Certification

program. Submit for record certificate from ACI-CRSI Adhesive Anchor Installation Certification Program for each certified installer on this Project.

3.4 INSTALLATION OF ACCESSORIES AND EMBEDDED ITEMS

A. Install concrete accessories in accordance with manufacturer's published instructions and Contract Documents.

1. Set and secure embedments, including embedded plates, bearing plates, and anchor rods, per approved setting drawings and in such a manner to prevent movement during placement of concrete and to allow removal of formwork without damage.
2. Tolerances: Anchor rod and other embedded items placement tolerances shall comply with AISC 303, “Code of Standard Practice”, Section 7.5.
3. Inspect locations to receive concrete accessories.
4. Immediately notify the Design Professionals in writing of conditions that will adversely affect the Work or fail to meet Contract Document requirements.
5. Do not place concrete until reinforcement, accessories and other built-in items have been inspected and accepted by Testing Agency.

B. Construction and Contraction (Control) Joints:

1. Construction and contraction (control) joints indicated on Drawings are mandatory and must not be omitted.

a) Provide construction joints in accordance with ACI 318.
b) Roughen surface at construction joints as indicated on the drawings.
c) Where specifically indicated on drawings, provide 1-1/2” (40mm) deep key type construction joints at end of each placement for slabs, beams, walls and footings.

i. Bevel forms for easy removal.

2. Provide waterstops in construction joints as indicated on the Contract Documents in sizes to suit joint.
3. Install waterstops to form continuous diaphragm in each joint.
4. Support and protect exposed waterstops during progress of Work.
5. Field-fabricate joints in waterstops according to manufacturer’s printed instructions.

C. Coordinate the installation of pipes, bolts, hangers, anchors, flashing and other embedded items with the work of other trades.

3.5 CORRECTIVE MEASURES

A. Where the Contractor requests that the Design Professionals develop the corrective actions or review corrective actions developed by others, the Design Professional shall be compensated as outlined in Part 3 – CORRECTIVE MEASURES section of Specification 033000.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 GENERAL

Work of this Section shall conform to requirements of Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections.

1.2 SCOPE

Provide all labor, materials, equipment, services and transportation required to complete all concrete work as shown on Drawings, as specified herein, and as required by the job conditions. This Specification is not intended to address the particular requirements of Architectural Concrete.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

Submittals	Division 1
Quality Control	Division 1
Quality Assurance: Structural Testing and Inspection	Section 014500
Concrete Reinforcement and Embedded Assemblies	Section 032000

1.4 CODES AND STANDARDS

A. Building Code: Concrete work shall conform to the requirements of the Building Code identified on the Structural General Notes, and OSHA requirements, except where more stringent conditions or criteria occur in the standards referenced below and on the Drawings.

B. Standards:

1. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials except as modified by more stringent requirements in the Project Specifications and/or Drawings.
2. ACI 237 – Self Consolidating Concrete.
3. ACI 301 – Specifications for Structural Concrete.
4. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.
5. American Concrete Institute “Manual of Concrete Practice”, various committee reports as referenced herein.
6. American Society for Testing and Materials "ASTM Standards in Building Codes", various standards as referenced herein.
7. AASHTO T318 – Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying.

C. Definitions:

1. The term “Contract Documents” in this Specification is defined as the design Drawings and the specifications.
2. The term “SER” in this Specification is defined as the Structural Engineer of Record for the structure in its final condition.
3. The term “Design Professionals” in this Specification is defined as the Owner’s Architect and SER.

4. The term “Contractor” in this Specification is defined to include any of the following: General Contractor and their sub-contractors, Construction Manager, Concrete Contractor and their sub-contractors.
5. The term “Testing Agency” in this Specification is defined as an independent testing and inspection service engaged by the Owner for quality assurance testing and inspection of structural construction in accordance with applicable building code provisions and any additional activities listed in the Contract Documents.
6. The terms “for record” and “submit for record” in this Specification are defined as Contractor submittals that do not require a response from the Design Professionals.
7. The term “Working Days” in this Specification is defined as Monday through Friday, excluding federal or state holidays.
8. The term “Delegated Design” in this Specification is defined as a scope of work that meets performance and design criteria established in the Contract Documents and is to be completed by the Contractor’s licensed engineer.

1.5 CONTRACTOR QUALIFICATIONS

A. Contractor’s testing agency services: Required as specified in Division 1, and herein.

1.6 SUBMITTALS

A. Required Submittals - Where the SUBMITTALS section of this Specification is in conflict with Division 1 Submittals, the more stringent requirements for the Contractor apply. Required submittal items are listed here; see below for detailed requirements. Do not submit items not requested. Reproduction of Contract Drawings for shop drawings is not permitted.

(1) Submittal Schedule
(2) Mix Designs
(3) Concrete Travel Times to the Project Site
(4) Hot and Cold Weather Procedures
(5) Product Data
(6) Concrete Joint Locations
(7) Comprehensive Layout Drawings
(8) Preconstruction Survey
(9) Survey of Flat Plate or Flat Slab Concrete Floors during construction
(10) FF/FL Testing
(11) Structural Repairs
(12) Patching Defective Concrete Finishes
(13) Hazardous Materials Notification

1. **Submittal Schedule**: The contractor shall submit for action a schedule at least twenty (20) working days prior to commencing submittals.

   a) This schedule shall include a list, in order of date to be submitted, of all drawings and other required submittal items scheduled to be submitted. The schedule shall list the proposed submittals for each week, as well as their formats. Once shop drawing submissions have commenced any modification or addition to this schedule must be submitted for action at least twenty (20) working days before the modification or addition is proposed to take place.

b) If at any time the total number of shop drawings received in any one week period exceeds the amount in the approved schedule by more than 10% for that week, the Design Professionals have the right to add two days to the average turnaround time for each 20% increment in excess of the scheduled quantity for that week's submissions. For example if the weekly total exceeds the schedule by 10% to 20%, two days may be added; if it is exceeded by 21% to 40%, four days may be added. The return dates for subsequent submittals may be extended based on the additional review time stated above.

c) For the purposes of developing a schedule, assume the following review rate, Shop drawings – 10 full size sheets per week.

2. **Mix Designs**: Submit for action concrete mix designs for each type and strength of concrete required for this Project at least thirty (30) days before placing concrete.

a) Mix designs shall be prepared or reviewed by an approved independent testing agency retained by the Contractor in accordance with requirements of ACI 301 and ACI 318 and shall be coordinated with design requirements and Contract Documents.

b) Before submitting to Testing Agency, submit complete mix design data for each separate mix to be used on the Project in a single submittal.

c) Provide a completed "Concrete Mix Design Submittal Form" (attached to the end of this Specification Section) for each proposed concrete mix.

d) Mix materials shall be from the same production facility that will be used for this Project.

e) Mix Design data shall include but not be limited to the following:

i. Locations on the Project where each mix design is to be used corresponding to Structural General Notes on the Drawings.

ii. Design Compressive Strength: As indicated on the Drawings.

iii. Proportions: ACI 301 and ACI 318.

iv. Gradation and quality of each type of ingredient including fresh (wet) unit weight, aggregates sieve analysis.

v. Water/cementitious material ratio.

vi. Evaluation and classification fly ash in accordance with ASTM D 5759.

vii. Report of chemical analysis of fly ash in accordance with ASTM C 618.

viii. Classification of slag cement in accordance with ASTM C 989.

ix. Slump: ASTM C 143.

x. Air content of freshly mixed concrete by the pressure method, ASTM C 231, or the volumetric method, ASTM C 173.

xi. Density of Concrete: ASTM C 138.

xii. Design strength at 28, 56 or 90 days, as indicated on Contract Documents: ASTM C 39.

(1) Document strength based on basis of previous field experience or trial mixtures per ACI 301. Proportioning by water-cement ratio alone, with no test results per the trial mixtures procedure is not permitted.

(2) Submit strength test records, mix design materials, conditions, and proportions for concrete used for record of tests, standard deviation calculation, and

determination of required average compressive strength. Test records to support proposed mixtures shall be no more than 24 months old and use current cement aggregate sources. Test records to establish standard deviation may be older if necessary to have the required number of samples.

(3) If early concrete strengths are required, Contractor shall submit trial mixture results as required.

xiii. Manufacturer's product data for each type of admixture.

xiv. Manufacturer's certification that all admixtures used are compatible with each other.

xv. All information indicating compliance with Contract Documents including method of placement and method of curing.

xvi. Normalweight Concrete: Density per ASTM C 138. Design the mix to produce the strength, modulus of elasticity and density as indicated on the Contract Documents.

xvii. Lightweight Concrete: Density per ASTM C 138. Design the mix to produce the strength, modulus of elasticity and density as indicated on the Contract Documents.

xviii. Certification from a qualified testing agency indicating absence of potential for deleterious expansion of concrete due to alkali reactivity of the aggregate as determined by testing per ASTM C1260 in accordance with ASTM C 33. If potential for deleterious expansion exists, expansion reduction and mitigation measures per the guidelines of ASTM C1778 or US Army COE CRD-C662 shall be submitted for review by the SER.

3. **Concrete Travel Times to the Project Site:** Submit for record.

4. **Hot and Cold Weather Procedures**: Submit for record written procedures for placement of concrete in hot and cold weather conditions. Hot and Cold weather are as defined in the Concrete Placement section of this Specification.

5. **Product Data**: Submit for action product data clearly marked to indicate locations to be used and all technical information which specifies full compliance with this section and Contract Documents, including published application instructions, product characteristics, compatibility, and limitations for each of the following:

a) Bonding agents.

b) Curing compound and liquid sealer densifier. Submit for record to Design Professionals a written statement guaranteeing that the compound will not leave discoloration on concrete to be left exposed, or affect the bond for paint or other applied finishes. Include provision in written statement that in the event of failure of applied finishes to bond to membrane cured concrete, to remove the curing compound and leave suitable surfaces for bonding such finishes.

c) Absorptive covers and moisture retaining covers.

d) Vapor Retarder: See Division 7, Thermal and Moisture Protection.

e) Self-leveling concrete topping see architect specifications.

f) Grout: Submittal of grout by manufacturers not listed herein must be accompanied by independent certification of ASTM C 1107 compliance without modification of standard methods.

g) Other products proposed by Contractor.

6. **Concrete Joint Locations**: Submit for action plans indicating locations and details of construction joints, contraction joints, waterstops, sleeves, embedments, etc. that interact with the joints. Contractor to coordinate joint location with reinforcement shop drawings. Reinforcement shop drawings shall indicate additional reinforcement bars where required at construction joints.

   Joint locations for concrete slabs to receive a terrazzo or similar finish subject to reflective cracking must be coordinated with layout of finish drawings.

7. **Comprehensive Layout Drawings:** Submit for action comprehensive layout drawings (a single drawing per area/element):

   a) Drawings shall show openings in structural members, including floor slab, shear walls, columns and beams.
   b) Drawings shall consolidate the work of all trades and shall be coordinated by the Contractor.
   c) Drawings shall show concrete accessories and embedded items, including fabrication details of items to be placed (exclusive of reinforcement).
   d) Submit with or prior to reinforcement and formwork submittals for same element/area.

8. **Preconstruction Survey**: Submit for record. Where interface with existing construction occurs, before related shop drawings are prepared survey the existing construction and submit the survey prepared by a professional surveyor employed by the Contractor to the Design Professionals.
9. **Survey of Flat Plate or Flat Slab Concrete Floors during construction**: Submit for record. Survey requirements are described on Drawings. Based on survey results, SER may propose adjustments to formwork and camber.
10. **FF/FL Testing:** Submit for record. Testing Agency to test and report flatness (F_F), levelness (F_L) prior to shoring removal. Do not test slabs for levelness (F_L) that include camber, inclined surfaces or planned changes in floor surface slope. Perform F_F/F_L testing in accordance with ASTM E 1155 requirements.
11. **Structural Repairs**: Submit for action procedures, intended locations, and product information. Alterations to design shall be sealed and signed by a Professional Engineer licensed in the state where the project is located.
12. **Patching Defective Concrete Finishes**: Submit for action procedures, intended locations, and product information.
13. **Conduit and Pipes Embedded in Concrete:** Submit for action layout of embedded conduit and pipes.
14. **Hazardous Materials Notification**: Submit for record. In the event no product or material is available that does not contain hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

B. Submittal Process

1. Submittal of shop drawings and other submittals by the Contractor shall constitute Contractor's representation that the Contractor has verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each drawing with other Drawings and other trades. The Contractor shall place their shop drawing stamp on all submittals confirming the above.

2. Shop drawings: Submit in complete packages so that individual parts and the assembled unit may be reviewed together. This Specification Section and the applicable Drawings used in the development of the shop drawings shall be referenced on each shop drawing to facilitate checking.
3. The Contractor shall submit to the Design Professionals one (1) electronic copy for shop drawing review. The naming convention of each drawing must follow the submittal numbering system and include the submittal number, Specification number, revision number and drawing number in the prefix of the drawing name.
4. The Contractor shall allow at least ten (10) working days between receipt and release by the SER for the review of shop drawings and submittals.
5. All modifications or revisions to submittals and shop drawings must be clouded, with an appropriate revision number clearly indicated. The following shall automatically be considered cause for rejection of the modification or revision whether or not the drawing has been approved by the Design Professionals:

    a) Failure to specifically cloud modifications
    b) Unapproved revisions to previous submittals
    c) Unapproved departure from Contract Documents

6. Resubmittals: Completely address previous comments prior to resubmitting a drawing. Resubmit only those drawings that require resubmittal. Do not include new content not previously reviewed.
7. Resubmittals Compensation: The Contractor shall compensate the Design Professionals for submittals that must be reviewed more than twice due to Contractors' errors. The Contractor shall compensate the Design Professionals at standard billing rates plus out-of-pocket expenses incurred at cost + 10%.
8. The Contractor shall deliver to the Design Professionals at the completion of the job two (2) copies of the electronic version of the final as-built shop drawings on a CD-ROM or other media acceptable to the Design Professionals.

C. SER Submittal Review

1. The Design Professionals' review and approval of shop drawings and other submittals shall be for general conformance with the design intent of the work and with the information given in the Contract Documents only and will not in any way relieve the Contractor or the Contractor's Engineer from:

    a) Conforming to the Contract Documents.
    b) Coordination with other trades.
    c) Responsibility for all required detailing and proper fitting of construction work.
    d) The necessity of furnishing material and workmanship required by Drawings and Specifications which may not be indicated on the shop drawings.
    e) Control or charge of construction means, methods, techniques, sequences or procedures, for safety precautions and programs in connection with the work.

2. TYPE 1 – Structural Submittal Review Stamp: For shop drawings for building elements designed by the SER, the responses on the shop drawing review stamp used by the SER require one of the following actions:

    a) APPROVED indicates that the SER has found that the information presented on the shop or erection drawing appears to conform to the

requirements of the Contract Documents. Fabrication, manufacture or construction of the elements of work shown in the shop drawing may proceed, provided that work is in compliance with the Contract Documents.

b) APPROVED AS NOTED indicates that the SER requires the shop or erection drawing to be corrected to reflect the notes and comments shown. Fabrication, manufacture or construction of the elements of work shown in the shop drawing may proceed, provided that work is in compliance with the notations shown on the shop drawings and the Contract Documents. Promptly resubmit the corrected shop or erection drawing for record.

c) REVISE and RESUBMIT indicates that the SER requires resubmission of the shop or erection drawing after correction per notes and comments. None of the elements of work shown on the shop drawing shall be fabricated, manufactured or constructed until the Contractor has received a returned shop drawing marked Approved or Approved as Noted.

d) NOT APPROVED indicates that the shop or erection drawing does not conform to the Contract Documents and must be extensively revised before re-submittal. None of the elements of work shown on the shop drawing shall be fabricated, manufactured or constructed until the Contractor has received a returned shop drawing marked Approved or Approved as Noted.

3. TYPE 2 – Delegated Design Review Stamp: For submittals for building elements which are not designed by the SER but are delegated design items, or for items that do not form part of the completed structural system but impose loads on the structure, or for construction items or activities which have an effect on the final structure. The responses on the stamp used by the SER require one of the following actions:

a) NO EXCEPTIONS indicates that the SER has found that the information presented on the submittal appears to conform to the requirements of the Contract Documents. Fabrication, manufacture or construction of the elements of work shown in the shop drawing may proceed, provided that work is in compliance with the Contract Documents.

b) EXCEPTIONS NOTED indicates that the SER requires the submittal be corrected to reflect the notes and comments shown. Fabrication, manufacture or construction of the elements of work shown in the shop drawing may proceed, provided that work is in compliance with the notations shown on the shop drawings and the Contract Documents. Promptly resubmit the corrected document for record.

c) REJECTED indicates that the SER requires resubmission of the submittal after correction per notes and comments. None of the elements of work shown on the shop drawing shall be fabricated, manufactured or constructed. Contractor to revise and resubmit until SER response of No Exceptions or Exceptions Noted is received.

D. Substitution Request

1. Requests for any departure from Contract Documents must be submitted in writing by the Contractor and accepted in writing by the Design Professionals, prior to receipt of submittals.
2. All substitutions must be requested using the structural substitution request form included at the end of this section. Acceptance using the structural substitution request form indicates acceptability of the structural concept only. Contractor

must submit shop drawings reflecting accepted substitutions for review in accordance with this Specification. The structural substitution request form, even if accepted, does not constitute a change order.

3. Accepted substitutions or modifications shall be coordinated and incorporated in the work at the sole expense of the Contractor.
4. The acceptance by the Design Professionals of a specific and isolated request by the Contractor to deviate from these requirements does not constitute a waiving of that requirement for other elements of, or locations in the project, unless specifically addressed as such and permitted by the Design Professionals in writing.
5. Compensation for Additional Services: Should additional work by Design Professionals such as design, documentation, meetings and/or site visits be required which are necessitated for the review and/or incorporation of the Contractor-requested substitution, including indirect effects on other portions of the work, the Contractor is responsible for paying for additional work performed by the Design Professionals at the standard billing rates plus out-of-pocket expenses incurred at cost + 10%. Additional costs for testing and inspection by the Owner shall also be compensated by the Contractor.
6. Contractor is responsible for means and methods and any impacts on other portions of the work that may arise from this substitution.

E. Request for Information (RFI)

1. RFIs shall be submitted by the Contractor. RFIs submitted by other entities will be returned with no response.
2. Limit RFI to one subject.
3. Submit RFI immediately upon discovery of the need for interpretation or clarification of the Contract Documents. Submit RFI within timeframe so as not to delay the Construction Schedule while allowing the full response time described below.
4. The response time for answering an RFI depends on the category in which it is assigned.

    a) Upon receipt by the SER, each RFI will be assigned to one of the following categories:

        i. No cost clarification
        ii. Shown in Contract Documents
        iii. Change to be issued in future document revision
        iv. Previously answered
        v. Information needs to be provided by others
        vi. Request for corrective field work
        vii. Request for substitution

    b) RFIs in the first five categories listed above will be turned around by the SER on average of five (5) working days.
    c) RFIs in the last two categories listed above will be immediately rejected and must be submitted as submittals or requests for substitution.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with General Conditions and Division 1.

B. Storage:

1. Store materials in accordance with ACI 304R.
2. Store cement in weather-tight buildings, bins or silos that will exclude moisture and contaminates.
3. Store admixtures to avoid contamination, evaporation, damage, and in accordance with manufacturer's temperature and other recommendations.
4. Keep packaged material in original containers with seals unbroken and labels intact until time of use.

C. Handling:

1. Handle fine and coarse aggregates as separate ingredients.
2. Arrange aggregate stockpiles to avoid excessive segregation, and prevent contamination with other materials or with other sizes of like aggregates.
3. Do not use frozen or partially frozen aggregates.
4. Allow sand to drain until it has reached relatively uniform moisture content before use.
5. Protect liquid admixtures from freezing and temperature changes that would adversely affect characteristics, and in accordance with manufacturer's recommendations.

1.8 PRE-CONCRETE CONFERENCE

A. At least 30 working days prior to the start of concrete construction, the Contractor shall hold a meeting to review the proposed concrete mix designs and to determine the procedures for producing proper concrete construction. The Contractor shall notify the Design Professionals of the meeting and require responsible representatives of every party who is concerned with the concrete Work to attend the conference, including but not limited to the following:

1. Contractor’s superintendent.
2. Testing Agency representative responsible for field quality control.
3. Concrete subcontractor.
4. Ready-mix concrete producer.
5. Admixture manufacturer(s).
6. Architect.
7. Structural Engineer.

B. Minutes of the meeting shall be recorded and distributed by the Contractor to all parties concerned within five working days of the meeting. One copy of the minutes shall also be furnished to the following:

1. Design Professionals.
2. Owner's Representative.

C. The minutes shall include a statement by the concrete contractor and admixture manufacturer(s) indicating that the proposed mix design and placing, finishing, and curing techniques can produce the concrete properties and quality required by these Specifications.

1.9 QUALITY ASSURANCE BY OWNER’S TESTING AGENCY

A. See Section 014500.

1.10 QUALITY CONTROL BY CONTRACTOR

A. The Contractor shall provide a program of quality control to ensure that the minimum standards specified herein are attained.

B. The Owner's general review during construction and activities of the Testing Agency are undertaken to inform the Owner of performance by the Contractor but shall in no way replace or augment the Contractor's quality control program or relieve the Contractor of total responsibility for quality control.

C. The Contractor shall immediately notify the Design Professionals of any deficiencies in the work which are departures from the Contract Documents. The Contractor shall propose corrective actions and their recommendations in writing and submit them for review by the Design Professionals. After proposed corrective action is accepted by the Design Professionals and Owner, the Contractor shall correct the deficiency at no cost to the Owner. Where the Contractor requests that the Design Professionals develop the corrective actions or review corrective actions developed by others, the Design Professional shall be compensated as outlined in the OBSERVATIONS AND CORRECTIONS BY DESIGN PROFESSIONALS section of this Specification.

D. Where SCC is used, the Ready Mix Producer shall have a Quality Control Representative on site during placements until mix consistency and stability is established.

1.11 OBSERVATIONS AND CORRECTIONS BY DESIGN PROFESSIONALS

A. Observations: The Design Professionals will observe the construction for general compliance with the provisions of the Contract Documents during various phases of construction.

B. Corrections by Design Professionals: See Part 3 - CORRECTIVE MEASURES section of this Specification.

1.12 PERMITS AND WARRANTY

A. Permits: The Contractor shall apply for, procure, renew, maintain, and pay for all permits required by City, State, or other governing authorities, necessary to execute work under this Contract. Contractor shall furnish copies of all permits to the Owner and Design Professionals.

B. Warranty: Comply with General Conditions, agreeing to repair or replace specified materials or work that has failed within the warranty period. Failures include but are not limited to the following:

1. Oily, waxy or loose residue which may interfere with the bonding or discoloration of various applied Architectural finish materials.
2. Discoloration of concrete surfaces scheduled to remain exposed as a finish.
3. Areas which show surface failure or defects.
4. Areas which puddle water.
5. Areas which are not properly prepared to receive Architectural finish materials. If necessary, the Contractor, at his own expense, shall have the Testing Agency perform appropriate tests for bond and discoloration.
6. Patches that become crazed, cracked or sound hollow when tapped.
7. Self-leveling concrete topping that has cracked, spalled and/or not performed in accordance with manufacturer's design criteria.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS AND PRODUCTION

A. Portland Cement:

1. ASTM C150, Type I or Type II
2. ASTM C150, Type III, High-early Strength Portland Cement may be used subject to review and approval of the SER. The specified 28-day concrete compressive strength shall occur within 7 days for concrete using Type III Portland Cement.
3. ASTM C150, Type V
4. Provide the same brand of Portland Cement from a single source throughout the project, as required to meet Design Professionals' requirements.
5. Provide Portland Cement that is uniform in color.

B. Aggregates for Normalweight Concrete:

1. ASTM C 33
2. Fine Aggregate: Natural sand, or sand prepared from stone or gravel, clean, hard, durable, uncoated and free from silt, loam and clay.
3. Provide aggregates from a single source throughout the project for exposed concrete.
4. Do not use fine or coarse aggregates that contain substances that cause spalling.
5. Maximum coarse aggregate size shall conform to the requirements as specified in ACI 301 but shall not exceed the following:

   Size no. 57 (25mm max) for footings, drilled piers and caissons
   Size no. 67 (20mm max) for all other locations

6. Contractor shall furnish concrete with maximum 3/8" (10mm) aggregate at no additional cost to the Owner if areas of high reinforcement density require it for placement and consolidation.

C. Aggregates for Lightweight Concrete:

1. ASTM C 330: Except aggregates prepared by processing natural materials, such as pumice, scoria, or tuff.
2. Classification of Aggregates: As required to meet Design Professional's requirements.
3. Provide aggregates from a single source throughout the project for exposed concrete.
4. Aggregate shall contain the minimum absorbed moisture content recommended by the manufacturer for the project prior to batching.
5. Maximum coarse aggregate size shall conform to the requirements as specified in ACI 301 but shall not exceed ¾" (20mm)

D. Water: ASTM C 1602. Clean, and free from injurious amounts of oil, acids, alkali, salts, organic material, or other deleterious materials.

E. Supplementary Cementitious Material

1. Fly Ash: ASTM C 618, Class C or Class F.
2. Slag Cement: ASTM C 989.

3. Silica Fume (Microsilica): ASTM C1240.

    a) Acceptable Products:

        i. Force 10,000 D by GCP Applied Technologies, Inc.
        ii. Eucon MSA by Euclid Chemical Company
        iii. MasterLife SF 100 by Master Builders Solutions
        iv. Sikacrete 950 DP by Sika Corporation

4. Metakaolin: ASTM C 618, Class N.

    a) Acceptable Products:

        i. MasterLife MK828 by Master Builders Solutions
        ii. HRMK 100 by GCP Applied Technologies, Inc.
        iii. Sikacrete M-100 by Sika Corporation

5. For concrete assigned to Exposure Classes F1 and F2, as defined in ACI 318, there is no limit to the maximum amount of supplementary cementitious materials included in the mix as a percentage of total cementitious materials by mass.
6. For concrete assigned to Exposure Class F3 as defined in ACI 318, limits to the maximum amount of supplementary cementitious materials included in the mix as a percentage of total cementitious materials by mass are as follows:

    a) Fly ash or other pozzolans conforming to ASTM C618 = 25%
    b) Slag cement = 50%
    c) Silica fume = 10%
    d) Total of fly ash or other pozzolans and silica fume = 35%
    e) Total of fly ash or other pozzolans, slag cement and silica fume = 50%
    f) The maximum percentage limits listed above shall include the supplementary cementitious materials used in the manufacture of ASTM C595 blended cements.

7. The fly ash or natural pozzolan supplier shall have an effective quality control program in place to guard against contamination of the fly ash and assure compliance with Specifications.
8. Supplementary Cementitious Materials shall be from one source throughout the project. Substitution of sources will be acceptable only if testing of concrete mixes containing the substituted material show similar test results and if the color of concrete produced with the substituted material matches the color of previously poured concrete to the satisfaction of the Architect.

F. Ready Mixed Concrete:

1. Shall be batch-mixed and transported in accordance with ASTM C 94.

2.2 CONCRETE MIX DESIGN

A. Concrete Strength:

1. Shall be as indicated on the Structural Drawings
2. Where concrete strength is not indicated on the drawings, the minimum concrete strength for exposure classes as defined in ACI 318 are as follows:

a) F0, S0, W0, C0, C1 = 2500 psi
b) F1 = 3500 psi
c) S1, W1 = 4000 psi
d) F2, S2, S3, = 4500 psi
e) F3, C2 = 5000 psi

B. Concrete Density (Unit Weight):

1. Shall be as indicated on the Structural Drawings

C. Air Entrainment

1. For concrete exposed to freeze/thaw cycles and/or deicing chemicals (ACI 318 Exposure Classes F1, F2, F3), and concrete intended to be watertight, provide entrained air content of 6% ± 1.5%, unless specified otherwise. This includes, but is not limited to, concrete at the following locations:

   a) Concrete at the exterior of the structure with at least one surface exposed to weather, such as exterior face of grade beams, foundation walls, exterior walls and parapets, exposed columns and edge beams.
   b) Floor framing and ramps in parking garages.
   c) Loading docks.
   d) Balconies and terraces with no waterproofing membrane.

2. For lightweight concrete less than 120 pcf (19 kN/m³) density, air content may be up to 7% regardless of exposure condition.
3. For concrete with a specified compressive strength (f'c) greater than 5000 psi (35MPa), required air content may be reduced to 5% ± 1.5%.
4. Entrained air content noted above shall occur at point of delivery.
5. No entrained air content is required for foundations with no surface exposed to weather.
6. All interior steel trowel finished, normal weight slabs shall have a maximum air content of 3%.

D. Water-Cementitious Material Ratio (w/cm) for Normalweight Concrete

1. The total combined weight of Portland cement and all other supplementary cementitious material shall be used to determine the w/cm.
2. The w/cm shall not exceed the values indicated below, including any water added to meet specified slump in accordance with the requirements of ASTM C 94.
3. Concrete used in structural slab on grade shall have a maximum w/cm ratio of 0.40.

E. Slump

1. Concrete design mixes shall be proportioned to meet the following slump limitations. Slump should be measured as described in the Testing Agency responsibilities:

   a) Concrete with high range or mid range water-reducing admixture: Concrete slump prior to addition of high range water-reducing admixture shall not exceed 3" +/- 1" (75mm) for normalweight concrete and 4" +/- 1"

(100mm) for lightweight concrete. After addition of water-reducing admixture, the concrete shall have a maximum slump of 9" +/- 1" (225mm) unless otherwise approved by the SER.

b) Concrete without a water-reducing admixture: Slump shall not exceed 4" +/- 1".

F. Chloride Ion Content

1. The total water-soluble chloride ion content of the mix including all constituents shall not exceed the limits defined in ACI 318 unless corrosion inhibiting admixtures are added to the mixture to offset the additional chloride.
2. If the specified level of water-soluble chloride ion content cannot be maintained, appropriate level of corrosion inhibiting admixture shall be added to the mix in accordance with the manufacturer's recommendation to offset the excess amount of chloride at no additional cost to the Owner.

2.3 ADMIXTURES

A. General:

1. Admixtures specified below can be used only when established in the mix design with Design Professionals' prior written approval.
2. Each admixture approved by Design Professionals shall be used in strict compliance with manufacturer's published instructions.
3. Concrete supplier shall certify all admixtures to be compatible with each other. (See Submittals Section in Part 1)

B. Air Entraining Admixture:

1. ASTM C 260
2. Acceptable Products:

a) MasterAir Series by Master Builders Solutions
b) Darex Series or Daravair Series by GCP Applied Technologies, Inc.
c) EUCON AEA –92 or EUCON Air Series by Euclid Chemical Company
d) AIR Series or AEA-14 by Sika Corporation

C. Water-Reducing Admixture:

1. ASTM C 494, Type A
2. Acceptable Products:

a) MasterPozzolith Series by Master Builders Solutions
b) EUCON NW or EUCON WR 91 by Euclid Chemical Company
c) WRDA Series, Zyla Series or Mira Series by GCP Applied Technologies, Inc.
d) Plastocrete Series by Sika Corporation

D. Retarding Admixture:

1. ASTM C 494, Type B
2. Acceptable Products:

a) MasterSet R Series or MasterSet DELVO Series by Master Builders Solutions
b) EUCON RETARDER 100 by Euclid Chemical Company
c) Daratard 17 by GCP Applied Technologies, Inc.
d) Plastiment Series by Sika Corporation

E. Non Corrosive Accelerating Admixture:

1. ASTM C 494, Type C
2. Acceptable Products:

a) MasterSet FP 20 or MasterSet NC 534 by Master Builders Solutions
b) ACCELGUARD 80, ACCELGUARD NCA or ACCELGUARD 90 by Euclid Chemical Company
c) Daraset" Series, Polarset, or DCI by GCP Applied Technologies, Inc.
d) Sikaset Series or Rapid-1 by Sika Corporation

F. Water-Reducing and Retarding Admixture:

1. ASTM C 494, Type D
2. Acceptable Products:

a) MasterSet R Series or MasterSet DELVO Series by Master Builders Solutions
b) EUCON RETARDER 75 or EUCON DS by Euclid Chemical Company
c) Daratard 17 or Recovery Series by GCP Applied Technologies, Inc.
d) Plastiment Series by Sika Corporation

G. Water-Reducing and Accelerating Admixture:

1. ASTM C 494, Type E
2. Acceptable Products:

a) MasterSet FP 20 by Master Builders Solutions
b) ACCELGUARD 80 or ACCELGUARD 90 by Euclid Chemical Company
c) Libricon NCA by GCP Applied Technologies, Inc.
d) Sikaset NC by Sika Corporation

H. Mid-Range Water-Reducing Admixture:

1. ASTM C 494, Type A
2. Acceptable Products:

a) MasterPolyheed Series by Master Builders Solutions
b) Daracem or Mira by GCP Applied Technologies, Inc.
c) Sikaplast Series or Sikament Series by Sika Corporation
d) Eucon MR or Eucon MRX by Euclid Chemical Company

I. High-Range Water-Reducing Admixture:

1. ASTM C 494, Type F
2. Acceptable Products:

a) MasterGlenium Series by Master Builders Solutions
b) EUCON 37 or PLASTOL SERIES by Euclid Chemical Company
c) Daracem or ADVA Series by GCP Applied Technologies, Inc.
d) Viscocrete Series or Sikament Series by Sika Corporation

J. High-Range Water-Reducing Admixture for production of Control Flow Concrete:

1. ASTM C494 Type A and F and ASTM C1017 Type I
2. Acceptable Product:

a) CONCERA SA8080 by GCP Applied Technologies, Inc.

K. High-Range Water-Reducing and Retarding Admixture:

1. ASTM C 494, Type G
2. Acceptable Products:

a) EUCON 537 by Euclid Chemical Company
b) Daracem Series or Adva Series by GCP Applied Technologies, Inc.

L. Workability Retaining Admixture:

1. ASTM C494, Type S
2. Acceptable Products:

a) MasterSure Z-60 by Master Builders Solutions
b) Visco Flow-2020 by Sika Corporation

M. Permeability-Reducing Admixture:

1. ASTM C494, Type S
2. Shall be a Portland cement based crystalline capillary waterproofing admixture that reacts in concrete to form non-soluble crystalline hydration products in the capillary pores of concrete,
3. Acceptable Products:

a) MasterLife 300D and 300C by Master Builders Solutions
b) Eucon Vandex AM-10 by Euclid Chemical Company
c) Admix C-Series by Xypex

N. Viscosity Modifying Admixture (VMA) for Self-Consolidating Concrete (SCC):

1. ASTM C 494, Type S
2. Acceptable Products:

a) MasterMatrix VMA Series by Master Builders Solutions
b) V-MAR3 by GCP Applied Technologies, Inc.
c) EUCON ABS or EUCON WO or VISCTROL by Euclid Chemical Company
d) Sika Stabilizer-4R by Sika Corporation

O. Corrosion Inhibiting Admixtures:

1. Calcium Nitrite Based: ASTM C 1582 and ASTM C 494, Type C, 30% + 2% solution

    a) Acceptable Products:

        i. DCI or DCI-Sby GCP Applied Technologies, Inc.
        ii. MasterLife CI 30 by Master Builders Solutions
        iii. EUCON CIA by Euclid Chemical Company
        iv. Sika-CNI by Sika Corporation

2. Amine Carboxylate Based: ASTM C 1582, which includes ASTM C-494 amine carboxylate

    a) Acceptable Product:

        i. MCI 2005, MCI 2005 NS, MCI 2006 or MCI 2006 NS by Cortec Corporation

3. Amino Alcohol Based:

    a) Acceptable Product:

        i. FerroGard 901 by Sika Corporation
        ii. MasterLife CI 222 by Master Builders Solutions

P. Shrinkage Reducing/Compensating Admixtures:

1. ASTM C 494, Type S
2. Acceptable Products:

    a) Eclipse Floor 200 or Eclipse 4500 (for use with air-entrained concrete) by GCP Applied Technologies, Inc.
    b) Conex or EUCON SRA Floor or EUCON SRA-XT (for use with air-entrained concrete) by Euclid Chemical Company
    c) MasterLife SRA Series or MasterLife CRA 007 by Master Builders Solutions
    d) SikaControl 75 by Sika Corporation
    e) PREVent-C by PremierCPG

Q. Alkali-Silica Reaction Inhibiting Admixture:

1. ASTM C 494, Type S
2. Shall contain a nominal lithium nitrate content of 30 percent.
3. Dosage to be determined in accordance with US Army COE CRD-C662
4. Acceptable Products:

    a) MasterLife ASR 30 by Master Builders Solutions
    b) Eucon Integral ARC by Euclid Chemical Company
    c) RASIR by GCP Applied Technologies

R. Porosity Inhibiting Admixture:

1. ASTM C494, Type S

2. Sodium silicate free
3. Manufacturer must be able to provide a flooring adhesion guarantee and life of the concrete vapor transmission warranty. In order to obtain warranty, product must be installed in compliance with the manufacturer's published data sheet including but not limited to proper on-site representation, mix design review, concrete testing and installation of vapor retarder for slabs on ground.
4. Acceptable Products:

    a) Barrier One by Concrete Moisture Solutions, Inc.
    b) MVRA 900 by ISE LOGIK Industries

S. Carbon Dioxide ($C0_2$) Mineralization:

1. Where called for on the drawings or when approved by the SER, provide concrete that has undergone carbonization treatment with carbon dioxide ($C0_2$) during mixing, such that $C0_2$ is chemically mineralized into the concrete.
2. $C0_2$ injected into the mix must be post-industrial $C0_2$ sourced from a nearby emitter. Provide concrete producer's certificate outlining quantity, location and supplier of $C0_2$.
3. Acceptable Product:

    a) Carbon Cure by CarbonCure Technologies.

2.4 ADHESIVES

A. Epoxy Bonding Agent for bonding hardened concrete to hardened concrete (existing concrete damp or dry, at least 28 days old, no surface water):

1. ASTM C 881 Type IV, Grade 1, 2 or 3, Class B or C as appropriate for field temperature conditions.
2. Acceptable Products:

    a) Acceptable Product: Dural 452 Series by Euclid Chemical Company
    b) Rezi-Weld 1000 by W. R. Meadows
    c) Sure Bond J58 by Dayton Superior

B. Epoxy Bonding Agent for bonding freshly mixed concrete to hardened concrete (existing concrete damp or dry, less than 28 days old, no surface water):

1. ASTM C 881, Type V, Grade 1, 2, or 3, Class B or C as appropriate for field temperature conditions.
2. Acceptable Products:

    a) Sikadur 32 Hi-Mod by Sika Corporation

C. Anti-Corrosive Epoxy Modified Cementitious Bonding Compound and Corrosion Protection of Reinforcement (bonding agent for existing concrete saturated surface dry, no surface water):

This adhesive shall be a water-based epoxy/cementitious compound for adhesion and corrosion protection of reinforcing members (20 hour maximum open time).

1. Acceptable Products:

a) DURALPREP AC by Euclid Chemical Company
b) ARMATEC 110 EpoCem by Sika Corporation
c) MasterEmaco P124 by Master Builders Solutions
d) Perma Prime 3C by Dayton Superior

2.5 CURING COMPOUNDS AND SEALERS

A. Interaction with finishes:

1. See architectural Drawings for finish material applied over concrete.
2. Use only curing and sealer compounds that are compatible with finish, waterproofing or roofing material.

B. Curing and Sealing Compound (VOC Compliant, 350 g/l) :

1. ASTM C1315, Type I, Class A and/or ASTM C 309, Type 1, Class A or B
2. Water based acrylic, clear, 25% solids curing and sealing compound.
3. Acceptable Products:

a) Super Diamond Clear VOX by Euclid Chemical Company
b) Cure & Seal 1315 J22WB by Dayton Superior
c) VOCOMP-25 by W. R. Meadows
d) Dress & Seal WB 30 or Lumiseal WB by Laticrete International, Inc.
e) MasterKure CC 1315WB by Master Builders Solutions**]**

C. Curing Compound-Dissipating/Strippable (VOC Compliant, 350 g/l):

1. ASTM C 309, Type I, Class A or B
2. Water based resin, clear curing compound that begins to dissipate when exposed to UV light and traffic.
3. Acceptable Products:

a) Kurez DR VOX by Euclid Chemical Company
b) Clear Resin Cure J11W by Dayton Superior
c) 1100 by W. R. Meadows

D. Surface Applied Vapor Emission Mitigation

1. Shall conform to state and federal VOC regulaions with zero VOC content.
2. Shall provide a 15 year warranty against flooring failure due to negative-side moisture vapor migration of moisture-born alkalinity.
3. Acceptable Products:

a) CS2000 by Creteseal

E. Liquid Densifier/Sealer:

1. The liquid densifier compound shall be a silicate based compound that penetrates and chemically hardens concrete surfaces.
2. Acceptable Products:

a) Euco Diamond Hard by Euclid Chemical Company
b) Acceptable Product: Dayton Superior “Densifier J13”

c) MasterKure HD 200WB by Master Builders Solutions
d) Liqui-Hard by W. R. Meadows

F. Evaporation Retarder:

1. Acceptable Products:

a) MasterKure ER50 by Master Builders Solutions
b) Eucobar by Euclid Chemical Company
c) Sika Film by Sika Corporation

2.6 DRY SHAKE HARDENERS

A. Mineral Aggregate Hardener:

1. The specified mineral aggregate hardener shall be a factory-blended mixture of specially processed graded non-metallic aggregate.
2. Acceptable Products:

a) Euclid Chemical Company, "Surflex" to be used with “Kurez DR VOX”
b) MasterTop 100 to be used with “MasterKure CC 200WB by Master Builders Solutions
c) Quartzplate FF to be used with Dress & Seal WB 30 by Laticrete International, Inc.

B. Non-Oxidizing Metallic Hardener:

1. The specified non-oxidizing metallic floor hardener shall be a mixture of specially processed non-rusting aggregates.
2. Acceptable Products:

a) Euclid Chemical Company, “Diamond-Plate” to be used with “Kurez DR VOX”
b) MasterTop 210COR to be used with “MasterKure CC 200WB by Master Builders Solutions
c) Emeryplate FF to be used with Lumiseal WB by Laticrete International, Inc.

2.7 MISCELLANEOUS CONCRETE AND CONCRETE RELATED PRODUCTS

A. Cementitious Non-Shrink Grout:

1. Provide pre-packaged high-precision, non-shrink, non metallic grout.
2. See General Notes for grout minimum compressive strength.
3. ASTM C 1107
4. Acceptable Products:

a) MasterFlow 928 by Master Builders Solutions
b) Dry Pack Grout or HI-FLOW GROUT by Euclid Chemical Company
c) Five Star Grout by Five Star Products
d) Sikagrout 328 by Sika Corporation
e) Duragrout by Latticrete International, Inc.

B. Moisture-Retaining Covers:

1. ASTM C171
2. A naturally colored, non-woven polypropylene fabric with a non-perforated reflective polyethylene coating containing stabilizers to resist degradation from ultraviolet light. Fabric shall exhibit low permeability and high moisture retention.
3. Acceptable Products:

    a) Hydracure S-16 by PNA Construction Technologies, Inc.
    b) Transguard 4000 by Amorlon a Division of Reef Industries , Inc.
    c) UltraCure NCF by Sika Corporation
    d) Top Cure by Transhield

C. Expanded Polystyrene (EPS) used as Fill - Geofoam

1. Material: Rigid, closed cell polystyrene blocks formed by expansion of polystyrene beads by steam.
2. Comply with the requirements of ASTM D 6817
3. Unless noted otherwise on the drawings, provide the following types of EPS:

    a) Fill between a lower slab and a raised slab area: EPS12 -2.2 psi (15 kPa) compressive resistance minimum at 1% deformation, 10 psi (70 kPa) flexural strength minimum
    b) Fill below exterior floor slabs or slabs with truck loading: EPS19 - 5.8 psi (40 kPa) compressive resistance minimum at 1% deformation, 30 psi (200 kPa) flexural strength minimum

4. Thickness as indicated on Drawings.
5. Execution: Conform to manufacturer's instructions regarding preparation, installation and protection
6. Gripper plates shall be used as needed to restrain EPS from moving laterally in multi-layer applications
7. Contractor shall sequence soil or concrete topping placement to avoid EPS block shift or flotation.
8. Submit the following for review:

    a) Manufacturer's product literature including physical properties in compliance with ASTM D 6817 and type specified
    b) 10 year physical property warranty

9. Submit the following for record:

    a) Summary of test compliance with specified performance characteristics and physical properties
    b) Product Certificates showing evidence of third party quality control

10. Acceptable Manufacturers:

    a) ACH Foam Technologies
    b) Atlas EPS
    c) Universal Construction Foam

D. Vapor Retarder: See Division 7, Thermal and Moisture Protection

1. Minimum 15-mil thick polyolefin membrane

2. Manufactured with prime virgin resins
3. Water Vapor Retarder: ASTM E 1745, meets or exceeds Class A
4. Water Vapor Transmission Rate: ASTM E 96, 0.008 gr./ft2/hr. (0.086 gr./m²/hr) or lower
5. Permeance Rating: ASTM E 96, 0.03 Perms or lower for new material and after conditioning tests in accordance with applicable sections of ASTM E 154
6. Puncture Resistance: ASTM E 1745, minimum 2200 grams
7. Tensile Strength: ASTM E 1745, minimum 45.0 lbs./in (8.0 kg/cm).
8. Acceptable products:

    a) Floprufe 120 by GCP Applied Technologies, Inc.
    b) Perminator by W. R. Meadows
    c) Stego Wrap by Stego Industry LLC
    d) Raven Vapor Block 15 by Raven Industries
    e) Husky Yellow Guard 15 Mil by Poly-America]

2.8 CONCRETE REPAIR MATERIALS

A. Polymer-Modified Repair Mortar

1. The following patching mortars may be used when color match of the adjacent concrete is not required. Prior approval by the Design Professionals is required.
2. Acceptable Products-Horizontal Surfaces:

    a) Tammspatch II or Tamms Thin Patch by Euclid Chemical Company
    b) Sikatop 122 Plus by Sika Corporation
    c) Meadow-Patch T1 or T2 or Meadow-Crete GPS by W. R. Meadows
    d) Duracrete by Laticrete International, Inc.

3. Acceptable Products-Vertical and Overhead Surfaces:

    a) MasterEmaco N400 by Master Builders Solutions
    b) Verticoat, Vertacoat Supreme or Dualtop Gel by Euclid Chemical Company
    c) SikaTop 123 Plus by Sika Corporation
    d) Meadow-Crete GPS by W. R. Meadows

B. Crack Repair:

    a) Euco Qwikstitch or Dural 50 LM by Euclid Chemical Company
    b) MasterSeal 630 by Master Builders Solutions
    c) T78 Methyl Methacrylate Crack Sealer by Transpo Industries, Inc.

C. High Strength Flowing Repair Concrete:

1. For forming and pouring large volume repairs, provide shrinkage compensated repair concrete with integral corrosion inhibitor.
2. Minimum compressive strength 8000 psi (56MPa) @ 28-days
3. Prior approval by the Design Professionals is required for cold weather applications
4. Acceptable Products:

    a) Eucocrete by Euclid Chemical Company

b) MasterEmaco S 466 CI by Master Builders Solutions
c) Meadow-Crete FNP by W. R. Meadows

D. Epoxy Injection:

1. ASTM C881
2. Acceptable Products:

a) MasterInject 1380 by Master Builders Solutions
b) Dural Injection Gel by Euclid Chemical Company
c) Sikadur 35 LV LPL by Sika Corporation
d) Rezi-Weld LV State by W. R.Meadows

E. Pressure-Injected Foam Resin:

1. Acceptable Products:

a) De Neef Sealform PURe by GCP Applied Technologies
b) Crack-Pac Flex-H2O by Simpson Strong-Tie
c) SikaFix HH LV by Sika Corporation

F. Semi Rigid Joint Filler:

1. Acceptable Products:

a) MasterSeal CR 190 by Master Builders Solutions
b) Euco 700 or Qwikjoint UVR by Euclid Chemical Company
c) MM-80 by Metzger/McGuire
d) Rezi-Weld Flex by W. R, Meadows

G. Methyl Methacrylate (MMA)

1. Acceptable Products:

a) MasterSeal 630 by Master Builders Solutions
b) Transpo Industries, Inc. “T-78 Methyl Methacrylate Polymer Crack Healer/Sealer”
c) MMA #884 by Epoxy Systems

H. Sealant:

1. Silicone or Polyurethane Sealant (as selected based on project requirements such as loading, traffic, bond, coatings, etc.).
2. Joint to be routed and cleaned per manufacturer’s written directions.
3. Acceptable Products:

a) MasterSeal Sealants by Master Builders Solutions
b) Sikaflex-1C SL and Loadflex 524 EZ by Sika Corporation
c) Pourthane NS by W. R. Meadows
d) Eucolastic 1NS by Euclid Chemical Company

PART 3 - EXECUTION

3.1 TOLERANCES

A. Work shall conform to all requirements of ACI 117 except as modified by more stringent requirements in the Project Specifications and/or Drawings.

3.2 PREPARATION

A. Subgrade:

1. Dampen subgrades not covered with membrane by sprinkling immediately before placing concrete.

    a) Omit when subgrade is already damp.

2. Do not place on water-saturated subgrade unless placing can be done without damage to subgrade (surface is stable) and loading the subgrade does not drive free water to the surface.
3. Do not place concrete on frozen ground.

B. Forms:

1. Coordinate with Section 031000 Concrete Formwork.
2. Remove dirt, sawdust, nails and other foreign material from formed space.
3. Dampen wood forms by sprinkling immediately before placing.
4. Cool metal forms by sprinkling immediately before placing.

C. Concrete Accessories:

1. Coordinate with Section 031000 Concrete Formwork.

D. Dewatering:

1. Remove water from concrete formwork.
2. Divert any flowing water to sump and remove by pumping.
3. Refer to Division 1 for additional dewatering requirements.

E. Vapor Retarder Placement: See Division 7, Thermal and Moisture Protection.

1. Vapor retarder installation shall be in accordance with manufacturer’s instructions and ASTM E 1643.
2. Place vapor retarder under slabs-on-grade in position with longest dimension parallel with direction of pour.
3. Joints: Lap 6" (150mm) minimum and seal with manufacturer’s recommended mastic or pressure-sensitive tape.
4. Prevent damage to moisture barrier.
5. If moisture barrier is damaged, place a piece of moisture barrier over damaged area (6" (150mm) larger all around) and tape in place with type of tape recommended by moisture barrier manufacturer.
6. Seal laps and intersections of walls with compatible trowel mastic or pressure-sensitive sealing tape.
7. Seal around pipes and other penetrations with compatible trowel mastic.
8. The vapor barrier installation must be approved prior to concrete placement.

3.3 JOINTS IN CONCRETE

A. Locate construction and contraction joints as indicated on Drawings and on approved joint location submittal.

1. Do not use contraction joints in framed floors or composite slabs.
2. Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Design Professionals.
3. Coordinate location of construction and contraction joints with locations of joints in finish materials where they exist.

    a) Construction and contraction joints in slabs or slab on grade with terrazzo finish must be reviewed and approved by the Design Professionals.

4. Maximum joint spacing is as indicated on Drawings.

B. Construction Joints:

1. Construction joints shall be located within the central third of the span. Any concrete spilling over or through the bulkhead shall be removed at the completion of the pour. All surfaces of the concrete shall have reinforcing extending through the joint.
2. Horizontal Joints: Horizontal construction joints other than those shown on the Drawings will not be permitted unless approved by the Architect.
3. Joint Preparation: Forms shall be removed in time to permit roughening of construction joints of structural members by chipping and wire brushing to remove all loose and foreign material and roughen as indicated on the Drawings. The existing concrete at joints shall either be (a) dampened to the point that the surface is saturated, but all standing water has been removed, promptly followed by placement and vibration of fresh concrete, or (b) not required to be dampened, with one of the specified bonding compounds applied as appropriate for the joint condition, following manufacturer recommendations, with placement and vibration of fresh concrete to follow while the epoxy bonding agent is still tacky. Joints without epoxy bonding agent require fresh concrete with slump 7 inches (180mm) or greater at horizontal joints, and fresh concrete confined to maintain pressure against the joint at vertical joints. Where such conditions are not present, or where applying water to dampen the surface is impractical, use epoxy bonding agent suitable for dry surfaces

C. Isolation Joints:

1. Interrupt structural continuity resulting from bond, reinforcement or keyway at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls and other locations, as indicated.

D. Contraction Joints in Floor Slabs-on-Grade:

1. Maximum slab area controlled by jointing is 400 square feet (35 square meters).
2. Space joints at 36 times slab thickness unless a smaller spacing is indicated on the Drawings, located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
3. Contraction joints can be provided by sawcuts, formed joints or appropriately detailed construction joints.

4. Sawcuts shall be made as soon as possible after slab finishing as may be safely done without dislodging aggregate. The Soff-Cut saw shall be used to a depth of ¼ of slab thickness immediately after final finishing. Conventional saw shall be used as soon as possible after final finish without raveling to a depth as indicated on the Drawings.
5. Where contraction joints coincide with construction joints, detail joint as indicated on Drawings.

E. Joint Fillers: Coordinate with Section 032000 Concrete Reinforcement and Embedded Assemblies and Division 7 requirements.

3.4 MIXING

A. Measurement of Materials: Conforming to ASTM C 94.

B. Mixing: All concrete shall be ready-mixed conforming to ASTM C 94 except as follows:

1. Provide concrete materials, proportions and properties as herein specified in lieu of ASTM C 94.
2. Water, beyond that required by the mix design, shall not be added at the Project site. Addition of water at the Project site shall be made only in the presence of the Testing Agency.
3. Furnish delivery ticket with each load of concrete delivered to the site to the Contractor conforming to the requirements of ASTM C 94.

C. High range water reducing agents (superplasticizer), if added at the batch plant, may be added again at the Project site.

1. If superplasticizers are added at the batch plant, the concrete mix design must account for the delivery time, workability, finishability, and setting time required on the jobsite for proper placing and finishing procedures.
2. If the superplasticizer is redosed at the jobsite in air entrained concrete, air content must be checked after mixing.

D. Discharge of the concrete shall be completed within 1-1/2 hours , after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. If the 1-1/2 hour limit cannot be achieved due to project location or other project specific conditions, hydration control measures to extend the proper workability up to 4 hours maximum can be proposed for approval by the SER. The increased time period along with redosing of the high range water reducer and/or use of hydration controlling/workability retaining admixtures should be agreed upon at the pre-concrete conference.

3.5 CONCRETE PLACEMENT

A. Prior to Concrete Placement:

1. Mechanical vibrators are required and must be available for placing concrete.
2. Remove debris from space to be occupied with concrete.
3. Notify Design Professionals and Testing Agency 48 hours prior to starting concrete placement.
4. Approved mix designs must be maintained on file in Contractor's Field Office.

5. Reinforcement and accessories shall be in proper locations, clean, free of loose scale, dirt or other foreign coatings that may reduce bond to concrete, and in accordance with Section 032000 and Drawings.
6. Do not place concrete having a slump outside of allowable slump range.
7. Place concrete before initial set has occurred, but in no event after it has been discharged from the mixer more than 30 minutes. All concrete shall be placed upon clean, damp surfaces, free from puddled water, or upon properly consolidated fills or upon Controlled Low-Strength Material with a strength between 50 and 1200 psi. Placement upon soft mud or dry earth is not permitted.
8. Unless adequate protection is provided, concrete shall not be placed during rain.
9. Rain water shall not be allowed to increase mixing water or to damage the surface finish.
10. At surfaces left exposed to view, do not use equipment in placing and finishing concrete that contain aluminum in the finishing edges that come in contact with the concrete surface.
11. Keep subgrade moisture uniform without puddles or dry areas.
12. Place vapor retarder directly below slabs on grade as specified in Contract Documents.

B. For Conduits and Pipes Embedded in Concrete:

1. For concrete slab, wall, beam or column, conform to requirements of ACI 318. For variations from these requirements, submit a written request for Design Professionals' review and response.
2. Conduits and pipes shall not be embedded in concrete slabs on steel deck without approval of Design Professional.
3. Provide sleeves for pipes passing vertically through concrete.
4. Do not embed aluminum materials.
5. Do not cut, bend or displace the reinforcement to facilitate placement of embedded pipes and conduits.

C. Pumping: Pumping shall be done in strict accordance with ACI 304.2R.

D. Placing Concrete in Forms:

1. Clean and prepare forms as specified in Section 031000/Concrete Formwork.
2. Place concrete continuously without interruption between predetermined construction and contraction joints in walls.
3. Deposit concrete in forms in horizontal layers no deeper than 24” (600mm) and in a manner to avoid inclined construction joints.
4. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
5. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping.

    a) Use equipment and procedures for consolidation of concrete in accordance with ACI 309R.

6. Do not use vibrators to move fresh concrete laterally inside forms from discharge point; shift discharge point as needed.
7. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine.

8. Place vibrators to rapidly penetrate placed layer and at least 6" (150mm) into preceding layer.
9. Do not insert vibrators into lower layers of concrete that have begun to set.
10. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
11. Do not vibrate Self-Consolidating Concrete (SCC).

E. Placing Concrete Slabs:

1. Place concrete continuously without interruption between predetermined construction and contraction joints in floors.

    a) Place slabs on grade by the long strip cast method. Refer to ACI 302.1R for recommended methods of placement.

2. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
3. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
4. Bring slab surfaces to correct level with a straightedge and strike off.

    a) Use highway straight edges, bullfloats or darbies to smooth surface free of humps or hollows.
    b) Do not disturb slab surfaces prior to beginning finishing operations.

5. Maintain reinforcing in proper position on chairs during concrete placement.
6. Do not place materials on slabs or impose loads during period of setting.

F. Placing Concrete on Steel Decks

1. Exercise care during concrete placement on steel decks to prevent concentrated loads or high pile-ups of concrete and to avoid impacts caused by dumping or dropping of concrete on steel decks.
2. Do not use buggies on unprotected areas of deck. If buggies are used to place concrete, furnish and install planked runways to protect deck from damage.

G. Placing Concrete at Construction Joints:

1. To secure full bond at construction joints, surfaces to receive concrete in a subsequent placement shall be left in a roughened state or intentionally roughened by raking while plastic or brushing and chipping immediately after removal.
2. Before new concrete is placed in contact, surfaces of hardened concrete already placed shall be thoroughly cleaned of foreign materials and laitance.
3. At hardened concrete at joints where no bonding agents are used, dampen concrete to achieve a saturated surface dry condition. Leave no standing water. Place and vibrate concrete (slump 7 inches (180mm) or greater) against horizontal joints. Place and vibrate flowing concrete (slump 8 to 10 inches (200 to 250mm)) while maintaining pressure against vertical joints by confinement.
4. At hardened concrete with joints not meeting conditions required for no bonding agents, apply appropriate specified bonding agent for conditions present including age and moisture per manufacturer’s specifications. Place new concrete while the bonding agent is still tacky.

H. Cold-Weather Placement:

1. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306R and as specified in this section.
2. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C), and not more than 80°F (27°C), at point of placement.
3. Do not use frozen materials or materials containing ice or snow.

    a) Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

4. Remove frost, snow and ice from forms, reinforcement and other embedments immediately prior to concrete placement.
5. Use only the specified non-corrosive accelerating admixture previously approved as part of the cold weather mixture. Addition of calcium chloride, salt, thiocyanates or admixtures containing more than 0.05 percent chloride ions is not permitted.
6. Freeze Resistant Concrete per ASTM C1622 and Chapter 9 of ACI 212.3R may be used if approved by SER. The contractor shall prepare a plan for placing, finishing and curing procedures that assure the specified hardened properties are achieved.

I. Hot-Weather Placement:

1. Hot weather is defined as air temperature which exceeds 90°F (32°C) or any combination of high temperature, low humidity and/or high wind velocity which causes a rate of evaporation in excess of 0.2 pounds per square feet per hour (1.0 kg/m² per hour) as determined by ACI 305R.
2. When hot weather conditions exist that would impair quality and strength of concrete, place concrete in compliance with ACI 305R and as specified in this section.
3. Cool ingredients before mixing to maintain concrete temperature at time of placement below 95°F (35°C).
4. Mixing water may be chilled, or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
5. Use of liquid nitrogen to cool concrete is Contractor's option.
6. Fog spray forms, reinforcement, and subgrade just before pouring concrete.
7. When concrete placement will occur late in the day and reinforcing steel will be heated by the sun, cover reinforcing steel with water-soaked burlap so that steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
8. When concrete operations must be performed in direct sun, wind, high temperatures, low relative humidity, or other adverse placing conditions, the specified evaporation retarder shall be applied one or more times during the finishing operation to prevent plastic cracking.

3.6 CONCRETE FINISHES

A. General:

1. Comply with recommendations for concrete finishing established by ACI 302.1R and ACI 304R.
2. Comply with dimensional tolerance limitations given by ACI 117.
3. For shored floor or slab on grade construction: Floor flatness/floor levelness tolerance compliance testing is to be performed prior to the removal of shores and forms but not later than 72 hours of concrete placement by Testing Agency.
4. See architectural Drawings for locations of the various finishes listed below.
5. Comply with the specified overall SOF_F and SOF_L values listed below:

    a) The specified overall area shall be each individual floor.
    b) F_F/F_L shall be measured in accordance with ASTM E 1155.
    c) The specified minimum local values of MLF_F/MLF_L shall be 3/5 of the SOF_F/SOF_L values listed below.
    d) If an individual test section measures less than either of the specified minimum local MLF_F/ MLF_L numbers, that section may be rejected and remedial measures may be required as specified in CONCRETE SURFACE REPAIRS.
    e) If the composite value of the test surface measures less than either of the specified overall SOF_F/SOF_L numbers, then the entire slab may be rejected and remedial measures may be required.
    f) F_L numbers shall only apply to supported slabs if the tested with all of the original shoring in place, prior to shoring removal/reshoring.
    g) F_L numbers shall not apply to unshored slabs or shored slabs with camber.

B. Finish for monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious finish flooring material, as indicated on architectural Drawings:

1. Scratch Finish.

    a) Finish surface to overall value of SOF_F=20 and SOF_L=15.
    b) Slope surfaces uniformly to drains where required.
    c) After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

C. Finish for monolithic slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, sand-bed terrazzo as indicated on architectural Drawings:

1. Float Finish.

    a) After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.
    b) Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both.
    c) Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.
    d) Finish surfaces to overall value of SOF_F=20 and SOF_L=15.
    e) Cut down high spots and fill low spots.
    f) Uniformly slope surfaces to drains.
    g) Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

D. Finishes for Pedestrian Sidewalks and Ramps, Exterior Platforms, Steps, as indicated on architectural Drawings:

1. Sidewalks and Curbs: Light-to-medium broom finish applied with fiber-bristle broom perpendicular to direction of main traffic route immediately after float finishing.
2. Ramps: Scored finish as applied perpendicular to direction of main traffic route immediately after float finishing.
3. Finish surface to overall value of SOF_F=20 and SOF_L=15.
4. Texture shall be approved by the Design Professionals from sample panels.

E. Finish for interior floor slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, paint or another thin film-finish coating system, as indicated on architectural Drawings:

1. Trowel Finish.
    a) After floating, begin first trowel-finish operation using a power-driven trowel.
    b) Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
    c) The final hand-troweling operation shall result in a smooth surface, free of trowel marks, uniform in texture and appearance.
    d) Grind smooth any surface defects that would telegraph through applied floor covering system.
2. Finish surface to overall value of SOF_F=25 and SOF_L=20.
3. Floor Slopes: Where drains occur, slope floor slabs uniformly to drains, maintaining scheduled slab thickness.
4. Floor Edges at Expansion Joints: Tool edges minimum 3/8" (10mm).
5. Defects: Remove defects of sufficient magnitude to show through floor covering by grinding.
6. Floor Hardener: Use only where scheduled and in accordance with manufacturer's published instructions.
7. Dry Cement: Shall not be used during finishing.

F. Finish for thin set ceramic tile or thin set epoxy terrazzo, as indicated on architectural Drawings:

1. Trowel and Fine Broom Finish:
    a) Apply a trowel finish as specified.
    b) Immediately follow by slightly scarifying the surface with a fine broom.
2. Finish surface to overall value of SOF_F=35 and SOF_L=25.

G. Finishes for Parking Garage Deck, Ramps, Loading Docks:

1. Highway straight edge immediately after screeding concrete.
2. Finish surface to overall values of SOF_F=20 and SOF_L=15. SOF_L should not be tested for parking slabs that include inclined surfaces or planned changes in floor surface slope.

3. For Slabs Not Receiving Deck Coating: Medium broom finish with ridges not to exceed 1/8" (3mm) in height. Texture shall be as approved by the Design Professionals from sample panels.
4. For Slabs Scheduled to Receive Deck Coating: Smooth floated finish which must be verified with coating manufacturer before finishing the slab.

    a) Coordinate with deck coating specified in Division 7.

5. Auto Ramps: Rough texture applied perpendicular to direction of traffic. Texture shall be as approved by the Design Professionals from sample panels.

H. Finishes Equipment and Housekeeping Pads

1. Coordinate finish surface to meet equipment manufacturer requirements, if any, for flatness and levelness.

I. Tolerances at Slab Discontinuities

1. Within 2 ft (600mm) of slab boundaries, construction joints, isolation joints, block-outs, penetrations or other similar discontinuities, where required for travel paths, installation of finishes and partitions, or any other requirements indicated in the Contract Documents, the following equivalent straightedge tolerances shall apply:

    a) Specified local MLF_F = 12, use ¼” (6mm) over 4 ft (1200mm), no offset greater than 1/16” (2mm)
    b) Specified local MLF_F = 15, use 1/8” (3mm) over 4 ft (1200mm), no offset greater than 1/32” (0.8mm)

J. Dry Shake Finish:

1. Non-slip aggregate where indicated on Drawings.
2. Non-oxidizing metallic hardener on loading docks at a rate of 1.5 lbs. per sq. ft. (7.3 kg/m²) and in other locations so noted on the Drawings.
3. Mineral aggregate hardener at a rate of 1.2 lbs. per sq. ft. (5.8 kg/m²) where noted on the Drawings.
4. Final finish type, method and tolerance as applicable by location and use.
5. Dry shake finish will be applied in accordance with the manufacturer's published instructions and the methods and procedures agreed upon at the pre-installation conference.

K. Rough Formed Finish:

1. Acceptable for formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated.
2. Concrete surface shall have texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4” (6mm) in height rubbed down or chipped off.

L. Architectural Concrete Finish:

1. Using self-consolidating concrete, provide smooth, uniform finish upon form removal with no patching, stoning or other form of repair except washing

permitted unless otherwise noted for surfaces exposed to view. The surface shall match the approved jobsite mock-up panel.

M. Smooth Formed Finish:

1. Required for formed concrete surfaces exposed to view, or scheduled to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system, as indicated on architectural Drawings:
2. Surface is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
3. Repair and patch tie holes and defects. Remove fins and other projections completely.

N. Smooth Rubbed Finish:

1. "Smooth Rubbed" finish shall consist of a finish free of fins, joint marks smoothed off, blemishes removed and surfaces left smooth and unmarred.
2. Provide smooth rubbed finish to scheduled concrete surfaces, as indicated on architectural Drawings, which have received smooth form finish treatment not later than one day after form removal.
3. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced.

    a) Do not apply cement grout other than that created by the rubbing process.

O. Grout-Cleaned Finish:

1. Provide grout-cleaned finish on scheduled concrete surfaces, as indicated on architectural Drawings, that have received smooth-formed finish treatment.
2. Combine one part Portland Cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint.
3. Blend standard Portland Cement and white Portland Cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.
4. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes.
5. Remove excess grout by scraping and rubbing with clean burlap.
6. Keep surface damp by fog spray for at least 36 hours after rubbing.

P. Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.7 CURING AND PROTECTION

A. Normal Conditions:

1. Protect concrete from premature drying, excessive hot or cold temperature, and damage.
2. Concrete shall be kept continuously moist and above 50°F (10°C) for seven days (ASTM C 150 Type I cement) or for 10 days (ASTM C 150 Type II cement). High early strength concrete usage shall be maintained over 50°F (10°C) for 10 days.
3. Concrete and concrete patching materials shall be cured according to manufacturers published recommendations.
4. Begin curing as soon as free water has disappeared from concrete surface and finishing has been completed.
5. Curing Methods: Cure concrete by curing compound, moist curing, moisture-retaining cover curing, or by combining these methods, as specified. Under extreme hot/dry or windy/dry conditions, moist curing and/or moisture-retaining cover curing should be used.

a) Curing compound is an acceptable form of curing if all of the following requirements are met:

i. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). In accordance with all manufacturer’s instructions.
ii. Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions.
iii. Recoat areas subjected to heavy rainfall within 3 hours after initial application.
iv. Maintain continuity of coating and repair damage during curing period.
v. Use curing and sealing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
vi. Floors to receive covering shall be cleaned thoroughly using a power scrubber and industrial strength detergent. Hand-brooming and sweeping is not sufficient.
vii. Strippable curing compound may be used in lieu of a moist curing method when approved by the Design Professionals.

b) Provide moist curing by the following methods:

i. Keep concrete surface continuously wet by covering with water.
ii. Use continuous water-fog spray.
iii. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4” (100mm) lap over adjacent absorptive covers.

c) Provide moisture-retaining cover curing as follows:

i. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends

lapped at least 3” (75mm) and sealed by waterproof tape or adhesive.

(1) Immediately repair any holes or tears during curing period using cover material and waterproof tape

6. Cure slabs on grade, concrete toppings, concrete pour strips, supported slabs, walls and columns, not subject to conditions of hot or cold weather concreting, in accordance with ACI 308.
7. Cure surfaces exposed to deicing salts, brackish water, etc., such as loading dock slabs, parking garage slabs and ramps in accordance with ACI 308 recommendations for moist curing.
8. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by leaving forms in place for the full curing period (equivalent to moist curing).

a) If forms are removed prior to completion of full curing period, continue curing by methods specified above for Unformed Surfaces, as applicable.

B. Cold-Weather Protection:

1. When concrete is placed under conditions of cold weather concreting (defined as a period when the mean daily temperature drops below 40°F (4°C) for more than 3 successive days), take additional precautions as specified in ACI 306R when placing, curing, monitoring and protecting the fresh concrete.

C. Hot-Weather Protection:

1. When concrete is placed under conditions of hot weather concreting, provide extra protection of the concrete against excessive placement temperatures and excessive drying throughout the placing and curing operations with an evaporation retarder.

a) Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

2. Hot weather curing is required if hot weather conditions occur within a 24-hour period after completion of concrete placement.

D. Floor surfaces, wherever indicated by weather conditions, shall be sprinkled during the interval between finishing operation and the start of curing to positively ensure against the possibility of surface drying.

3.8 CONCRETE REPAIRS

A. Perform patching and repairs in accordance with ACI 301.

B. Contractor shall submit patching and repair methods and materials for review by Design Professionals.

C. When complete, all patches and repairs shall match color and texture of adjoining surfaces.

D. At surfaces that are exposed to view, prepare test areas at inconspicuous locations for review by Design Professionals to verify repair color and texture match before proceeding with repair.

E. Apply all patching and repair materials in accordance with manufacturer's specifications.

F. Repairing Cracks In Formed and Unformed Surfaces:

1. Contractor shall notify Design Professionals of all cracks wider than 0.02" (0.50mm) and all cracks wider than 0.01" (0.25mm) that occur in a group of at least three cracks within twelve inches (300mm), in concrete. If Design Professionals deem repairs necessary, Contractor shall be responsible for repairing all such cracks per Design Professionals recommendation at no expense to the Owner. Repairs will generally require one or more of the following: Epoxy Injection, Semi-Rigid Epoxy, Pressure Injected Foam Resin, Methyl Methacrylate and/or Sealant with joint routed and cleaned. See Concrete Repair Materials section of this Specification for acceptable products

G. Repairing Formed Surfaces

1. Immediately after stripping forms, patch all honeycombing, defective joints, voids, etc. before the concrete is thoroughly dry.
2. Remove all burrs, fins, and ridges before the concrete is thoroughly dry.
3. Remove stains from rust, grease and oils, from release agents, etc.
4. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Design Professionals.

    a) Surface defects, include color and texture irregularities, cracks as defined above, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
    b) Chip away defective areas, honeycomb, rock pockets, voids over 1/4" (6mm) in any dimension and holes left by tie rods and bolts, down to solid concrete but in no case to a depth less than 1" (25mm) and saw-cut edges to prevent feather edging of fill material.

5. Repair concealed formed surfaces, where possible, containing defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
6. Clean out form tie holes and fill with dry pack mortar or precast cone plugs secured in place with bonding agent.
7. If honeycombing exposes reinforcement, chip to provide clear space at least 3/4" (20mm) wide all around steel to allow proper bond.

H. Repairing Unformed Surfaces:

1. High and Low areas in concrete surfaces which are in excess of specified tolerances shall be leveled or ground-smooth.

    a) Correct high areas by grinding after concrete has cured at least 14 days.
    b) Correct low areas by applying leveling material. Finish leveling material as specified in this section.

2. Repair surfaces containing defects that affect durability of concrete.

a) Surface defects include crazing, cracks as defined above, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

3. Repair defective areas, except random cracks and single holes not exceeding 1" (25mm) in diameter, by cutting out and replacing with fresh concrete.

a) Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4" (20mm) clearance all around.

I. Filling In: Fill in holes and openings left in concrete for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place.

3.9 EVALUATION AND ACCEPTANCE OF CONCRETE

A. In accordance with ACI 301, except where otherwise specified.

B. If, at any time during construction, the concrete resulting from the approved mix design deviates from Specification requirements for any reason, such as lack of workability, or insufficient strength, the Contractor shall have his laboratory verify the deficiency and modify the mix design, until the specified concrete is obtained. Modified mix to be submitted for approval per Part 1 - SUBMITTALS.

3.10 CORRECTIVE MEASURES

A. Conflicts: The Contractor shall be solely responsible for errors of detailing, fabrication, and placement of reinforcement steel; placement of inserts and other embedded items; and the structural adequacy of all formwork.

B. Compensation for Additional Services: Should additional work by Design Professionals such as design, documentation, meetings and/or site visits be required which are necessitated by failure of the Contractor to perform the work in accordance with the Contract Documents either developing corrective actions or reviewing corrective actions developed by others, the Contractor is responsible for paying for additional work performed by the Design Professionals at their standard firm-wide billing rates plus out-of-pocket expenses incurred at cost + 10%. Additional costs for testing and inspection by the Owner shall also be compensated by the Contractor.

[Balance of page blank; see form on next page]

CONCRETE MIX DESIGN SUBMITTAL FORM

Project: _____

City: _____

General Contractor: _____

Concrete Contractor: _____

Concrete Strength: _____

Use/Location on Job: _____

Supplier's Mix Designation: _____

Design Mix Information	**(Please check one):**	*Refer to ACI 301 for requirements of data used to substantiate strength calculations.*
Field Experience (Based on Standard Deviation Analysis):		
Trial Mixture Test Data:		

Design Characteristics:

Density:		Pcf (kg/m3)
Strength:		Psi (MPa) (28 day)
Air:		% (specified)

Materials:	**Type/Source**	**Specific Gravity**	**Weight (lb)**	**Absolute Vol. (cu. ft.) (cu. m)**
Cement:				
Fly ash:				
Slag (GGBFS)				
Microsilica:				
Coarse Aggregate:				
Fine Aggregate:				
Water:				
Air:				
Other:				
TOTAL:				27.0 cu. ft. (1.0 m3)
Water/Cementitious Material Ratio (lbs. (kg) water / lbs. (kg) cementitious material) =				%

Admixtures:	Manufacturer	ASTM	Dosage (oz/cwt)
Water Reducer:			
Air Entraining Agent:			
High Range Water Reducer			
Non-corrosive Accelerator:			
Other:			

Slump before HRWR: _____ Inches (mm)

Slump after HRWR: _____ Inches (mm)

Standard Deviation Analysis (from experience records):

No. of Test Cylinders Evaluated: _____

Standard Deviation: _____

Required Average Strength f'cr

Average Strength by Tests

Equation Used (ACI Chapter 5)

(Refer to ACI 318 for increased deviation factor when less than 30 tests are available)

TRIAL MIXTURE TEST DATA

Compressive Strength:	Age (days)	Mix #1	Mix #2	Mix #3
	28 [56] [90]	psi (MPa)	psi (MPa)	psi (MPa)
	28 [56] [90]	psi (MPa)	psi (MPa)	psi (MPa)
	28 [56] [90]	psi (MPa)	psi (MPa)	psi (MPa)
	Average	psi (MPa)	psi (MPa)	psi (MPa)
Required Average Strength f'cr				
Average Strength by Tests				
Equation Used (ACI Chapter 5)				

REQUIRED ATTACHMENTS	***Please check***
Coarse Aggregate Gradation Report	
Fine Aggregate Gradation Report	
Fly Ash (or other Supplementary Cementitious Material) Certification	
Concrete Compressive Strength Data or Trial Mixture Test Data	
Admixture Compatibility certification letters	
Chloride Ion Content Certification	
Alkali Aggregate Reactivity Certification	
Shrinkage Test Reports	

SUBMITTED BY:

Name: _____

Address: _____

_____

Phone no.: _____

Main Plant Location: _____

Miles from Project: _____

Secondary Plant Location: _____

Miles from Project: _____

_____

Date: _____

Certification by Concrete Supplier:
Signature: _____

Print Name:

_____

PE License Number and Expiration Date (print or stamp)

_____

Structural Substitution Request Form – to be completed by Contractor

Project:		Substitution Request #
Date:		
Requesting Contractor:		Pages Attached (including this form)

1. Description of Requested Substitution:

2. Related Drawings and Specification Sections:

3. Rationale or Benefit Anticipated:

4. Effect on Construction Schedule[1] (check one): ☐ NONE ☐ See Attached

5. Effect on Owner's Cost[2] attach data (check one): ☐ CREDIT TO OWNER ☐ EXTRA

6. Effect on Construction Documents[3] (design work anticipated): ☐ NONE ☐ See Attached

7. Requesting Contractor Agrees to Pay for Design Changes (check): ☐ YES ☐ NO ☐ NOT APPLICABLE

8. Effect on Other Trades[4]:

9. Effect of Substitution on Manufacturer's Warranty (check): ☐ NONE ☐ See Attachment

Signature[5]: Date:

Company:

General Contractor Signature[5]: Date:

Notes:

1. Contractor is responsible for means and methods and any problems that may arise from making the requested substitution.
2. This is **NOT A CHANGE ORDER FORM**. A separate form is required to adjust costs and/or schedules.
3. Contractor is responsible for any design impacts that may arise from this substitution, including redesign efforts.
4. Contractor is responsible for effects on other trades from this substitution;
   General Contractor must review and agree effects on other trades are fairly represented in items 4-9.
5. Signature by a person having authority to legally bind his/her company to the above terms. Otherwise this request is void
6. All items in form must be completed for substitution request to be considered.

Request Review Responses (completed by Architect and/or Engineer(s)):

ACCEPTED	ACCEPTED AS NOTED	REJECTED	INSUFFICIENT DATA TO SUPPORT REQUEST	ENGINEER / ARCH / MEP SIGNATURE	DATE

Engineer/Architect Comments:

END OF SECTION