Contract Documents and Specifications

For

Williams-Brice Stadium West Side Portal Entries

For

University of South Carolina

Project # CP00353757

July 23, 2012

Design Team:

Jumper-Carter-Sease Architects, PA

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Project Name: Williams-Brice Stadium West Side Portal Entries

2011 Edition

SE-311
Invitation for Minor Construction Quotes

SCBO NOTES 2, 4 and 5 APPLY TO THIS INVITATION FOR QUOTES

PROJECT NAME: Williams-Brice West Side Portal Entries

PROJECT NUMBER: CP00353757 **PROJECT LOCATION:** Williams-Brice Stadium, Columbia, SC

BID SECURITY REQUIRED? Yes ☐ No ☑

PERFORMANCE BOND REQUIRED? Yes ☐ No ☑

PAYMENT BOND REQUIRED? Yes ☐ No ☑ **CONSTRUCTION COST RANGE:** < $ 50,000

DESCRIPTION OF PROJECT:
Cut and patch concrete walls; add metal gates; add concrete steps. Create new walkways from lower bowl area.
Small and minority business participation is encouraged.
Contractors are responsible for obtaining bid documents and all updates from the USC purchasing website
http://purchasing.sc.edu See Facilities/Construction Solicitations and Awards

A/E NAME: Jumper-Carter-Sease Architects, PA **A/E CONTACT:** Todd Sease

ADDRESS: 412 Meeting Street **PHONE:** 803-791-1020 **Fax:** 803-791-1022

CITY: W Columbia **STATE:** sc **ZIP:** 29169 **E-MAIL:** TSease@jcsarchitects.com

PLANS ON FILE AT: AGC: _____ DODGE: _____ OTHER: _____

PLANS MAY BE OBTAINED FROM: http://purchasing.sc.edu See Facilities/Construction Solicitations and Awards

PLAN DEPOSIT AMOUNT: $ 0 **IS DEPOSIT REFUNDABLE?** Yes ☐ No ☐

PRE-QUOTE CONFERENCE? ☑ Yes ☐ No **MANDATORY ATTENDANCE?** ☐ Yes ☑ No

DATE: 8/1/12 **TIME:** 10:00am **PLACE:** 743 Greene St, Cola., SC 29208, Conf rm 53

AGENCY: University of South Carolina

NAME AND TITLE OF AGENCY COORDINATOR: Kay Keisler

ADDRESS: 743 Greene St **PHONE:** 803-777-5812 **Fax:** 803-777-8739

CITY: Columbia **STATE:** SC **ZIP:** 29208 **E-MAIL:** kkeisler@fmc.sc.edu

IFQ CLOSING DATE: 8/9/12 **TIME:** 1:00pm **LOCATION:** 743GreeneSt,Cola,SC29208, CR 53

IFQ DELIVERY ADDRESSES:

HAND-DELIVERY:
743 Greene St
Columbia, SC 29208
Attn: Kay Keisler

MAIL SERVICE:
743 Greene St
Columbia, SC 29208
Attn: Kay Keisler

IS PROJECT WITHIN AGENCY CONSTRUCTION CERTIFICATION? *(Agency MUST check one)* ☑ YES ☐ NO

APPROVED BY: _____ _____
(State Engineer) *(Date)*

SE-331
Quote Form

2011 Edition

Quotes shall be submitted only on SE-331

QUOTE SUBMITTED BY: _____
(Offeror's Name)

QUOTE SUBMITTED TO: University of South Carolina
(Agency Name)

FOR PROJECT: CP00353757 Wms Brice Stadium West Side Portal Entries
(Number) *(Name)*

OFFER

1. In response to the Form SE-311, *Request for Minor Construction Quotes*, and in compliance with the *Instructions to Bidders* for the above-named Project, the undersigned **OFFEROR** proposes and agrees, if this Quote is accepted, to enter into a Contract with the **AGENCY** in the form included in the Solicitation Documents, and to perform all Work as specified or indicated in the Solicitation Documents, for the prices and within the time frames indicated in the Solicitation and in accordance with the other terms and conditions stated.
2. Pursuant to Section 11-32-3030(1) of the SC Code of Laws, as amended, **OFFEROR** has submitted Bid Security as follows in the amount and form required by the Solicitation Documents:

☐ Bid Bond with Power of Attorney ☐ Electronic Bid Bond ☐ Cashier's Check
(OFFEROR check one, if Bid Security is required)

3. **OFFEROR** acknowledges the receipt of the following Addenda to the Solicitation documents and has incorporated the effects of said Addenda into its Quote:

ADDENDUM No: _____

4. **OFFEROR** agrees that this Quote, including all bid alternates, if any, may not be revoked or withdrawn after the opening of bids, and shall remain open for acceptance for a period of 60 Days following the Quote Date, or for such longer period of time that **OFFEROR** may agree to in writing upon request of the **AGENCY**.
5. **OFFEROR** agrees that from the compensation to be paid, the **AGENCY** shall retain as Liquidated Damages the amount of for each calendar day the actual construction time required to achieve Substantial Completion exceeds the specified or adjusted Contract Time for Substantial Completion, as provided in the Contract Documents.
6. **OFFEROR** herewith submits its offer to provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fee, permits, licenses and applicable taxes necessary to complete the following items of construction work:

6.1 BASE BID _____
(enter BASE BID in figures only)

6.2 ALTERNATE NO. 1 _____ **to be ADDED/DEDUCTED from BASE BID.**
(circle one)

6.3 ALTERNATE NO. 2 _____ **to be ADDED/DEDUCTED from BASE BID.**
(circle one)

FEIN/SSN: _____

SC Contractor's License Number: _____

Address: _____

Telephone/Fax _____

E-mail _____

This Quote is hereby submitted on behalf of the Offeror named above.

BY: _____
(Signature of Offeror's Representative)

_____
(Print or Type Name of Offeror's Rpresentative)

ITS: _____

USC SUPPLEMENTAL GENERAL CONDITIONS FOR CONSTRUCTION PROJECTS

1. Contractor's employees shall take all reasonable means not to interrupt the flow of student traffic in building corridors, lobbies and stairs. All necessary and reasonable safety precautions shall be taken to prevent injury to building occupants while transporting materials and equipment through the building to the work area. Providing safe, accessible, plywood pedestrian ways around construction may be required if a suitable alternative route is not available.

2. Fraternization between Contractor's employees and USC students, faculty or staff is strictly prohibited-zero tolerance!

3. USC will not tolerate rude, abusive or degrading behavior on the job site. Heckling and cat-calling directed toward students, faculty or staff or any other person on USC property is strictly prohibited. Any contractor whose employees violate this requirement will be assessed a fine of up to $500 per violation.

4. Contractor's employees must adhere to the University's policy of maintaining a drug-free and smoke-free/tobacco free workplace.

5. Contractor must sign a Contractor Key Receipt/Return form before any keys are issued. Keys must be returned immediately upon the completion of the work. The Contractor will bear the cost of any re-keying necessary due to the loss of or failure to return keys.

6. A welding permit must be issued by the University Fire Marshall before any welding can begin inside a building. Project Manager will coordinate.

7. Contractor must notify the University immediately upon the discovery of suspect material such as those potentially containing asbestos or other such hazardous materials. These materials must not be disturbed until approved by the USC Project Manager.

8. At the beginning of the project, the USC Project Manager will establish the Contractor=s lay-down area. This area will also be used for the Contractor=s work vehicles. No personal vehicles will be allowed in this area, or in any areas surrounding the construction site that are not regular or authorized parking lots. Personal vehicles must be parked in the perimeter parking lots. Parking permits can be obtained at the USC Parking Office located in the Pendleton Street parking garage. The lay down area will be clearly identified to the contractor by the PM, with a sketch or drawing provided to Parking. In turn, the contractor will mark off this area with a sign containing the project name, PM name, Contractor name and contact number, and end date. Where this area is subject to foot traffic, protective barriers will be provided as specified by the PM. The area will be maintained in a neat and orderly fashion. Vehicles parked in the lay down area (or designated parking areas) will be clearly marked or display a CPC furnished placard for identification.

Updated: July 15, 2011

9. Contractor will be responsible for providing its own temporary toilet facilities, unless prior arrangements are made with the USC Project Manager.

10. Use of USC communications facilities (telephones, computers, etc.) by the Contractor is prohibited, unless prior arrangements are made with the USC Project Manager.

11. For all projects over $100,000, including IDC's, an SE-395, Contractor Performance Evaluation, will be completed by the USC Project Manager and reviewed with the GC at the beginning of the project and a copy given to the GC. At the end of the project the form will be completed and a Construction Performance rating will be established.

12. Contractor is responsible for removal of all debris from the site, and is required to provide the necessary dumpsters which will be emptied at least ____1__ times per week. Construction waste must not be placed in University dumpsters. THE CONSTRUCTION SITE MUST BE THOROUGHLY CLEANED WITH ALL TRASH PICKED UP AND PROPERLY DISPOSED OF ON A DAILY BASIS AND THE SITE MUST BE LEFT IN A SAFE AND SANITARY CONDITION EACH DAY. THE UNIVERSITY WILL INSPECT JOB SITES REGULARLY AND WILL FINE ANY CONTRACTOR FOUND TO BE IN VIOLATION OF THIS REQUIREMENT AN AMOUNT OF UP TO $1,000 PER VIOLATION.

13. **Contractor must provide all O&M manuals, as-built drawings, and training of USC personnel on new equipment, controls, etc. prior to Substantial Completion. Final payment will not be made until this is completed.**

14. The contractor will comply with all regulations set forth by OSHA and SCDHEC. Contractor must also adhere to USC's internal policies and procedures (available by request). As requested, the contractor will submit all Safety Programs and Certificates of Insurance to the University for review.

15. Tree protection fencing is required to protect existing trees and other landscape features to be preserved within a construction area. The limits of this fence will be evaluated for each situation with the consultant, USC Arborist and USC Project Manager. The tree protection fence shall be 5' high chain link fence unless otherwise approved by USC Project Manager. No entry or materials storage will be allowed inside the tree protection zone. A 4" layer of mulch shall be placed over the tree protection area to maintain moisture in the root zone.

16. Where it is necessary to cross walks, tree root zones (i.e., under canopy) or lawns the following measures shall be taken: For single loads up to 9,000 lbs., a 3/4" minimum plywood base shall be placed over areas impacted. For single loads over 9,000 lbs., two layers of 3/4" plywood is required.

17. For projects requiring heavy loads to cross walks tree root zones or lawns. A construction entry road consisting of 10' X 16' oak logging mates on 12" coarse, chipped, hardwood base. Mulch and logging mats shall be supplemented throughout the project to keep

matting structurally functional.

18. Any damage to existing landscaping (including lawn areas) will be remediated before final payment is made.

19. Orange safety fence to be provided by the contractor. (USC Arborist, Kevin Curtis may be contacted at 777-0033 or 315-0319)

Campus Vehicle Expectations

1. All motorized vehicles on the University campus are expected to travel and park on roadways and/or in parking stalls.

2. All motorized vehicle traffic on USC walkways must first receive the Landscape Manager=s authorization. Violators may be subject to fines and penalties.

3. All motorized vehicles that leak or drip liquids are prohibited from traveling or parking on walks or landscaped areas.

4. Contractors, vendors, and delivery personnel are required to obtain prior parking authorization before parking in a designated space. Violators may be subject to fines and/or penalties. See Item 10 below.

5. Drivers of equipment or motor vehicles that damage university hardscape or landscape will be held personally responsible for damages and restoration expense.

6. Vehicle drivers who park on landscape or drives must be able to produce written evidence of need or emergency requiring parking on same.

7. All vehicles parked on landscape, hardscape, or in the process of service delivery, must display adequate safety devices, i.e. flashing lights, cones, signage, etc.

8. All drivers of equipment and vehicles will be respectful of University landscape, equipment, structures, fixtures and signage.

9. All incidents of property damage will be reported to Parking Services or the Work Management Center.

10. Parking on campus is restricted to spaces designated by Parking Services at the beginning of the project. Once the project manager and contractor agree on how many spaces are needed, the project manager will obtain a placard for each vehicle. This placard must be hung from the mirror of the vehicle, otherwise a ticket will be issued and these tickets cannot be "fixed". Parking spaces are restricted to work vehicles only; no personal vehicles.

Project Name: Williams-Brice Stadium West Side Portal Entries

Project Number: CP00353757

University of South Carolina

CONTRACTOR'S ONE YEAR GUARANTEE

STATE OF _____

COUNTY OF _____

WE_____
as General Contractor on the above-named project, do hereby guarantee that all work executed under the requirements of the Contract Documents shall be free from defects due to faulty materials and /or workmanship for a period of one (1) year from date of acceptance of the work by the Owner and/or Architect/Engineer; and hereby agree to remedy defects due to faulty materials and/or workmanship, and pay for any damage resulting wherefrom, at no cost to the Owner, provided; however, that the following are excluded from this guarantee;

Defects or failures resulting from abuse by Owner.

Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

_____
[Name of Contracting Firm]

*By_____

Title_____

*Must be executed by an office of the Contracting Firm.

SWORN TO before me this
_____ day of _____, 2____ (seal)

_____State

My commission expires _____

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, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after
installation of other work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

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

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

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

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

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

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

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017310

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, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of a building or structure.
2. Repair procedures for selective demolition operations.

B. Related Sections include the following:

1. Division 1 Section "Summary" for use of the premises and phasing requirements.
2. Division 1 Section "Construction Progress Documentation" for preconstruction photographs taken before selective demolition.
3. Division 1 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition.
4. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
5. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
6. Division 23 Sections for demolishing, cutting, patching, or relocating mechanical items.
7. Division 26 Sections for demolishing, cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

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 school faculty and students on-site operations are uninterrupted.
2. Interruption of utility services.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of temporary partitions and means of egress.
6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

E. Pre-demolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

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

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

E. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.7 PROJECT CONDITIONS

A. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

B. Owner assumes no responsibility for condition of areas to be selectively demolished.

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

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site will not be permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage

original Installer or fabricator, engage another recognized experienced and specialized firm.

a. Preformed metal panels.
b. Firestopping.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

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

3.2 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.

B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.

C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. 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.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
3. Protect existing site improvements, appurtenances, and landscaping to remain.
4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.

D. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

E. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

F. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

A. 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, and pollution.
2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

C. Cleaning: 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.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly.
9. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.

C. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. 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 cleaned and reinstalled in their original locations after selective demolition operations are complete.

F. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 7 Section for new roofing requirements.

3.6 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Patching: Comply with Division 1 Section "Cutting and Patching."

C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.

D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

E. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Burning: Burning of demolished materials will be permitted only at designated areas on Owner's property, providing required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport demolished materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 017320

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of manufactured material and product, including forming and reinforcement accessories, admixtures, waterstops, joint systems, joint fillers, curing compounds, and others if requested.

C. Design Mixes: For each concrete mix.

1. Provide laboratory tests of materials and mix design tests.
2. Indicate amounts of mix water, if any, to be withheld for later addition at Project site.
3. For lightweight concrete mixes, indicate calculated equilibrium unit weight as determined by ASTM C 567.
4. Specify the location of the batch plant where the concrete will be mixed and the approximate distance from the job site.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, spacings, bent bar diagrams, arrangement, and supports of concrete reinforcement.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.

1. Shoring and Re-shoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing re-shoring.

A. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.

    a. Include statement indicating costs for each product having recycled content.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete work similar to that indicated for this Project with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the state where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and re-shoring installations that are similar to those indicated for this Project.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

D. Source Limitations: Obtain each type of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each type of admixture from the same manufacturer.

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 318, "Building Code Requirements for Structural Concrete."
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material.

B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1, or better.
    b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
    c. Structural 1, B-B, or better, mill oiled and edge sealed.

d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

C. Forms for Cylindrical Columns: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, unless otherwise indicated.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no metal closer than 1 inch to the plane of the exposed concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

D. Steel Fiber Reinforcement: ASTM A 820, Type 1 cold drawn wire. Fibers shall be Novocon 1050, by SI Concrete Systems or approved equal. See structural drawings for areas where fibers shall be used and for required dosage rate.

E. Blended Fibers: A blend of cold drawn steel wire fibers complying with ASTM A 820 and graded multifilament polypropylene fibers complying with ASTM C 1116, Type III, 4.1.3, blended at a rate of 23 pounds of steel fibers and one pound of polypropylene fibers per 24 pound bag. Fiber reinforced concrete must have an average residual strength value of at least 80 psi when tested in accordance with ASTM C 1399. Uniformly disperse in concrete mixture at a rate of not less than one 24-pound bag per cubic yard. Fibers shall be Novomesh 850 by SI Concrete Systems or approved equal.

2.3 SYNTHETIC FIBER REINFORCEMENT

A. Fibers shall be fibrillated polypropylene fibers designed and manufactured for use in concrete for secondary reinforcement, complying with ASTM C 1116, Type III, 4.1.3. See structural drawings for areas where fibers may be used. Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 pounds per cubic yard. Acceptable products include:

1. Fibermesh 300, by SI Concrete Systems.

2. Grace Fibers, by W.R. Grace & Co.
3. MasterFiber M or F Series, BASF Construction Chemicals.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

2. Precast concrete supports may be used only for concrete members cast on earth. Precast concrete supports shall have an embedded wire for tying the reinforcement to the support. Bricks or blocks without an embedded wire are not acceptable.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 36. Cut bars true to length with ends square and free of burrs.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Fly Ash: ASTM C 618, Class C or F.

C. Normal Weight Aggregate: ASTM C 33.

D. Lightweight Aggregate: ASTM C 330.

E. Water: Potable and complying with ASTM C 94.

2.6 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

E. Water-Reducing Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing Retarding Admixture: ASTM C 494, Type D.

2.7 WATERSTOPS

A. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Volclay Waterstop-RX, bentonite-based waterstop by CETCO or equal.

2.8 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

2.9 CURING MATERIALS

A. Contractor shall verify that curing and sealing materials applied to floor slabs are compatible with all floor stains, coatings, tile, and other finish materials.

B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry. (Burlean non-staining mats).

D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.10 RELATED MATERIALS

A. Expansion and Isolation Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber. Thickness 1/2 inch unless otherwise indicated. Acceptable products include:

1. Fibre Expansion Joint, W.R. Meadows, Inc.

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240. Acceptable products include:

1. Euco 700, The Euclid Chemical Company.
2. MM-80, Metzger/McGuire.

B. Vapor Retarder: See Division 7 specifications.

C. Slab Granular Base Course: Clean crushed stone, crushed gravel, or manufactured or natural sand. Material shall be compactable. Rough or sharp materials which may puncture the vapor retarder shall be covered with a 1/2" layer of fine-graded material rolled or compacted over the base course prior to installation of the vapor retarder.

D. Dovetail Anchor Slots: Hot-dipped galvanized sheet steel, not less than 0.0336 inch thick with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

E. Bonding Agent: ASTM C 1059, Type II, non-re-dispersible, acrylic emulsion or styrene butadiene.

F. Epoxy Bonding Agent: ASTM C 1059, Type II, non-re-dispersible, acrylic emulsion or styrene butadiene.

G. Epoxy Anchoring Adhesive: ASTM C 881, two-component epoxy resin, supplied in manufacturer's standard side-by-side cartridge and dispensed through a mixing nozzle supplied by the manufacturer, of class and grade to suit requirements.

H. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.12 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal weight structural concrete according to ACI 211.1 and ACI 301.
2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Maximum Unit Weight of Lightweight Concrete:

1. Calculated Equilibrium Unit Weight: 110 lb/cu. ft. plus or minus 3 lb/cu. ft. as determined by ASTM C 567 unless otherwise indicated.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

E. Maximum Slump:

1. Concrete containing high-range water-reducing admixture (superplasticizer): 8 inches, after admixture is added to concrete with 2 to 4 inch slump.
2. Other concrete: 4 inches, plus or minus one inch.

F. 28-Day Compressive Strength: As indicated.

G. Air Content: In exterior concrete which is exposed to weather, add air-entraining admixture to result in concrete at point of placement having an air content of 5.5 percent within a tolerance of plus 1 or minus 1.5 percent. Footings and other subterranean concrete do not require air-entrainment.

H. Do not air entrain concrete in trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

I. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

J. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

K. Self-Consolidating Concrete: Self-Consolidating Concrete (SCC) shall be used where indicated. The requirements listed below supersede conflicting requirements elsewhere in this specification and on the drawings.

1. Minimum 28-day compressive strength: 4000 psi.
2. Slump Flow: The slump flow of the concrete, as measured according to ASTM C 1611, at the time of placement shall be 24 plus or minus 2 inches.
3. Segregation: No visual segregation of the mixture may occur on-site.
4. Admixture: Use high-range water-reducer Glenium 3030 NS, produced by Master Builder Technologies, or an approved equal.

5. Quality Assurance Plan and Qualifications: The concrete producer shall submit along with the SCC mix design, a procedure for adding admixture at the ready mix plant and at the job-site to obtain the desired spread of the slump cone. During initial placement, an approved technical representative of the ready mix supplier shall be present to make adjustments to the mix as required. The concrete producer shall submit proof of actual production of 250 cubic yards or more of SCC in similar applications.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

B. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, fabricate reinforcing so that lap splices in alternate bars are staggered.

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Job site mixing is not permitted.

C. Synthetic Fiber: In concrete for exterior sidewalks and slabs, and at other locations where indicated, uniformly disperse synthetic fibers in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cubic yard.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class D, 1/2 inch for rough-formed finished surfaces which will be permanently concealed from view.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1 vertical to 1.5 horizontal.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, water, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.

B. Conduits, Pipes, and Sleeves: Conduits, pipes and sleeves shall be permitted to be embedded in concrete only with approval of the Architect. Embedded items must meet the following requirements:

1. Conduits, pipes and sleeves shall be made only of materials not harmful to concrete. Aluminum is not permitted.
2. Diameter of items shall not be larger than 1/3 the thickness of the wall, footing, or beam in which they are embedded.
3. Items shall not be spaced closer than 3 diameters on center.
4. Conduits are not permitted in slabs.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. Retaining walls and basement walls may not be backfilled until after 7 days minimum and after the concrete has

achieved 75 percent of 28-day design compressive strength as verified by compression test results.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that support weight of concrete in place until concrete has achieved at least 75 percent of 28-day design compressive strength.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces.

3.4 SHORES AND RESHORES

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, install reinforcing so that lap splices in alternate bars are staggered.

D. Before concrete is placed, accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. "Wet-sticking" of dowels and other reinforcing is not permitted. Do not weld or tack weld reinforcing bars unless indicated on the drawings or authorized by the Structural Engineer.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets so that length of overlap measured between outermost cross wires of each fabric sheet is not less than one spacing of cross wires plus 2 inches. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

G. Where blockouts are formed in slabs, provide two #4 diagonal bars, 4'-0" long, at each corner of the blockout in the middle of the depth of the slab.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Provide construction joints at all locations where concrete placement is terminated resulting in concrete elements not being completed in a single monolithic placement. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Provide keys at construction joints using preformed galvanized steel or wood bulkhead forms, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Locate joints in continuous wall footings as required to facilitate construction.
6. In areas with terrazzo or hard tile, coordinate joint locations to match joints in terrazzo or tile.

C. Contraction (Control) Joints in Slabs on Grade: Construct contraction joints in slabs on grade to form patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab thickness unless otherwise indicated.

1. Contraction joints shall be cut as soon as possible after slab finishing as may safely be done without dislodging aggregate or raveling joint edges. Joints shall be cut within 12 hours after concrete is placed.
2. If joint pattern is not shown, provide contraction joints at a maximum spacing of 15 feet in each direction. Locate to conform to bay spacing where possible (at column centerlines, half bays, third bays.)
3. In areas with terrazzo or hard tile, coordinate joint locations to match joints shown in terrazzo or tile.

D. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.

1. Use dowel sleeves or lubricate one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable. Tightly butt ends of waterstop together to form a continuous waterstop. Locate waterstops so that there is a minimum of 3 inches of concrete on all sides of waterstop.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless water has been withheld from the mix for this purpose.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When the average daily outdoor temperature is expected to fall below 40 deg F for three successive days, or when freezing temperatures may occur during the first 24 hours after concrete placement, deliver and maintain concrete temperature within the temperature range required by ACI 306.1. The average daily outdoor temperature is the average of the highest and lowest temperature during the period from midnight to midnight.
2. Uniformly heat water and/or aggregates before mixing to obtain a concrete mixture temperature at point of placement within the temperature range required by ACI 306.1.
3. Temperatures specified to be maintained shall be those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air.
4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen sub-grade or on sub-grade containing frozen materials.
5. Do not use salt or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
6. **Do not use calcium chloride.**

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is included in calculation of total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and sub-grade just before placing concrete. Keep sub-grade moisture uniform without standing water, soft spots, or dry areas.

H. The concrete for elevated slabs shall be placed in sequence from the lowest elevated floor to the highest elevated floor. Do not place concrete on an upper floor until the concrete on all elevated floors below has been placed.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view, to receive a rubbed finish, or to be covered with a coating material applied directly to the concrete. This is the concrete surface imparted by selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

C. Smooth Rubbed Finish: Not later than one day after form removal, apply a smooth rubbed finish as follows to smooth-formed finished concrete where indicated. A grout-cleaned rubbed finish will be considered an acceptable alternate to a smooth rubbed finish.

1. If forms are removed before curing is complete, the concrete surfaces shall be kept wet while exposed until the curing period is complete.
2. The concrete surface to be finished shall be saturated with water
3. Rub with carborundum brick or other abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
4. Rubbing shall continue until all form marks, projections, and irregularities have been removed, all voids are filled, and a uniform surface has been obtained. The paste produced by rubbing shall be left in place.
5. After the final finish is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks.
6. Obtain approval of a sample area from Architect before proceeding with Work.

D. Grout-Cleaned Rubbed Finish: Apply a grout-cleaned rubbed finish as follows to smooth-formed finished concrete where indicated. Grout-cleaned finish shall be done when the air temperature is at least 40 deg F and rising. All finishing on an area shall be completed the same day it is started.

1. Surfaces to be grout cleaned shall be steel brushed to remove laitance and scale and to reveal partly obscured air bubble holes. Uneven form joints shall be ground smooth.
2. Combine one part portland cement to one and one-half parts fine sand by volume, with sufficient water to produce a grout having the consistency of thick paint. Blend standard and white portland cement in amounts determined by trial patches so that final color of dry grout will produce the color desired by the architect.
3. Thoroughly dampen concrete surfaces and cover with an application of grout.
4. Immediately after application of the grout, the surface shall be scoured with a cork float or other suitable material. This floating shall completely fill all holes and other irregularities in the surface.
5. When the grout is of such plasticity that it will not be pulled from the holes, remove excess grout by scraping and rubbing with a clean float of sponge rubber or burlap.
6. When the grout is thoroughly dry, the surface shall be vigorously rubbed with dry burlap to completely remove any dried grout. No visible film of dry grout shall remain.
7. Obtain approval of a sample area from Architect before proceeding with Work.
8. Keep surfaces damp for at least 36 hours after rubbing.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Broom Finish: Apply a light fine broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect and Owner before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes, beam pockets and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and trowel-finish concrete surfaces. At stair landings, provide plain-steel welded wire fabric, of the same size used in adjacent floor slabs, located at mid-depth of the concrete fill.

3.12 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss exceeding 0.1 pounds per square foot per hour, based on chart in ACI 305R, before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period of seven days.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period of seven days.

F. Remove curing and sealing materials from floor slabs, without damaging concrete surfaces, by method recommended by curing and sealing manufacturer after the curing period in areas where floor stains, coatings, tile, and other floor finish materials are to be applied if recommended by the floor finish manufacturer.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler where indicated according to ACI 302 and manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least 60 days. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Do not use backer rod in saw-cut joints. Formed joints may be filled with silica sand to within 2 inches of the slab surface or a backer rod can be placed in compression at a depth of 2 inches below the slab surface.

D. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Concrete which will be exposed to view in the finished structure shall be restored to its original intended appearance or shall be removed and replaced. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension, down to solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at an inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness by using a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., plus one set for each additional 50 cu. yd. more than the first 25 cu. yd.

    a. When frequency of testing will provide fewer than five compressive-strength tests for a given concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample of air-entrained concrete.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 90 deg F and above.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days two at 28 days, and hold one specimen in reserve for later testing if necessary.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project name, date of concrete placement and testing, location of concrete batch in Work, mix identification including design compressive strength at 28 days, slump, compressive breaking strength, and type of break for both 7-and 28-day tests. Air content and concrete temperature results shall also be provided when applicable.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Special inspector shall make additional tests of concrete at Contractor's expense when test results indicate that slump, air entrainment, compressive strength, or other requirements have not been met, as directed by Architect. Special inspector may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Contractor shall fill core-drilled holes with non-shrink grout unless directed otherwise by Architect.

END OF SECTION 033000

1.0 GENERAL

1.1 SCOPE: This section covers miscellaneous metal work, complete.

1.2 EXTENT: the extent of miscellaneous metal work is shown on the drawings and includes items fabricated from iron and steel shape, plates, bars, strips, tubes, cables, pipes and castings which are not a part of the structural steel or other metal systems in other sections of these specifications.

1.3 CODES AND STANDARDS: Comply with the provisions of the following codes, standards, and specs, except as otherwise shown and specified.

AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" and including "Commentary of the AISC Specifications".

AISC "Specification for the Design of Cold-Formed Steel Structural Members".

ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

1.4 QUALIFICATION FOR WELDING WORK: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1.5 FIELD MEASUREMENTS: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.

1.6 INSERTS AND ANCHORAGES: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of miscellaneous metal work. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery of other work to avoid delay.

1.7 SHOP ASSEMBLY: Pre-assemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Dis-assemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

1.8 SUBMITTALS: Submit shop drawings for the fabrication and erection of all assemblies of miscellaneous metal work, which are not shown completely by the manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

2.0 PRODUCTS:

2.1 GENERAL: For the fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

2.2 STRUCTURAL STEEL PLATES, SHAPES AND BARS:

a. Structural-Size Shapes and Plates (except Plates to be bent or Cold-Formed: ASTM A36

b. Steel Plates to be bent or Cold-Formed: ASTM A283, Grade C.

c. Steel Bars and Bar-sized Shapes: ASTM A306, Grade 65, or ASTM A36.

2.3 GRAY IRON CASTINGS: ASTM A48, Class 30.

2.4 MALLEABLE IRON CASTINGS: ASTM A47, Grade as selected.

2.5 STEEL PIPE: ASTM A53, type as selected; Grade A; black finish unless galvanizing is required; standard weight (Schedule 40), unless otherwise shown or specified.

2.5 ALUMINUM: Comply with the following standards for the forms and types of aluminum for the required items of work. Provide alloy and temper as recommended by the aluminum producer.

a. Extruded Shapes and Tubes: ASTM B221 or B308, as possible.

b. Plate: ASTM B209, alloy 5005-H-16 for anodic coatings.

c. Bars and Rods: ASTM B211.

d. Castings: ASTM B26 or B108, alloy No. 214.

2.07 ANCHORS:

a. For Steel Work: Provide zinc-coated fasteners, with galvanizing complying with ASTM a153, for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.

b. For Steel Work: Provide fasteners of the basic metal and alloys matching finished color and texture, as the metal being fastened, unless otherwise shown or specified.

2.10 Welding Electrodes and Filler Metal: Provide the type and alloy of filler metal and electrodes in compliance with the recommendations of the producer of the metal to be welded and as required for color match, strength and compatibility in the fabricated items.

2.11 Metal Primer Paint: Metal Primer Paint shall be Tnemec No. 99.

2.12 Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with Military Specs Nil-P-21035 (Ships).

2.13 Fabrication:

a. General: Use materials of size and thickness shown, or if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.

1. Form Exposed Work: True to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approx. 1/32" unless otherwise shown. Form bent metal corners to

smallest radius possible without causing grain separation or otherwise impairing work.

2. Weld Corners and Seams continuously, complying with AWS recommendations. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

3. Form exposed Connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown, or, if not shown, Phillips flathead (countersunk) screws or bolts.

4. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support for intended use.

5. Cut, Reinforce, Drill and Tap miscellaneous metal work as required to receive finish hardware and similar items.

6. Use Hot-Rolled Steel Bars for work fabricated from bar stock, unless shown or specified to be fabricated from cold-finished or cold-rolled stock.

7. Galvanizing: Provide a zinc-coating for those items shown or specified to be galvanized as follows:

   ASTM A153 for galvanizing iron and steel hardware.

   ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars, and strip 1/8" thick and heavier.

   ASTM A386 for galvanizing assembled steel products.

8. Shop Painting: Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded and galvanized surfaces, unless otherwise specified. Apply one shop coat to fabricated metal items, except two coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

B. Carpenter's Iron Work: Furnish bent or otherwise custom fabricated bolts, plates anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware are specified in Division 6 Sections. Manufacture or fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for head nuts which bear on wood structural connections; elsewhere, furnish steel washers.

C: Loose Steel Lintels: Provide loose structural steel shape lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit. Provide not less than 8" bearing at each side of openings, unless otherwise shown.

D. Miscellaneous Framing and Support:

1. Provide Miscellaneous Framing and Supports which are not a part of the structural steel work, including, but not necessarily limited to hangers and bracing for folding doors, shelf angles, curb edge angles, as required to complete the work.

2. Fabricate Miscellaneous Framing and Supports to sizes, shapes and profiles shown. Except as otherwise shown, fabricate from brackets and splice plates and a minimum number of joints for field connection. Cut, drill, and tap units to receive hardware and similar items to be anchored to the work. Equip units with integrally welded anchor straps for casting onto poured concrete or building into masonry wherever possible. Furnish inserts if units must be installed after concrete is poured. (See concrete sections for installation of inserts). Except as otherwise shown, space anchors 2' - 0" o.c. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps. Galvanized miscellaneous frames and supports where indicated for exterior use.

3.0 EXECUTION

3.1 EXAMINATION OF CONDITIONS: Installer must examine areas and conditions under which miscellaneous metal items are to be installed. Notify contractor, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until the unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 Preparation: Furnish setting drawings, diagrams, templates, instruction and directions for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items have integral anchors, which are to be imbedded in concrete or masonry construction. Coordinate the delivery of such items to the project site.

3.3 Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

3.4 Cutting, Fitting, and Placement:

A. Perform all Cutting, Drilling and fitting required for the installation of the miscellaneous metal items. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to built into concrete, masonry or similar construction.

B. Fit Exposed Connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and tough up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

C. Do not cut or abrade Members with finished which cannot be completely restored in the field. Where cutting, welding, and grading are required for fitting and jointing of the work, restore finishes to eliminate any evidence of such corrective work. Return items with such finishes to the shop for required alterations, followed by complete refinishing.

3.5 Setting Steel Railing and Handrails: Adjust rails and handrails prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

A. Anchor posts in concrete by means of pipe sleeves previously set and anchored into concrete. After posts have been inserted into sleeves and properly aligned, weld continuously around the post and around the sleeve. Cover anchorage joint with a round metal flange finished to match post.

B. Anchor Railing Ends into concrete and masonry with round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts, except where indicated otherwise.

3.6 Setting Standard Catalog Products: Set standard catalog products in accordance with manufacturer's shop drawings and installation recommendations.

3.7 Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance of quality of welds made and the methods used in correcting welding work.

3.8 Touch-Up Painting: Refer to Section entitled "Painting" of these specs. for cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on the miscellaneous metal (required immediately after erection and before proceeding with field painting).

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes traffic coatings for the following applications:
   1. Waterproofing and pedestrian traffic coating system for exterior elevated concrete deck and adjacent concrete components within the lower west level of the football stadium as indicated on the drawings.

B. Provide labor, materials, equipment and supervision necessary to install the complete traffic coatings system as specified and as indicated on the drawings.

C. The manufacturer's written applicant instructions for each product used are considered part of this specification and must be followed at all times.

1.2 SYSTEM DESCRIPTION

A. Fluid-applied polyurethane waterproofing coating system consisting of moisture curing mechanisms of compatible materials to create a seamless waterproof membrane.

B. Acceptable systems as described herein are Sonoguard by Sonneborn, Peda-gard by Neogard or GMX Elastomeric 5000 TC by GMX/Garland Industries.

C. The waterproofing coating system must be designated for the application on the specific type of deck surface indicated.

D. The system is to include the system primer as per the manufacturer's written recommendations.

E. The total system thickness is to be 44 mils, exclusive of aggregate, including a minimum 20 mil (60sf/gal) base coat, 12 dry mill intermediate coat and a 12 dry mil topcoat.

1.3 SUBMITTALS

A. Product Data: For each product indicated. Submit manufacturer's technical bulletins and MSDS on each product. Include manufacturer's available color selections.

B. Shop Drawings: Show extent of each traffic coating. Include details for treating substrate joints and cracks, flashings, control joints, expansion joints, deck penetrations, and other termination conditions.

C. Samples: For each type of traffic coating required, prepared on rigid backing (6" by 8" minimum). Provide stepped samples on backing large enough to illustrate build-up of traffic coatings. Submit the standard Gray (to match the existing 2008 installed gray already in place at the three tunnels) on sample boards along with the same size sample of the Garnet color required for the contrasting stripe at nosing edge of all isle way treads. The Garnet color must match the University Garnet color.

D. Applicator Approval: Submit letter from manufacturer stating applicator is approved to install the traffic coating system specified and that the applicator has completed the manufacturer's certified applicator training course and programs for the specified product.

E. Maintenance data.

F. Submit list of project references as documented in this Specification under Quality Assurance Article. Include contact name and phone number of manufacturer's representative responsible for the oversight and inspections for this project. The representative must be a full time employee of the deck coatings manufacturer.

G. Quality Control Submittals:
1. Provide evidence of Qualifications as documented in this Specification under Quality Assurance Article.
2. Provide protection plan of surrounding areas and non-work surfaces.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products and systems.
2. Manufacturer Qualifications: Company shall be ISO 9001:2000 Certified.
3. Applicator Qualifications: Company with minimum of 10 years experience in application of specified products and systems on projects of similar size and scope, and is approved by the traffic coating manufacturer to install the system specified.
a. Successful completion of a minimum of 5 projects of similar size and complexity to specified Work.
b. Successful completion of the traffic coating manufacturer's certified training course for the specified system within the last two years.
c. Certification: Written approval or license of applicator by traffic coating manufacturer.

B. Requirements of regulatory agencies:

1. The pedestrian deck coating system shall be rated Class "A" by Underwriters Laboratories (ASTM E 108/UL 790). Containers to bear Underwriters Laboratories labels.

2. Materials used in the pedestrian deck coating system shall meet Federal, State and local VOC regulations.

C. Source Limitations: Use traffic coatings of a single manufacturer.

D. Field Sample:
1. Install at Project site or pre-selected area of structure an area for field sample, as directed by Architect.
a. Provide mockup of at least 100 square feet (9.3 sm) to include surface profile, sealant joint, crack, flashing, and juncture details and allow for evaluation of slip resistance and appearance.
b. Apply material in strict accordance with manufacturer's written application instructions.
2. Manufacturer's representative or designated representative will review technical aspects; surface preparation, application, and workmanship.
3. Field sample will be standard for judging workmanship on remainder of Project.
4. Maintain field sample during construction for workmanship comparison.
5. Do not alter, move, or destroy field sample until Work is completed and approved by Architect.
6. Obtain Architect's written approval of field sample before start of material application, including approval of aesthetics, color, texture, and appearance.

E. Pre-installation Conference: The deck coating manufacturer (manufacturer's representative) shall conduct pre-installation conference at the Project site prior to the start of work and issue typed minutes of the conference. Attendees must include at a minimum the deck coating manufacturer's representative, the onsite superintendent & personnel of the coating applicator, the concrete repairs contractor, the control and expansion joint contractor, the bleacher remover/re-installer, the architect and the owner's representative.

F. Inspections: Refer to Part 3 – Execution of this specification.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Schedule: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Materials shall be delivered in manufacturer's original, unopened, undamaged containers, with product identification labels intact. Each container or package shall be clearly marked with supplier's name, brand name and type of material.

C. Storage and Handling: Recommended material storage temperature is 75°F (23.8°C). Handle products to avoid damage to container. Do not store for long periods in direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F (5 deg C), when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.
2. Do not apply in rain or when rain is expected within 24 hours. Do not apply above 90 degrees F (32 degrees C) or below 40 degrees F (4 degrees C) or when temperatures are expected to fall below 40 degrees F (4 degrees C) within 24 hours.
3. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of the substrate.
4. Do not apply materials unless surface to receive coating is clean and dry, or if precipitation is imminent.

B. Safety and Health Conditions:

1. During coating application, it is essential that maximum effort is made to protect the coating mechanic and others near the workplace from breathing vapors and coming in contact of material with skin or eyes.
2. In confined areas, the best form of protection against organic solvents or other potentially sensitizing vapors is a fresh air supply. For maximum protection, it is recommended to use NIOSH/MSHA-approved, self-contained breathing apparatus with a full-face piece operated in a positive pressure mode.
3. In unrestricted (open outdoor) areas, it is recommended to wear a suitable mask or respirator of a type approved by NIOSH/MSHA.
4. To prevent excessive skin contact with the material, it is recommended to use fabric coveralls and neoprene or other resistant gloves. To prevent eye contact, wear a full-face mask or OSHA-approved protective goggles.

C. Protection:

1. Keep products away from heat, sparks, and flames. Do not allow use of spark producing equipment during application and until vapors are gone. Post "No Smoking" signs.
2. The overspray and/or solvents from coatings can carry considerable distances and care should be taken to do the following:

    a. Post warning signs a minimum of 100 feet from the work area.
    b. Mask off or cover all air intakes near the work area to prevent odors from entering occupied areas of the building or structure.
    c. Set up wind breaks when needed.
    d. Minimize or exclude all personnel not directly involved with the coating application.
    e. Have CO_2 or other dry chemical fire extinguishers available at the jobsite.
    f. Provide adequate ventilation.

3. After completion of application, do not allow traffic on coated surface for a period of at least 48 hours at 75°F (23.8°C) and 50% R.H., or until completely cured.
4. Protect plants, vegetation and animals which might be affected by coating. Use drop cloths or masking as required.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard Joint and Several (manufacture and manufacturer approved installers) in which manufacturer agrees to repair or replace the traffic coating system and any part there of included in the scope of work of this project that fail in materials and workmanship witnin five years from date of Substantial Completion. Applicator must be certified and trained by the deck coating manufacturer.

1. Warranty does not include deterioration or failure due to unusual weather phenomena, failure of prepared and treated substrate, formation of new substrate cracks exceeding 1/16 inch (1.6 mm) in width, fire, vandalism, or abuse by maintenance equipment, and truck traffic.
2. Failure includes, but is not limited to, the following:

    a. Adhesive or cohesive failures.
    b. Abrasion or tearing failures.
    c. Surface crazing or spalling.
    d. Intrusion of water, oils, gasoline, grease, salt, or acids into deck substrate.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design System: Subject to compliance with requirements, provide Sonoguard waterproof deck coating system and all related components of the water tight system including concrete repairs and expansion joint replacement by BASF Building Systems or one of the following waterproof coating manufacturers, systems and applicators. No manufacturers, coating system or applicators other than those listed herein shall install the water proofing coating system for their specific manufacturer listed.

B. Basis of Design waterproof deck coating system Product and Manufacturer:
1. SONOGUARD
BASF Building Systems
889 Valley Park Drive

Shakopee, MN 55379
Phone: 952-496-6000
Internet: www.BASFbuildingsystems.com

C. Accepted Comparable waterproof deck coating system Product and Manufacturers:
1. PEDA-GARD
Neogard, Division of Jones Blair
2728 Empire Central
Dallas, Texas 75235-4409
Phone: 800-321-6588
Internet: www.neogard.com

2. GMX Elastomeric 5000 TC
GMX/GARLAND
3800 East 91st Street
Cleveland, Ohio, 44105
Phone: 866-226-7743
Internet: www.gmxwaterproofing.com

2.2 MATERIALS

A. Acceptable Miscellaneous Products:
1. Sealant primer: Sonneborn Primer 733 or as required by coating manufacturer.
2. Sealant: Sonneborn SL-2 or Sonneborn Ultra or as required by coating manufacturer.
3. Deep joint sealant: Sonneborn SL-2 or Sonneborn NP-2 or as required by coating manufacturer.
4. Plywood joint sealant: Sonneborn NP-1 or Sonneborn NP-2 or as required by coating manufacturer.
5. Reinforcing fabric: Sonoshield Reinforcing Fabric or as required by coating manufacturer.

2.3 MIXING

A. Mix material per manufacturer instructions allowing material to rest before remixing and application.

B. Colors:
1. Gray (to match the existing 2008 installed gray already in place at the three tunnels)
2. Garnet (to match the University Garnet color)

PART 3 - EXECUTION

3.1 EXAMINATION

A. The deck coating manufacturer is required to perform weekly inspections of the work and issue a written report.

B. In addition, the deck coating manufacturer is required to perform the following inspections and issue a written report.
1. Progress Completion Inspections at 25%, 50%, 75% completion along with the 100% completion report. These inspections may coincide with the weekly inspections.
2. Progress Quality Reports prior to the concrete repairs to confirm compatibility of the products used, during the concrete repair process, after the concrete repairs and prior to the deck

coating surface preparation and coating process. The inspection also includes all control and expansion joint conditions.

3. All reports are to be issued to the architect within three days of the inspection. The reports are to be logged by the manufacturer's inspector and available to the architect and owner upon request. The inspector must be a full time employee of the deck coating manufacturer.

3.2 SURFACE PREPARATION

A. Substrates must be sound and free of dust, dirt, laitance, paints, oils, grease, curing compounds, or any other contaminants.

B. Verify substrate has properly cured. If efflorescence is present, mechanically remove it before proceeding. For extreme cases where this is not adequate, contact the manufacturer's Technical Service.
   1. Concrete should have a minimum compressive strength of 3,000 psi (21 MPa) and be cured for a minimum of 28 days or 80 percent of design strength.

C. Mechanically prepare substrate to remove previous coatings, laitance, and miscellaneous surface contamination. Shotblast surface to profile equal to International Concrete Repair Institutes CSP 3.
   1. Roughen or brush blast extremely smooth surfaces to ensure good mechanical adhesion.
   2. Patch all holes and cracks before installation.

D. Repair voids and delaminated areas with cementitious and epoxy patching materials.

3.3 APPLICATION – GENERAL

A. Surface Pre-striping and Detailing:
   1. Pre-stripe with primer 1 inch (25 mm) beyond all surfaces that require detail work, using short-nap roller.
   2. For nonmoving joints and cracks less than 1/16 inch (1.6 mm) wide, apply 25 wet mils (0.6 mm) pre-striping of base coat over cured primer. Apply the base coat to fill and overlap the joint or crack 3 inches (76 mm) on each side. Feather the edges.
   3. Dynamic cracks and joints over 1/16 inch (1.6 mm) wide shall be routed to a minimum of 1/4 inch by 1/4 inch (6 mm by 6 mm) and cleaned. Install bond breaker tape to prevent adhesion to bottom of joint. Prime joint faces only with sealant primer and fill with sealant. Fill joints deeper than 1/4 inch (6 mm) with backer rod and deep joint sealant. For cracks, sealant shall be flush with the adjacent surface. For expansion joints, sealant shall be slightly concave.
   4. Sealed joints 1 inch (25 mm) or less shall be coated over with the deck coating system.
   5. Expansion joints exceeding 1 inch (25 mm) wide, including the primary wide expansion-joint system, shall not to be coated.
   6. Where the coating system will be terminated and no wall, joint, or other break exists, cut a 1/4 inch by 1/4 inch (6 by 6 mm) keyway into the concrete. Fill and coat keyway as application of base coat progresses.
   7. Protect all steel studs and threads from coating system.

B. Metal Surfaces:
   1. Remove dust, debris, and any other contaminants from vent, drain pipe, and post penetrations; reglets; and other metal surfaces. Clean surfaces to bright metal and prime with sealant primer. Provide cant with deep joint sealant to eliminate 90 degree angles.
   2. Detail cant with primer and base coat per manufacturer requirements prior to application of deck coating system.

C. Priming:
   1. After thoroughly vacuuming the surface, apply primer to the properly prepared deck surfaces at the rate of 200 to 250 square foot per gallon (4.9 to 6.1 sm/L). Using a roller pan and a short- to medium-nap roller cover, force the primer into pores and voids to eliminate pinholes. Do not apply over pre-striping.
   2. Allow primer to dry tack free. Base coat shall be applied the same working day.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Metal Gates.
2. Concrete Walls.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS:

The following categories of work are not included as part of the painter-applied finish work or are included in other sections of the specifications except as otherwise shown on drawings or specified herein.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal items, hollow metal work and shop-fabricated or factory built metal mechanical and electrical equipment or accessories.

2. Colors: Paint colors will be as selected by the Architect and before any painting is done the Architect will furnish the Contractor with the selected color chips and schedule showing where the various colors will be applied. Finish colors shall exactly match the color chips.

1.3 SUBMITTALS

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

B. Samples: For each finish and for each color and texture required.

1.4 LIST OF PROPOSED MATERIALS

A. List of Proposed Materials: Verify, in writing, that products proposed are from products listed herein. This submittal shall include full identifying product names and catalog numbers. Materials for prime coats, undercoats, finish coats and thinning applied to same surface shall be produced by the same manufacturer.

1.5 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.6 DELIVERY AND STORAGE

A. A. Deliver materials to job in original containers with labels intact and seals unbroken. Store materials and painters tools in a single room assigned for this use only. Keep storage place clean and neat and damage to it shall be corrected. Keep paint and other volatile material tightly covered at all times when not in actual use. Remove soiled and oily rags and waste from building every night and take every precaution to prevent spontaneous combustion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.8 JOB, WEATHER, AND TEMPERATURE CONDITIONS

A. Exterior painting: Do no exterior painting when temperature is below 50 degrees F., while surface is damp or during cold, foggy, rainy or frosty weather or when temperature is likely to drop to freezing within 24 hours. Avoid painting surfaces while they are exposed to hot sun. Allow 48 hours drying after rain before commencing painting.

1.9 COOPERATION WITH OTHER TRADES: Schedule this work and coordinate it with other trades and do not proceed until other work and/or job conditions are as required to achieve satisfactory results. Examine drawings and specifications for the work of various other trades and become familiar with all their provisions regarding painting. Surfaces that are left unfinished by requirement of other sections shall be painted or finished as part of the work covered by this section.

1.10 INSPECTION OF SURFACES:

A. Examine surfaces to receive paint finishes, in accord with Contract Conditions, for defects which cannot be corrected by procedures specified herein under "Preparation of Surfaces" and which might prevent satisfactory painting results. Do not proceed with work until such defects are corrected. Commencing of work constitutes acceptance of surfaces and thereafter, Contractor shall be responsible for satisfactory results as required herein.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experiance.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As noted on drawings.

C. Approved Manufacacturers:

1. Sherwin Williams or prior approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 PREPARATION AND APPLICATION CLEANING: The Painting Contractor will not only protect his work at all times, but will also protect all adjacent work and materials by suitable covering or other method during the progress of his work. Upon completion of the work, he is to remove all paint and varnish spots from the premises, all rubbish and accumulated materials and he is to leave the work in a clean, orderly and acceptable conditions.

3.4 EXTERIOR PAINTING SCHEDULE

A.

A. Metal Gates:

1. Primer System: Two full coats of Macropoxy 646 Epoxy at 6-10 mils dft.
   a. Make sure to properly prep the metal before priming. Remove all debris and contamination. Use heavy duty detergent to remove any oils or packing compounds. Rinse with clear water and allow it to dry overnight. It is vital that a full coat of 6-10 mils dft is applied.
2. Intermediate Coat: Acrolon Ultra HP Urethane B65R820/B65V820 applied at 2-3 mils dft.
3. Top Coat: Acrolon Ultra HP Urethane B65R820/B65V820 applied at 2-3 mils dft.

B. Concrete Walls:
1. Primer System: Loxon Conditioner A24-100 (white).
2. Intermediate Coat: Bond-Plex B71 applied at 4 mils dft. Color: Garnet #3.
3. Top Coat: Bond-Plex B71 applied at 4 mils dft. Color: Garnet #3.

END OF SECTION 099113