ADDENDUM #3  
Date of Addendum: 12/09/2020

1.0 NOTICE TO ALL BIDDERS AND PLANHOLDERS

The Contract Documents for the above-referenced Project are modified as set forth in this Addendum. The original Contract Documents and any previously issued addenda remain in full force and effect, except as modified by this Addendum, which is hereby made part of the Contract Documents. Bidder shall take this Addendum into consideration when preparing and submitting a bid, and shall acknowledge receipt of this Addendum in the space provided on the Bid Form.

2.0 BID SUBMITTAL DEADLINE

The bid submittal deadline remains the same and is not changed by this Addendum.

3.0 SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Section No.</th>
<th>Description of Change</th>
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<tbody>
<tr>
<td>3.1</td>
<td>01 31 00</td>
<td>Add new item 5 to paragraph 1.7.B. to read as follows: “There is an active building being built adjacent to the art building switchgear. The contractor is using Chelan lane for forklift access and some crane picks at the dumpsters. Contractor to coordinate the work through the University’s owner representatives, such that Chelan Lane remains accessible the community at large and the adjacent construction project.”</td>
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<td>3.2</td>
<td>03 30 00</td>
<td>Add Section to the Specifications</td>
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<td>3.3</td>
<td>07 84 13</td>
<td>Add Section to the Specifications</td>
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<td>3.4</td>
<td>09 91 13</td>
<td>Add Section to the Specifications</td>
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<td>3.5</td>
<td>09 91 23</td>
<td>Add Section to the Specifications</td>
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<td>3.6</td>
<td>31 20 00</td>
<td>Add Section to the Specifications</td>
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4.0 DRAWINGS

<table>
<thead>
<tr>
<th>Item</th>
<th>Drawing No.</th>
<th>Description of Change</th>
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<tbody>
<tr>
<td>4.1</td>
<td>E0.3</td>
<td>Updated cable lengths at Art BLDG</td>
</tr>
<tr>
<td>4.2</td>
<td>E1.2B</td>
<td>Updated switch locations at Art BLDG</td>
</tr>
<tr>
<td>4.3</td>
<td>S1.0</td>
<td>Created underground trenching requirements to new MV Switch locations.</td>
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<tr>
<th>Item</th>
<th>Drawing No.</th>
<th>Description of Change</th>
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<tbody>
<tr>
<td>4.4</td>
<td>E3.1</td>
<td>Updated conduit requirements on drawing.</td>
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</table>
# Addendum #3

**December 9, 2020**

<table>
<thead>
<tr>
<th>Item</th>
<th>Questions and Answers</th>
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<tbody>
<tr>
<td>4.5</td>
<td>E3.2 Updated conduit and pull box requirements on drawing.</td>
</tr>
<tr>
<td>4.6</td>
<td>E3.4 Updated conduit requirements on drawing</td>
</tr>
<tr>
<td>4.7</td>
<td>E3.5 Updated conduit and pull box requirements on drawing.</td>
</tr>
</tbody>
</table>

## 5.0 Questions and Answers

The following questions and answers are provided as a matter of information to clarify issues raised about the Contract Documents. To the extent that changes to the Contract Documents are required based on the questions received, the Contract Documents have been modified as noted above in the Specifications and Drawings sections of this Addendum.

<table>
<thead>
<tr>
<th>Item</th>
<th>Questions and Answers</th>
</tr>
</thead>
</table>
| 5.1  | Question: Can you provide details on the fencing requirements?  
Answer: The contractor shall reinstall existing fencing and where new fencing is necessary, duplicate the existing fencing. |
| 5.2  | Question: Does the good faith estimate cover the existing MV Switches?  
Answer: No suspect material was found in the existing MV switches in Condon, Bloedel, Benson, Bagley, John Wallace, or Art. |
| 5.3  | Question: Transformer replacement drawings. Sheet E.2 Henderson Hall Basement Electrical Plan. Construction note 2,3,7. Please clarify method of installation and support of 2/0 IAC cable from deadbrakes in room 014A to new disconnect switch. Will this run be entirely in 4" conduit? It appears that it is run in conduit from room 014A to room 008. Does the cable leave the conduit at note 3, and continue on cable supports to the 24"x 24" x 24" exterior enclosure?  
Answer: The #2/0 IAC will be installed in conduit on the exterior of the building. The conduit will not be required inside the building. |
| 5.4  | Question: Transformer replacement drawings. Sheet E.2 Henderson Hall Basement Electrical Plan. Construction note 5,9. Will the 24" x 24" x 24"pull box enclosures need to be NEMA 3R, or 4X?  
Answer: Pull boxes shall be NEMA 3R. |
| 5.5  | Question: Transformer replacement drawings, sheet E3.5, construction note 10 shows the 2/0 IAC cable run on the outside wall, around the SW corner of the building without conduit. At the 15KV primary switch, PVC Coated rigid is called out. Is this a vertical conduit sleeve to transition from above to underground?  
Answer: The #2/0 IAC cable shall be installed in 4" RGS conduit on the exterior of the building. There is not requirement for PVC Coated rigid conduit. |
5.6 | Question: Transformer replacement drawings, sheet E3.5 Henderson Hall Partial Plan Transformer. Construction note 8,14. Will the 12” x 48” x 48”, and 12” x 12” boxes shown on the West wall need to be NEMA 3R or 4X?
Answer: Pull Boxes shall be NEMA 3R.

5.7 | Question: Will the UW approve equipment vendors that are not on the approved vendor list?
Answer: The UW will not approve equipment vendors during the bid process. The UW entertain approving vendors during the submittal process of the project.

5.8 | Question: Will a City of Seattle electrical permit be required for the MV work?
Answer: Yes, the contractor will have to obtain an electrical permit from the City of Seattle.

### 6.0 INFORMATION

The following item(s) are provided as a matter of information only to all bidders and plan holders and do not modify or become part of the Contract Documents.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
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| 6.1  | Specification Sections:  
 01 31 00 – Project Management and Coordination  
 07 84 13 – Penetration Firestopping  
 09 91 13 – Exterior Painting  
 09 91 23 – Interior Painting  
 31 20 00 – Earth Moving |
| 6.2  | END OF ADDENDUM |
PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for project management and coordination during construction, in addition to the requirements specified elsewhere in the Contract Documents.

B. Owner’s forms referenced in this Section include (see Appendix A):
   1. Request for Information (RFI)
   2. Non-Conformance Report (NCR)

C. The Owner intends to utilize an internet-based construction management system (CMS) for communications and documents controls with the Contractor and A/E on this Project (see Section 01 35 00 “Electronic Controls”).

1.2 GENERAL COMMUNICATION

A. The Owner shall designate, in writing, the Owner’s Representative for this Project.

B. All verbal communications between Owner, A/E, and Contractor shall be for clarification and collaboration purposes and are not binding unless issued in writing through the Owner’s Representative.

C. Contractor communications by and with A/E’s consultants shall be through the A/E, and A/E’s communications by and with the Contractor’s Subcontractors shall be through the Contractor.

D. In case of an emergency:
   1. Contact the Owner’s Representative; and
   2. Follow emergency procedures in accordance with Section 01 35 23 “Owner Safety Requirements.”

1.3 CORRESPONDENCE

A. Address all correspondence to Owner’s Representative.

B. All correspondence to and from Contractor will be routed through the Owner’s Representative.

1.4 CONTRACTOR REQUEST FOR INFORMATION

A. When field conditions or Contract Documents require clarification or verification by the A/E or A/E’s consultants, a written RFI is to be submitted per the following:
   1. Identify the nature and location of each requested clarification and/or verification using the RFI form. Provide as a minimum the following information:
      a. Project name and number
      b. Date
      c. Date response required by
      d. RFI number
      e. Subject
      f. Initiator of the question
      g. Indication of costs, if known
      h. Location on site
      i. Contract Drawing reference
j. Contract Specification section and paragraph reference
k. Descriptive text

2. Number each RFI sequentially beginning with #001. Submit only one question per RFI. Also, RFI's shall be categorized as ARCH, MECH, ELEC, etc.

1.5 CLARIFICATIONS

A. Clarifications may be discussed with A/E, or A/E’s consultants, with concurrence of Owner. Following the discussion, the Contractor shall document on an RFI form any agreed upon modification which does not require a Change Order. The A/E may provide supplemental information to clarify the Contract Documents. RFIs and A/E supplemental information (ASI) which modify or change the Work will be authorized only by Change Order.

1.6 NON-CONFORMANCE REPORT

A. Non-Conforming Work: Work found defective, or in any way not in accordance with the requirements of the Contract Documents, is defined as non-conforming Work.

B. Procedure: If, after an oral discussion or written notification, the Contractor fails to correct Work that is found defective or not in accordance with the Contract Documents, the Owner will issue a Non-Conformance Report (NCR). Upon receipt of an NCR, the Contractor shall take immediate action to resolve the Work to the Owner's satisfaction, or remove and replace with conforming Work at Contractor's expense and with no increase in Contract Time. Corrective actions for non-conforming Work shall be discussed at construction progress meetings and be completed no later than prior to Final Completion.

1. Where non-conforming Work requires re-design by the A/E, such re-design costs shall be borne by the Contractor.

1.7 COORDINATION

A. General Coordination:

1. The Contractor shall be in charge of this Contract and the Project, as well as directing and scheduling of all Work. Final responsibility for performance, interface, and completion of the Project shall be the Contractor’s.

a. Anticipate interrelationship of all Subcontractors and their relationship with the total Work.

b. Resolve differences or disputes between Subcontractors and materials suppliers concerning coordination, interference, or extent of the Work. Contractor’s decisions, if consistent with Contract Document requirements, shall be final.

2. Cooperation with other contractors during the term of this Project may be required within the building or other adjacent locations to the construction limits of this Project. The Contractor is to cooperate with the Owner in coordination of all work to prevent impact to this or other Owner sponsored construction projects.

3. Cooperation with building occupants may be required when scheduling construction activities that create excessive noise or structure-borne vibration. The Contractor is to cooperate with the Owner in coordination of all work to minimize these impacts to the Owner's operations (see Section 01 50 00 “Temporary Facilities and Controls”).

B. Special Coordination:

1. The Contractor is responsible for receiving, unloading, storage and handling of Owner Furnished Contractor Installed (OFCI) items from the time of receipt through Substantial Completion.

a. The Contractor is responsible for protecting OFCI and Owner Existing Contractor Installed (OECI) items from damage, such as: damage from exposure to the elements; or from damage to a warranty due to Contractor’s improper installation
and testing. The costs to repair or replace items damaged while in the Contractor's possession shall be borne by the Contractor.

1) The Contractor shall consult with the Owner to determine the warranty requirements of OFCI and OECI items.

2. Coordination with building occupants for mitigating construction sound in building

3. Coordination with Owner’s operations including, but not limited to:
   a. Escorts in sensitive areas
   b. Owner’s sign-in procedures
   c. Project Site access routes within buildings, including use of Owner’s elevators and any time-of-use or access restrictions

4. Contractor shall provide storage of Owner-Furnished medium voltage switches for the project in a client controlled storage area until the switches are to be installed.

5. There is an active building being built adjacent to the Art Building switchgear. The contractor is using Chelan Lane for forklift access and some crane picks at the dumpsters. Contractor to coordinate the work through the University’s owner representatives, such that Chelan Lane remains accessible the community at large and the adjacent construction project.

C. Mechanical and Electrical Coordination:
   1. Resolve all tight or restricted conditions involving work of various sections in advance of installation.
   2. Coordinate the Work of all sections to ensure that all fixtures, devices, switches, outlets, ducts, pipes, and similar items can be installed as shown.

D. Job Site Field Measurements and Templates:
   1. Obtain field measurements required for accurate fabrication and installation of work included in the Contract Documents. Exact measurements are the Contractor’s responsibility.
   2. Furnish or obtain templates, patterns, and setting instructions as required for installation of all work. Verify in field.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Features
   1. Cast-in-place structural concrete
   2. Concrete mix design
   3. Concrete placement procedures
   4. Concrete finishing
   5. Concrete curing
   6. Repair of surface defects

B. Related Sections
   1. 013300 – Submittal Procedures
   2. 014523 – Structural Testing, Inspection, and Quality Assurance

1.2 REFERENCE STANDARDS

A. The latest versions of the publications listed below form a part of this specification; comply with provisions of these publications except as otherwise shown or specified.

   1. ACI 117 Standard Specification for Tolerances for Concrete
   2. ACI 301 Standard Specifications for Structural Concrete, including other standards referred to in ACI 301, such as ASTM, etc.
   3. ACI 30 Standard Specification for Hot Weather Concreting
   4. ACI 30 Standard Specification for Cold Weather Concreting
   5. ACI 30 Standard Specification for Curing Concrete

1.3 SUBMITTALS

A. General: Make submittals in accordance with Section 01330, "Submittal Procedures."

B. Product Data: For each type of product indicated.
C. Concrete Mix Design Proportions: Submit concrete mixture proportions and characteristics. Submit the concrete mix design to the local building officials where required. Do not begin concrete production until concrete mix designs have been reviewed and approved. Mix designs shall include proportions of all ingredients, including admixtures added at time of batching or at job site. Include the following:

1. Specify the locations for each mix design.
2. Specify the method used to determine proposed concrete mix design. Include field test records or trial mix test data used to establish the average compressive strength of the concrete mixture.
3. For aggregates, submit types, pit or quarry locations, producers’ names, gradings, specific gravities, certification, and evidence not more than 90 days old demonstrating compliance with this specification. Aggregate weights shall be based upon saturated surface dry conditions. Include concrete mix gradation of fine and coarse aggregates.
4. For admixtures, submit types, brand names, producers, manufacturer’s technical data, and certification data.
5. Submit the cement type and certification, fly ash type and certification, water/cementitious materials ratio, and source of water supply.
6. Submit the slump.
7. Submit the air content of freshly mixed concrete.
8. Submit the concrete compressive strength at 7, 28, and 56 days. The 56 day strength is required only when specified in the Concrete Mix Specification Table in the General Notes.
9. Submit the chloride ion content of concrete.
10. Submit the fibrous reinforcing type, fiber length, dosage rate, and dosage procedures.

D. Curing Methods: Submit written methods, procedures, and products for curing of all concrete.

E. Repair Methods: Submit the proposed methods of repair, along with repair material specification, manufacturer’s data on the proposed patching material, and the proposed preparation and application procedure.

F. Construction Joints: Submit information for acceptance of proposed location and treatment of construction joints proposed but not indicated on the Construction Documents.

G. Qualification of Finishers: Submit qualifications of the finishing contractor and the finishers who will perform the Work.

H. Matching Sample Finish: When required by Contract Documents, submit sample finish.
I. Exposed-Aggregate Surface: When an exposed-aggregate surface is specified and a chemical retarder is proposed, submit specification and manufacturer’s data for the retarder and the proposed method of use.

J. Records: Retain records of all concrete poured, including exact mix proportions, slumps, test strength, date, time, location of the placement, weather conditions at time of placement, and the source of concrete. Submit copy to Owner’s Representative and Building Official.

1.4 QUALITY ASSURANCE

A. The Contractor is responsible for correcting Work that does not conform to the specified requirements, including strength, tolerances, and finishes. The Contractor shall submit the proposed solution for review and approval.

B. Unless otherwise noted, maintain the allowable tolerances in ACI 117.

C. Maintain records verifying materials used are of the specified and accepted types and sizes and are in conformance with the Contract Documents.

D. Special Inspection and Testing: Concrete work is subject to special inspection and testing as specified; notify the Testing Agency at least 48 hours before inspection is required.

E. Single Source Responsibility: Provide materials for concrete work made or produced from a single source of supply; no mixing of brands or types of cement will be allowed; no substitution of aggregate type or size from those approved will be permitted.

F. Concrete Contractor Qualifications: An experienced concrete contractor who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

G. Concrete Producer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94. Producer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

H. Pre-Construction Conference: At least 30 days prior to start of concrete work, the Contractor shall hold a meeting to review the finish appearance requirements, reveal locations, joint spacings, concrete design mixes, requirements for submittals, construction procedures, schedules for testing, inspection, and certifications.

1. Notify attendees 10 days prior to the scheduled date of the meeting.

2. Required in attendance:
   a. Contractor and Subcontractors
   b. Testing Laboratory representative
c. Concrete subcontractor

d. Ready-mix producer

e. Architect/Engineer

f. All subcontractors with work to be installed in or affected by concrete work

1.5 DELIVERY, STORAGE, AND HANDLING

A. Cementitious Materials: Store cementitious materials in dry, weather-tight buildings, bins, or silos that will exclude contaminants.

B. Aggregates: Store and handle aggregate in a manner that will avoid segregation and prevent contamination with other materials or other sizes of aggregates. Store aggregates to drain freely. Do not use aggregates that contain frozen lumps.

C. Admixtures: Protect stored admixtures against contamination, evaporation, or damage. Protect liquid admixtures from freezing and from temperature changes that will adversely affect their characteristics. Store and handle products in a manner to retain original quality. Do not use products stored beyond the manufacturer’s recommended shelf life.

D. Delivery of Materials: Deliver site applied materials, such as joint and curing materials, in original factory packaging and unopened containers and protect from damage and contamination.

E. Place concrete within the time limits specified. Concrete shall possess the specified characteristics in the freshly mixed state at the point of placing.

1.6 WARRANTY

A. Project Warranty: Refer to Condition of the Contract for project warranty provisions.

B. Manufacture’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by an authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights Owner may have under the contract documents.

1. Performance Warranty: Provide warranty to repair water leakage through industry-accepted and approved means such as epoxy injection.

2. Warranty Period: 10 years commencing upon date of acceptance of building occupancy by Owner.
PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: Portland cement shall conform to ASTM C150, Type I or Type II.
   a. The cement shall be of the same brand and type and from the same plant of manufacture as the cement used in the concrete represented by the submitted field test records or used in the trial mixtures.
   b. For architectural concrete, use one brand of cement throughout project, unless otherwise acceptable to the Architect.
   c. Type III cement may be used for cold weather construction.

2. Fly Ash: Pozzolanic mineral admixture conforming to ASTM C618, Class F. Use fly ash from one single source for the whole project. When fly ash is used, the maximum amount shall be 30% by weight of the total cementitious materials, unless otherwise noted in the Construction Documents.


B. Aggregate: Aggregates and aggregate grading requirements shall conform to ASTM C33. Aggregates shall be free from any substance that may be deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete. Aggregates used in concrete shall be obtained from same sources and have the same size ranges as the aggregates used in the concrete represented by submitted historical data or used in trial mixtures.

C. Admixtures: The use of admixtures shall be the responsibility of the Contractor. When more than one admixture is used in the mix, furnish satisfactory evidence to the Architect that the admixtures to be used are compatible in combination with the cement and aggregates. Provide only one brand of each type of admixture. Accelerating admixtures shall not be used. Unless approved by the Architect, admixtures shall be free of calcium chloride and thiocyanate (not more than 0.05% chloride ions). The following types of admixtures are approved:


D. Water: Water shall be in conformance with ASTM C94.

2.2 RELATED MATERIALS

A. Dissipating Resin Curing Materials: Liquid type membrane-forming curing compound complying with ASTM C309, Type I. Curing compound must be of a type that does not inhibit subsequent moist curing operations. The film shall chemically break down in a 6- to 8 week period and shall not affect adhesion of coverings or membranes. Acceptable products are Burke "RES X Curing Compound," Euclid Chemical Co. "Kurez DR," Dayton "Day-Chem Rez Cure (J 11 W)," or approved equal.

B. Cure and Seal Combination Materials (Exposed Interior Concrete Slabs, including Garage Slabs): Use curing and sealing compounds that conform to ASTM C309 (Types 1 and 1D, Class B) or ASTM 1315. Acceptable products are Master Builders "Acryseal," Euclid Chemical Co. "Rez-Seal," Sonneborn "Kure-N-Seal," or approved equal. Cure and seal material for use in parking garages must resist de-icing chemicals.

C. Moisture Retaining Cover: Use waterproof sheet materials that conform to ASTM C171.

D. High Density Insulation Fillers: Extruded polystyrene foam insulation complying with ASTM C578, Type VII.

E. Commercial Bonding Grout and Repair Materials: Use products in accordance with manufacturer’s recommendations. Products include, but are not limited to, the following:

1. Portland-cement mortar modified with a latex acrylic, non re-emulsifiable bonding agent conforming to ASTM C1059 Type II. Acceptable products include Euclid Chemical Co. "Flex-Con," Dayton "Day-Chem Ad Bond (J 40)," or approved equal.

2. Epoxy mortars and epoxy compounds that are moisture-insensitive during application and after curing and that embody an epoxy binder conforming to ASTM C881. The type, grade, and class shall be appropriate for the application as specified in ASTM C881.


2.3 PROPORTIONING AND DESIGN REQUIREMENTS OF CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete by Field Experience Method or, if not available, by Laboratory Trial Batch Methods as specified in ACI 301. Mix proportions shall produce consistent and workable concrete that can be worked readily into forms and around reinforcement without segregation or excessive bleeding.
1. Field Experience Method: If field test data is available, in accordance with ACI 301, submit for acceptance the mixture proportions along with the field test data. The mix design shall be pre-approved by the City of Renton or Seattle Building Department in accordance with DPD Director’s Rule 27 87.

2. Trial Batch Method: Use an independent, qualified Testing Facility for preparing and reporting proposed mix designs. All expenses connected with such testing and submittals shall be borne by the Contractor.

B. Concrete Mixes: Provide concrete mixes conforming to the requirements as indicated in the Structural Drawing General Notes.

1. Strength Requirements: Compressive strength requirements are indicated on drawings and are based on cylinder tests at indicated age. Concrete made with high-early strength cement shall have a 7 day strength equal to the specified 28 day strength for concrete made with Type III Portland cement.

2. Cement Content for Slabs: Not less than those indicated in ACI 301.

3. Water/Cementitious Material Ratio: Not to exceed limits indicated on Structural drawings.

4. Air Entrainment: Use air entraining admixture in exterior exposed concrete as indicated on the Structural drawings.

5. Slump: The Contractor shall determine slump. Each concrete mix submitted shall have the slump specified. Slump tolerances shall meet the requirements of ACI 117.

6. Admixtures: Concrete may contain admixtures, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete. When admixtures are specified or required for workability for particular parts of the Work, use the types specified.

7. Chloride Ion: Maximum water soluble chloride ion concentrations in hardened concrete at ages 28 to 42 days contributed from the ingredients, including water, aggregates, cementitious materials and admixtures, shall not exceed a maximum, by weight of cement, of 0.06% for prestressed concrete and 0.30% for other concrete.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to the Owner. New field data, data from new trial mixtures, or evidence that indicates that the change will not adversely affect the relevant properties of the concrete shall be submitted for acceptance before use.

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not place concrete until the Architect approves all required submittals.
B. Remove snow, ice, frost, water, and other foreign materials from form surfaces, reinforcement, and embedded items against which concrete will be placed.

C. Place concrete on properly prepared and unfrozen sub-grade or forms and only in dewatered excavations and forms.

D. Do not allow mud or foreign materials into the concrete during placement operations.

E. When the ambient temperature necessitates the use of cold or hot weather concreting, make provisions in advance of concrete placement.

F. Do not begin placing concrete when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing.

G. Do not begin placing concrete while rain, sleet, or snow is falling unless adequate protection is provided. Do not allow rainwater to increase mixing water or to damage the surface of the concrete.

3.2 JOINTS

A. Construction Joints: Locate construction joints as indicated on the structural drawings or as approved by the Architect. Remove laitance and thoroughly clean and dampen construction joints prior to placement of fresh concrete.

B. Bonded Construction Joints: Coat concrete joined with new concrete, including topping, with a concrete bonding compound. Mix and apply in strict accordance with manufacturer's recommendations for the conditions of the application. Concrete surfaces to which other concrete is to be bonded shall be roughened in an approved manner that will expose sound aggregate uniformly without damaging the concrete; remove all laitance and loose particles.

C. Control Joints in Slabs-on-Ground: Construct control joints in slabs-on-ground to form panels of patterns as approved. Use inserts 1/4 inch wide x 1/4 of slab depth. Where saw-cut joints are required or permitted, start cutting as soon as concrete has hardened sufficiently to prevent dislodgment of aggregates. Saw a continuous slot to a depth of 1/4 the slab thickness, but not less than 1 inch. Complete sawing within 12 hours after placement. If an alternative method, timing, or depth is proposed for saw cutting, submit detailed procedure plans for review and acceptance.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

1. Embedded items include, but are not limited to, expansion joints, joint fillers, waterstops, anchor bolts, embedded plates, dovetail anchor slots, etc.

2. Items shall be free of oil, loose scale, rust, etc.
3. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent the entry of concrete into the voids.

4. Do not embed aluminum in concrete, except where the aluminum is protected from direct contact from the concrete.

3.4 CONCRETE DELIVERY

A. Ready Mix Concrete: Comply with requirements of ASTM C94 and as herein specified.

1. Elapsed time from start of batching at plant to completed discharge at job site shall not exceed 90 minutes or more than 300 revolutions, whichever comes first after introducing mixing water.

2. When air temperature is between 85°F and 90°F, reduce mixing and delivery time from 90 minutes to 75 minutes. When air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.

3. The concrete temperature shall be monitored in the truck. A rise in temperature of 5°F within 10 minutes or less indicates concrete setting has started before discharge and the load shall be rejected.

4. Ready-Mix Concrete: Provide certificate signed by authorized official of supplier with each load of concrete, stating the following:

   a. Time truck left plant
   b. Mix of concrete
   c. Amount of water and cement in mix
   d. Amount and type of admixtures
   e. Time truck is unloaded at site
   f. Additional water amount allowed at the project site
   g. A truck without batch tickets will be rejected.

B. Control of Mixing Water: Water may be added once to increase the slump of the concrete within the first 15 minutes after the truck arrives at the job-site, provided the following requirements are adhered to:

1. The specified slump and maximum allowable water/cement ratio is not exceeded.

2. The Independent Testing Agency is present to monitor the amount of water added to compare with the amount of water added at the plant. Testing Agency shall keep written record of the amount of water added at the job site to each truckload delivered.
3. The drum shall be turned an additional 30 revolutions, or more if necessary, until the added water is uniformly mixed into the concrete.

4. Water shall not be added to the batch after the taking of test cylinders, unless new test cylinders are taken at the expense of the Contractor.

5. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Admixtures: Add admixtures within an accuracy of 3%. Where two or more admixtures are used in the same batch, they shall be added separately and must be compatible. Approved admixtures must be added at the appropriate time in strict compliance with manufacturer's directions. Concrete that shows evidence of total collapse or segregation caused by the use of admixtures shall be removed from the site.

3.5 CONCRETE PLACEMENT

A. Pre-Placement Inspection: Before concrete placement operation begins, perform the following procedures:

1. Inspect and complete formwork installation and all reinforcing, and embed items. Notify other crafts to permit installation of their work.

2. Ensure that the reinforcing will be maintained in the proper position during concrete placement operations.

3. Moisten wood forms immediately before placing concrete where form coatings are not used.

4. At topping slabs, thoroughly saturate base slab just prior to placing topping, but do not leave pools of water.

5. Verify all dimensions and elevations.

6. Verify that site conditions are acceptable for placement of waterproofed concrete.

7. Do not proceed with concrete placement until conditions unacceptable to the concrete waterproofing manufacturer's on-site representative are corrected.

B. Conveying: Methods of conveying concrete is the responsibility of the Contractor. Convey concrete from mixer to the place of final deposit rapidly by methods that prevent segregation or loss of ingredients and that will ensure the required quality of concrete. Do not use aluminum pipes or chutes. Use acceptable conveying equipment of a size and design that will prevent cold joints from occurring. Clean conveying equipment before each placement.

1. Provide runways or other means for wheeled equipment to convey concrete to deposit points. Do not run wheeled equipment used to deposit concrete over reinforcement; do not support runways on reinforcement.
2. Belt Conveyors: Use belt conveyors that are horizontal or at a slope that will not cause excessive segregation or loss of ingredients. Protect concrete to minimize drying and effects of temperature rise. Use an acceptable discharge baffle or hopper at the discharge end to prevent segregation. Do not allow mortar to adhere to the return length of the belt.

3. Chutes: Use metal or metal-lined chutes having rounded bottoms and a slope between 1:2 and 1:3 (vertical:horizontal). Chutes more than 20 feet long and those not meeting slope requirements may be used, provided they discharge into a hopper prior to distributing into the forms.

4. Pumping or Pneumatic Conveying: Use pumping conveying equipment that permits placement rates that avoid cold joints and prevent segregation in discharge of pumped concrete. In addition:
   a. Pipeline shall be steel pipe or heavy-duty flexible hose.
   b. Inside diameter of the pipe shall be at least three times the maximum size of the coarse aggregate.
   c. Distance to be pumped shall not exceed the limits recommended by the pump manufacturer.
   d. Provide continuous supply of concrete to the pump.
   e. When pumping is completed, the concrete remaining in the pipeline shall be ejected without contaminating the concrete in place.

5. Cleaning: Do not discharge rinse water into forms or areas to receive concrete.

C. Depositing: Deposit concrete continuously in one layer, or in multiple layers if the fresh concrete is deposited on in-place concrete that is still plastic. Do not deposit fresh concrete on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joint as specified. Deposit concrete as near to its final location as practicable to avoid segregation. In addition:
   1. There shall be no vertical drop greater than 3 feet, except where suitable equipment is provided to prevent segregation and where specifically authorized.
   2. Do not use concrete that has surface-dried or partially hardened or that contains foreign material.
   3. Place concrete for beams, girders, brackets, column capitals, haunches, and drop panels at the same time as concrete for slabs.

D. Consolidating: Consolidate concrete by vibration. Thoroughly work concrete around reinforcement and embedded items and into corners of forms, eliminating air and stone pockets that may cause honeycombing, pitting, or planes of weakness.
1. Workers shall be experienced in use of the vibrators.

2. Vibrators shall have a frequency of not less than 8,000 vibrations per minute, and the head diameter and amplitude shall be appropriate for the concrete mix being placed. A spare vibrator shall be kept at the job site during all concrete placing operations.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniform spacing over the area of placement; distance between insertions shall be approximately 1 1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just vibrated area by a few inches. Do not place vibrators within 2 1/2 inches of form face.

4. 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 set; if there is a delay of more than 15 minutes, vibrate previous lift prior to placing the new concrete. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix. Withdraw vibrators slowly.

5. Consolidation of slabs shall be obtained with vibrating screeds, rolling pipe screeds, or internal vibrators.

E. Re-tamping of concrete that has taken its initial set is not allowed.

F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.1 and as specified herein.

1. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.

G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305.1 and as specified herein. Loss of slump, flash set, or cold joints due to temperature of concrete as placed will not be acceptable.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.
2. When temperature of steel reinforcement, embedments, or forms is greater than 120°F, fog steel reinforcement, embedments, and forms with water immediately before placing concrete. Remove standing water before placing concrete.

3. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, if approved by the Architect.

3.6 CONCRETE CURING AND PROTECTION

A. General: Cure concrete in accordance with the Curing Methods noted below for a minimum of 7 days after placement. Cure high-early strength concrete for a minimum of 3 days after placement. The materials and methods of curing shall be subject to acceptance.

B. Protection: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Protect concrete during the curing period such that the concrete temperature does not fall below requirements of ACI 306.1. The concrete shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and to ensure the necessary strength development for structural safety.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing, or as soon as marring of the concrete will not occur.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Avoid rapid drying at end of final curing period. Upon completion of curing cycle on slabs, withdraw water at a gradual rate over an additional 7 days.

3. Monitor the curing operations as required to ensure the concrete surfaces remain fully wetted and that cover materials are not displaced during the full curing period; at a minimum, the curing method shall be checked every 8 hours, including Saturdays, Sundays, and holidays.

4. Additional Curing Periods: When the 7 day compression test cylinders, representative of parts of a structure already placed, indicate that the 28 day strengths may be less than 85 percent of the design strengths, give those parts of the structure additional curing.

C. Curing Unformed Concrete Surfaces: Apply one of the Curing Methods after completion of placement and finishing of concrete surfaces not in contact with forms.

D. Curing Formed Concrete Surfaces: Keep absorbent wood forms wet until they are removed. After formwork removal, cure concrete by one the Curing Methods.

E. Curing Methods: After placing and finishing, use one or more of the following methods to preserve moisture in concrete. When one of the curing procedures is used initially, the curing procedure may be replaced by one of the other procedures when concrete is 1 day old, provided the concrete is not permitted to become surface-dry at any time.
1. Ponding, continuous fogging, or continuous sprinkling
2. Application of mats or fabric kept continuously wet
3. Continuous application of steam (under 150°F)
4. Application of sheet materials conforming to ASTM C171
5. Application of a curing compound conforming to ASTM C309 or C1315 (note permitted for exposed floor slabs, including the hangar floor slab)
   a. Apply the compound in accordance with manufacturer’s recommendation as soon as water sheen has disappeared from the concrete surface and after finishing operations. The application rate shall not be less than 1 gallon per 200 square feet.
   b. For rough surfaces, apply curing compound in two applications at right angles to each other. The material applied in each coat shall not be less than 1 gallon per 200 square feet.
   c. Do not use curing compound on any surface where concrete or other material will be bonded unless the curing compound will not prevent bond or unless measures are to be taken to completely remove the curing compound from areas to receive bonded applications.
   d. Curing compound may be used on concrete that is to receive resilient flooring, carpet, sand cushion terrazzo, and wood flooring, unless otherwise required by finish treatment manufacturer. Provide written certification from the finish floor treatment manufacturer as previously specified.
   e. The Contractor shall be responsible for removing any traces of the dissipating curing compound that remains on the substrate prior to applying subsequent floor finish. This shall include, but is not limited to, removing the curing compound using power scrubbers and industrial strength detergents and using fresh water to remove the detergents. Comply with any additional instructions and recommendations of the manufacturer whose products are to be applied directly over concrete slab.

3.7 CONCRETE SURFACE REPAIRS

A. General: All surface defects shall be reported to the Architect.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to the satisfaction of the Owner's Representative. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, stains, and other discolorations that cannot be removed by cleaning.
1. Repair concealed formed surfaces that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace the concrete.

2. Repair tie holes and surface defects immediately after formwork removal. Where the concrete surface will be textured by sandblasting or bush-hammering, repair surface defects before texturing.

C. Repair of Unformed Surfaces: Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects include crazing, cracks in excess of 0.01 inch wide or which penetrate to reinforcement or completely through non reinforced sections regardless of width, spalling, pop outs, honeycomb, rock pockets, and other objectionable conditions.

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope.

2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Architect.

D. Repair of Tie Holes: Plug tie holes except where stainless steel ties, non-corroding ties, or acceptably coated ties are used. When Portland cement patching mortar is used for plugging, clean and dampen tie holes before applying the mortar. When other materials are used, apply them in accordance with manufacturer's recommendations.

E. Repair of Surface Defects: Outline honeycombed or otherwise defective concrete with a 1/2- to 3/4 inch-deep saw cut and remove such concrete down to sound concrete. When chipping is necessary, leave chipped edges perpendicular to the surface or slightly undercut. Do not feather edges. Dampen the area to be patched, plus 6 inches around the patch area perimeter. Prepare bonding grout and thoroughly brush grout into the surface. When the bond coat begins to lose water sheen, apply patching mortar and thoroughly consolidate mortar into place. Strike off mortar, leaving the patch slightly higher than the surrounding surface to permit initial shrinkage. Leave the patch undisturbed for 1 hour before finishing. Keep the patch damp for 7 days.

F. Removal of Stains: Remove stains, rust, efflorescence, and surface deposits considered objectionable by the Owner's Representative by acceptable methods.

G. Site-Mixed Repair Materials

1. Bonding Grout: Mix approximately 1 part cement and 1 part fine sand with water to the consistency of thick cream.
2. Repair Mortar: Mix repair mortar using the same materials as concrete to be patched with no coarse aggregate. Do not use more than 1 part cement to 2 1/2 parts sand by damp loose volume.

   a. For repairs in exposed concrete, make a trial batch and check color compatibility of repair material with surrounding concrete. Blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding.

   b. Use repair mortar at a stiff consistency with no more mixing water than is necessary for handling and placing. Mix repair mortar and manipulate the mortar frequently with a trowel without adding water.

H. Commercial Repair Products: Acceptable commercial repair products other than site-mixed repair materials may be used for repair, as specified in Part 2. Use repair products in accordance with manufacturer’s recommendations.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.02 PERFORMANCE REQUIREMENTS

A. A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling, or exceeding fire-resistance rating of constructions penetrated.

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
   a. Penetrations located outside wall cavities.
   b. Penetrations located outside fire-resistance-rated shaft enclosures.

3. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 deg F.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.03 SUBMITTALS

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

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Qualification Data: For Installer.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.

D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application on Drawings. Provide all firestopping systems manufactured by one manufacturer for any one project.

3. Hilti, Inc.
6. NUCO Inc.
7. RectorSeal Corporation (The).
8. Specified Technologies Inc.
9. 3M; Fire Protection Products Division.
10. Tremco; Sealant/Weatherproofing Division.
11. USG Corporation.
12. or approved equal

2.02 FIRESTOPPING

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

PART 3 EXECUTION

3.01 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.02 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage an independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.
3.03 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ. Install firestopping at all wall penetrations.

END OF SECTION 07 84 13
PART 1   PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Concrete.
   2. Concrete masonry units (CMU).
   3. Steel.
   5. Wood.

1.02 SUBMITTALS

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

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

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.03 QUALITY ASSURANCE

A. MPI (Master Painters Institute) Standards:

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. University will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
      b. Other Items: University will designate items or areas required.
   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 University at no added cost to University.
1.04 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. of each material and color applied.

PART 2 PRODUCTS

2.01 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: Match University's samples.

2.02 BLOCK FILLERS


2.03 PRIMERS/SEALERS

A. Alkali-Resistant Primer: MPI #3.

B. Bonding Primer (Water Based): MPI #17.

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

2.04 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

B. Waterborne Galvanized-Metal Primer: MPI #134.

2.05 WOOD PRIMERS

2.06 EXTERIOR LATEX PAINTS

A. Exterior Latex (Flat): MPI #10 (Gloss Level 1).

B. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

C. Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

2.07 QUICK-DRYING ENAMELS

A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

B. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).

2.08 FLOOR COATINGS

A. Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.

PART 3 EXECUTION

3.01 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. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   3. Wood: 15 percent.
   4. Plaster: 12 percent.
   5. Gypsum Board: 12 percent.

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

D. 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.
3.02 PREPARATION AND APPLICATION

A. Comply with manufacturer’s written instructions and recommendations in "MPI Universityrual 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 University, and leave in an undamaged condition.

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

3.03 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:
   1. Latex System: MPI EXT 3.1A.
      c. Topcoat: Exterior latex flat.
   2. Latex Aggregate/Latex System: MPI EXT 3.1 B.
      a. Prime Coat: Latex stucco and masonry textured coating.
      c. Topcoat: Exterior latex flat.
   3. Latex Over Alkali-Resistant Primer System: MPI EXT 3.1K.
      c. Topcoat: Exterior latex flat.

B. Concrete Substrates, Traffic Surfaces:
   1. Latex Floor Paint System: MPI EXT 3.2A.
c. Topcoat: Interior/exterior latex floor and porch paint low gloss.

2. Water-Based Clear Sealer System: MPI EXT 3.2H.

C. CMU Substrates:
1. Latex System: MPI EXT 4.2A.
   c. Topcoat: Exterior latex flat.
2. Latex Over Alkali-Resistant Primer System: MPI EXT 4.2L.
   c. Topcoat: Exterior latex flat.
3. High-Build Latex System: MPI EXT 4.2K, applied to form dry film thickness of not less than 10 mils.
   a. Prime Coat: As recommended in writing by topcoat manufacturer.
   b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
   c. Topcoat: High-build latex exterior.

D. Steel Substrates:
1. Quick-Drying Enamel System: MPI EXT 5.1A.

E. Galvanized-Metal Substrates:
1. Latex System: MPI EXT 5.3A.
   c. Topcoat: Exterior latex flat.
2. Latex Over Water-Based Primer System: MPI EXT 5.3H.
c. Topcoat: Exterior latex flat.

F. Glue-Laminated Beam and Column Substrates:
   1. Latex System: MPI EXT 6.1L.
      c. Topcoat: Exterior latex flat.

G. Dressed Lumber Substrates: Including architectural woodwork and doors.
   1. Latex System: MPI EXT 6.3L.
      c. Topcoat: Exterior latex flat.

H. Wood Panel Substrates: Including plywood siding, fascias, and soffit.
   1. Latex System: MPI EXT 6.4K.
      c. Topcoat: Exterior latex flat.

I. Wood Shingle and Shake Substrates (Excluding Roofs):
   1. Latex System: MPI EXT 6.6E.
      c. Topcoat: Exterior latex flat.

J. Dimension Lumber Substrates, Nontraffic Surfaces
   1. Latex System: MPI EXT 6.2M.
      c. Topcoat: Exterior latex flat.

K. Dimension Lumber Substrates, Traffic Surfaces:
   1. Latex System: MPI EXT 6.5E.
      c. Topcoat: Interior/exterior latex floor and porch low gloss.
1) With additive to increase skid resistance of painted surface.

L. Stucco Substrates:

1. Latex System: MPI EXT 9.1A.
   c. Topcoat: Exterior latex flat.

2. Latex Over Alkali-Resistant Primer System: MPI EXT 9.1J.
   c. Topcoat: Exterior latex flat.

   END OF SECTION 09 91 13
PART 1  GENERAL

1.01  SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Concrete.
   2. Concrete masonry units (CMU).
   3. Steel.
   5. Aluminum (not anodized or otherwise coated).
   6. Wood.
   7. Gypsum board.
   8. Plaster.
   9. Cotton or canvas insulation covering.

1.02  SUBMITTALS

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

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

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

D. LEED Submittals: For Credit EQ 4.2, manufacturers' product data for paints, including printed statement of VOC content and chemical components.

1.03  QUALITY ASSURANCE

A. MPI (Master Painters Institute) Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List." See www.paintinfo.com

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. Owner will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.

b. Other Items: Owner will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.

3. 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 Owner at no added cost to Owner.

PART 2 PRODUCTS

2.01 PAINT, GENERAL

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

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
   1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
   2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
   3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   4. Restricted Components: Paints and coatings shall not contain any of the following:
      a. Acrolein.
      b. Acrylonitrile.
      c. Antimony.
      d. Benzene.
      e. Butyl benzyl phthalate.
      f. Cadmium.
      g. Di (2-ethylhexyl) phthalate.
      h. Di-n-butyl phthalate.
      i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

C. Colors: Match Owner's samples.

2.02 BLOCK FILLERS


2.03 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

B. Interior Alkyd Primer/Sealer: MPI #45.

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.04 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

C. Rust-Inhibitive Primer (Water Based): MPI #107.

D. Waterborne Galvanized-Metal Primer: MPI #134.
E. Vinyl Wash Primer: MPI #80.

2.05 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.

2.06 LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1).

B. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).

C. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).

D. Interior Latex (Satin): MPI #43 (Gloss Level 4).

E. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).

F. Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

G. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).

H. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).

I. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).

J. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

K. High-Performance Architectural Latex (Low Sheen): MPI #138 (Gloss Level 2).

L. High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).

M. High-Performance Architectural Latex (Satin): MPI #140 (Gloss Level 4).

N. High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).

O. Exterior Latex (Flat): MPI #10 (Gloss Level 1).

P. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

Q. Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
2.07 ALKYD PAINTS

A. Interior Alkyd (Flat): MPI #49 (Gloss Level 1).

B. Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).

C. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

D. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).

PART 3 EXECUTION

3.01 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. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   3. Wood: 15 percent.
   4. Gypsum Board: 12 percent.
   5. Plaster: 12 percent.

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

D. 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.

3.02 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates 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. Painting Door and Glazing Frames: Paint shall be brushed not rolled.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Tanks that do not have factory-applied final finishes.
   e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:
   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

F. 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 Owner, and leave in an undamaged condition.

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

3.03 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System: MPI INT 3.1E.
   c. Topcoat: Interior latex (eggshell).

2. Latex Over Sealer System: MPI INT 3.1A.
c. Topcoat: Interior latex (eggshell).

3. Latex Over Latex Aggregate System: MPI INT 3.1B.
   a. Prime Coat: Latex stucco and masonry textured coating.
   c. Topcoat: Exterior latex (flat).

4. Institutional Low-Odor/VOC Latex System: MPI INT 3.1M.

5. High-Performance Architectural Latex System: MPI INT 3.1C.

B. Concrete Substrates, Traffic Surfaces:

1. Latex Floor Enamel System: MPI INT 3.2A.
   c. Topcoat: Interior/exterior latex floor and porch paint (low gloss).

2. Alkyd Floor Enamel System: MPI INT 3.2B.

3. Concrete Stain System: MPI INT 3.2E.

4. Clear Sealer System: MPI INT 3.2F.

5. Water-Based Clear Sealer System: MPI INT 3.2G.
C. Clay-Masonry Substrates:

1. Latex System: MPI INT 4.1A.
   c. Topcoat: Interior latex (low sheen).

2. Alkyd System: MPI INT 4.1D.
   c. Topcoat: Interior alkyd (eggshell).

3. Latex Aggregate System: MPI INT 4.1B.
   a. Prime Coat: As recommended in writing by topcoat manufacturer.
   b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
   c. Topcoat: Latex stucco and masonry textured coating.

4. Institutional Low-Odor/VOC Latex System: MPI INT 4.1M.

5. High-Performance Architectural Latex System: MPI INT 4.1L.

D. CMU Substrates:

1. Latex System: MPI INT 4.2A.
   c. Topcoat: Interior latex (low sheen).

2. Alkyd System: MPI INT 4.2C.
   c. Topcoat: Interior alkyd (eggshell).

3. Alkyd Over Latex Sealer System: MPI INT 4.2N.

d. Topcoat: Interior alkyd (eggshell).

4. Institutional Low-Odor/VOC Latex System: MPI INT 4.2E.

5. High-Performance Architectural Latex System: MPI INT 4.2D.

E. Steel Substrates:

1. Quick-Drying Enamel System: MPI INT 5.1A.
c. Topcoat: Quick-drying enamel (semigloss).

2. Water-Based Dry-Fall System: MPI INT 5.1C.
b. Topcoat: Latex dry fog/fall.

3. Alkyd Dry-Fall System: MPI INT 5.1D.
b. Topcoat: Interior alkyd dry fog/fall.

4. Latex Over Alkyd Primer System: MPI INT 5.1Q.
c. Topcoat: Interior latex (low sheen).

5. Alkyd System: MPI INT 5.1E.
c. Topcoat: Interior alkyd (eggshell).

6. Aluminum Paint System: MPI INT 5.1M.
c. Topcoat: Aluminum paint.
7. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.
   a. Prime Coat: Rust-inhibitive primer (water based).

8. High-Performance Architectural Latex System: MPI INT 5.1R.

F. Galvanized-Metal Substrates:
   1. Water-Based Dry-Fall System: MPI INT 5.3H.
      a. Prime Coat: Waterborne dry fall.
      b. Topcoat: Waterborne dry fall.
   2. Alkyd Dry-Fall System: MPI INT 5.3F.
      b. Topcoat: Interior alkyd dry fog/fall.
   3. Latex System: MPI INT 5.3A.
      c. Topcoat: Interior latex (low sheen).
   4. Latex Over Waterborne Primer System: MPI INT 5.3J.
      c. Topcoat: Interior latex (low sheen).
   5. Alkyd System: MPI INT 5.3C.
      c. Topcoat: Interior alkyd (eggshell).
   6. Aluminum Paint System: MPI INT 5.3G.
      c. Topcoat: Aluminum paint.
   7. Institutional Low-Odor/VOC Latex System: MPI INT 5.3N.

8. High-Performance Architectural Latex System: MPI INT 5.3M.

G. Glue-Laminated Beam and Column Substrates:
1. Latex System: MPI INT 6.1M.
c. Topcoat: Interior latex (eggshell).
2. Latex Over Alkyd Primer System: MPI INT 6.1A.
c. Topcoat: Interior latex (eggshell).
3. Institutional Low-Odor/VOC Latex System: MPI INT 6.1Q.
4. High-Performance Architectural Latex System: MPI INT 6.1N.

H. Dressed Lumber Substrates: Including Architectural woodwork and doors.
1. Latex System: MPI INT 6.3T.
c. Topcoat: Interior latex (semigloss).
2. Institutional Low-Odor/VOC Latex System: MPI INT 6.3V.
3. High-Performance Architectural Latex System: MPI INT 6.3A.


I. Wood Panel Substrates: Including painted plywood and medium-density fiberboard.

1. Latex System: MPI INT 6.4R.
   c. Topcoat: Interior latex (semigloss).

2. Latex Over Alkyd Primer System: MPI INT 6.4A.
   c. Topcoat: Interior latex (eggshell).

3. Alkyd System: MPI INT 6.4B.
   c. Topcoat: Interior alkyd (eggshell).

4. Institutional Low-Odor/VOC Latex System: MPI INT 6.4T.

5. High-Performance Architectural Latex System: MPI INT 6.4S.

J. Dimension Lumber Substrates, Nontraffic Surfaces: Including exposed joists and exposed beams.

1. Latex System: MPI INT 6.2D.
   c. Topcoat: Interior latex (eggshell).

2. Institutional Low-Odor/VOC Latex System: MPI INT 6.2L.

3. High-Performance Architectural Latex System: MPI INT 6.2B.

K. Gypsum Board Substrates:
   1. Latex System: MPI INT 9.2A.
      c. Topcoat: Interior latex (eggshell).
   2. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.
   3. High-Performance Architectural Latex System: MPI INT 9.2B.

L. Plaster Substrates:
   1. Latex System: MPI INT 9.2A.
      c. Topcoat: Interior latex (eggshell).
   2. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.
   3. High-Performance Architectural Latex System: MPI INT 9.2B.

M. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.
1. Latex System: MPI INT 10.1A.
   c. Topcoat: Interior latex (flat).
2. Institutional Low-Odor/VOC Latex System: MPI INT 10.1D.

END OF SECTION 09 91 23
PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Preparing subgrades for construction and improvements shown on the drawings.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for slabs-on-grade.
   4. Subbase course for concrete walks.
   5. Excavating and backfilling for utility trenches.

1.02 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner. Authorized additional excavation and replacement material will be paid for according to Contract provisos changes in the Work.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner. Unauthorized excavation, as well as remedial work directed by Owner, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.
H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.03 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner and then only after arranging to provide temporary utility services according to requirements indicated.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.  
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
G. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

H. Topsoil: Shall be as specified in Section 32 93 00.

2.02 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing." during earthwork operations.

3.02 EXCAVATION

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.03 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
3.04 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.05 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

B. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
   1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

3.06 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner, without additional compensation.

3.07 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Owner.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Owner.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
3.09 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.

D. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

E. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material (subgrade only).
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.

C. Topsoil placement per Section 32 93 00.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
   3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
   4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
   1. Shape subbase and base course to required crown elevations and cross-slope grades.
   2. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.15 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Owner.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00