THE SCHOOL DISTRICT OF PHILADELPHIA

BOARD OF EDUCATION
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Addendum No. 1

Subject: **Structural Repairs**
SDP Contract No. B-107C of 2017/18 General Construction

Location: **James R. Ludlow Elementary School**

This Addendum, dated August 19, 2020 shall modify and become part of the Contract Documents. Any items not mentioned herein, or affected by this addendum, shall remain strictly in accordance with the original document.

1. MODIFICATIONS TO GENERAL AND SUPPLEMENTARY CONDITIONS (DIVISION 00)

A. Not Applicable

2. MODIFICATIONS TO DIVISION 01 GENERAL REQUIREMENTS (DIVISION 01)

A. Not Applicable

3. CHANGES TO TECHNICAL SPECIFICATIONS (DIVISIONS 02-36):

A. The wrong technical specifications were included in the original issue of the Bidding and Contract Documents.

B. DELETE and REPLACE with the attached with the correct COMBINED SPECIFICATIONS dated 8.19.20.

End of Addendum 1

TABLE OF CONTENTS DATE: AUGUST 18, 2020

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 FIELD CONDITIONS

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

B. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

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

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

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

1.8 WARRANTY

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

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.9 COORDINATION

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

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

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions:

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

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

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

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

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 4 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

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

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See other sections for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

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

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

B. Burning: Do not burn demolished materials.

3.7 CLEANING

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

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Engineer.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

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

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.8 FIELD CONDITIONS

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

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
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 unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).
2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

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

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

    a. Structural 1, B-B or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

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

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

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

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

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

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source
1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

G. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

H. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

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

D. Water: Potable.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

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

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Refer to the Contract Documents for Concrete Mixtures for Building Elements.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

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

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

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

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

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

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

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

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

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

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

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

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

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

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

3.2 EMBEDDED ITEM INSTALLATION

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

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

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

3.4 STEEL REINFORCEMENT INSTALLATION

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

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

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

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh

spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.5 JOINTS

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

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 WATERSTOP INSTALLATION

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

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

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

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

1. Apply to concrete surfaces not exposed to public view

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

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

3.9 FINISHING FLOORS AND SLABS

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

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.

C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

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

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

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

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

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

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

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacture.

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

3.12 JOINT FILLING

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

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

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

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

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

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

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

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

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

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

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

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

2. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
3. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

4. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

5. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
6. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
7. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
9. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.
10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

SECTION 040110 - MASONRY CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cleaning the following:

1. Unit masonry surfaces.
2. Stone surfaces.

1.3 ALLOWANCES

1.4 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi (690 kPa)

B. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)

C. Medium-Pressure Spray: [400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s)] <Insert range of values>.

1.5 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry-cleaning work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.
5. Where water repellents are to be used on or near masonry, delay application of these chemicals until after cleaning.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to masonry repair Sections. Patch holes in mortar joints according to masonry repointing Sections.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.

B. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Water: Potable.

B. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.

C. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.

PART 3 - EXECUTION

3.1 PROTECTION

A. Remove downspouts and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.2 CLEANING MASONRY, GENERAL

A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by Engineer.

B. Proceed with cleaning in an orderly manner; work from top to bottom]of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.

C. Use only those cleaning methods indicated for each masonry material and location.

1. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.

    a. Equip units with pressure gages.
    b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.

D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.

E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.

F. Water Application Methods:
    1. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 CLEANING MASONRY

A. Cold-Water Wash: Use cold water applied by medium pressure spray.

3.4 FINAL CLEANING

A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.

B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 040110

SECTION 040120.63 - BRICK MASONRY REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repairing brick masonry, including replacing units.
2. Removing abandoned anchors.
3. Painting steel uncovered during the work.

1.3 DEFINITIONS

A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

B. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform brick masonry repair work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to "Masonry Unit Patching" Article. Patch holes in mortar joints according to Section 040120.64 "Brick Masonry Repointing."

1.5 QUALITY ASSURANCE

A. Brick Masonry Repair Specialist Qualifications: Engage an experienced brick masonry repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repair work.

1. Field Supervision: Brick masonry repair specialist firm shall maintain experienced full-time supervisors on Project site during times that brick masonry repair work is in progress.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on masonry units as follows:

1. Provide test specimens as indicated and representative of proposed materials and existing construction.
2. Replacement Brick: Test each proposed type of replacement masonry unit according to sampling and testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).
3. Existing Brick: Test each type of existing masonry unit indicated for replacement according to testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove five existing units from locations designated by Engineer. Take testing samples from these units.
4. Existing Mortar: Test according to ASTM C 295/C 295M, modified as agreed by testing service and Engineer for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength.
5. Temporary Patch: As directed by Engineer, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.

B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

F. Handle masonry units to prevent overstressing, chipping, defacement, and other damage.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit brick masonry repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repair masonry units only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:

1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

1.9 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for repairing brick masonry (brick, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

1.10 MASONRY MATERIALS

A. Face Brick: As required to complete brick masonry repair work.

1. Brick Matching Existing: Units with colors, color variation within units, surface texture, size, and shape that match existing brickwork and with physical properties within 10 percent of those determined from preconstruction testing of selected existing units.

a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2. Tolerances as Fabricated: According to tolerance requirements in ASTM C 216, Type FBX

B. Building Brick: ASTM C 62, of same vertical dimension as face brick, for masonry work concealed from view.

1. Grade SW, MW, or NW for concealed backup.

1.11 MORTAR MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91/C 91M.

D. Mortar Cement: ASTM C 1329/C 1329M.

E. Mortar Sand: ASTM C 144.

1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.

G. Water: Potable.

1.12 MANUFACTURED REPAIR MATERIALS

A. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.

1. Use formulation that is vapor and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than masonry units being repaired, and develops high bond strength to all types of masonry.
2. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.

1.13 ACCESSORY MATERIALS

A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units, less the required depth of pointing materials unless removed before pointing.

B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

C. Other Products: Select materials and methods of use based on the following:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

1.14 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Engineer's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

PART 2 - EXECUTION

2.1 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

2.2 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area.

C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.

D. Notify Engineer of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.

G. Replace removed damaged brick with other removed brick in good condition, where possible, or with new brick matching existing brick. Do not use broken units unless they can be cut to usable size.

H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.

I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with enough mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. (30 g/194 sq. cm per min.) Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets according to Section 040120.64 "Brick Masonry Repointing." Point at same time as repointing of surrounding area.
3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

2.3 PAINTING STEEL UNCOVERED DURING THE WORK

A. Notify Engineer if steel is exposed during masonry removal. Where Engineer determines that steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

1. Surface Preparation: Remove paint, rust, and other contaminants according to-SP 3, "Power Tool Cleaning as applicable to comply with paint manufacturer's recommended preparation.
2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the thickness of a steel member is found to be reduced from rust by more than 1/8 inch notify Engineer before proceeding.

2.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Engineer's Project Representatives: Engineer will assign Project representatives to help carry out Engineer's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Engineer's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify inspectors in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

2.5 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.

B. Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION 040120.63

SECTION 040120.64 - BRICK MASONRY REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repointing joints with mortar.

1.3 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform brick masonry repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction Test Reports: For existing masonry units and mortar.

1.5 QUALITY ASSURANCE

A. Brick Masonry Repointing Specialist Qualifications: Engage an experienced brick masonry repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a

record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repointing work.

1. Field Supervision: Brick masonry repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that brick masonry repointing work is in progress.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction

1. Provide test specimens as indicated and representative of proposed materials and existing construction.
2. Existing Brick: Test each type of existing brick indicated for repointing according to testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove five existing units from locations designated by Engineer. Take testing samples from these units.
3. Existing Mortar: Test according to ASTM C 295/C 295M, modified as agreed by testing service and Engineer for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength.
4. Temporary Patch: As directed by Engineer, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repoint mortar joints only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.

1.9 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for repointing brick masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

1.10 MORTAR MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91/C 91M.

D. Mortar Cement: ASTM C 1329/C 1329M.

E. Mortar Sand: ASTM C 144.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.

G. Water: Potable.

1.11 ACCESSORY MATERIALS

1. Colors: Provide colors of exposed sealants to match colors of mortar adjoining installed sealant unless otherwise indicated.

B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

1.12 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Engineer's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

1.13 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

1.14 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints at locations of the following defects:

    a. Holes and missing mortar.
    b. Cracks that can be penetrated 1/4 inch (6 mm) or more by a knife blade 0.027 inch (0.7 mm) thick.
    c. Cracks 1/16 inch or more in width and of any depth.
    d. Hollow-sounding joints when tapped by metal object.
    e. Eroded surfaces 1/4 inch (6 mm) or more deep.
    f. Deterioration to point that mortar can be easily removed by hand, without tools.
    g. Joints filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows:

1. Remove mortar from joints to depth of indicated, but not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Engineer for direction.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Engineer.

D. Notify Engineer of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm) until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch (9 mm). Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.

4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

1.15 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Engineer's Project Representatives: Engineer will assign Project representatives to help carry out Engineer's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Engineer's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify inspectors in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040120.64

SECTION 040140.61 - STONE REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repairing stone masonry, including replacing units.
2. Removing abandoned anchors.

1.3 DEFINITIONS

A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

B. Rift: The most pronounced direction of splitting or cleavage of a stone.

C. Stone Terminology: ASTM C 119.

1.4 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform stone repair work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean stone.
5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
6. Repair stonework, including replacing existing stone with new stone.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone according to "Stone Patching" Article. Patch holes in mortar joints according to Section 040140.62 "Stone Repointing."

1.5 QUALITY ASSURANCE

A. Stone Repair Specialist Qualifications: Engage an experienced stone repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repair work.

1. Field Supervision: Stone repair specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repair work is in progress.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on stone units as follows:

1. Provide test specimens as indicated and representative of proposed materials and existing construction.
2. Replacement Stone: Test each proposed type of replacement stone according to ASTM C 170/C 170M for compressive strength, ASTM C 99/C 99M for modulus of rupture, and ASTM C 97/C 97M for absorption and bulk specific gravity.
3. Existing Stone: Test each type of existing stone indicated for replacement according to ASTM C 170/C 170M for compressive strength, wet and dry, perpendicular and parallel to rift; ASTM C 99/C 99M for modulus of rupture, wet and dry, perpendicular and parallel to rift; and ASTM C 97/C 97M for absorption and bulk specific gravity. Carefully remove one existing stone from locations designated by Engineer. Take testing samples from these stones.
4. Existing Mortar: Test according to ASTM C 295/C 295M, modified as agreed by testing service and Engineer for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength.
5. Temporary Patch: As directed by Engineer, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone units to Project site strapped together in suitable packs or pallets or in heavy-duty crates and protected against impact and chipping.

B. Deliver each piece of stone with code mark or setting number on unexposed face, corresponding to Shop Drawings, using nonstaining paint.

C. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

G. Handle stone to prevent overstressing, chipping, defacement, and other damage.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit stone repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repair stone units only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for stone repair unless otherwise indicated:

1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients, repair materials, and existing stone to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect stone repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

1.9 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for repairing stone (stone, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

1.10 STONE MATERIALS

A. Stone Matching Existing: Natural building stone of variety, color, texture, grain, veining, finish, size, and shape that match existing stone and with physical propertiesm within 10 percent of those determined from preconstruction testing of selected existing stone.

1. For existing stone that exhibits a range of colors, texture, grain, veining, finishes, sizes, or shapes, provide stone that proportionally matches that range rather than stone that matches an individual color, texture, grain, veining, finish, size, or shape within that range.

B. Cutting New Stone: Cut each new stone so that, when it is set in final position, the rift or natural bedding planes will match the rift orientation of existing stones.

1.11 MORTAR MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91/C 91M.

D. Mortar Cement: ASTM C 1329/C 1329M.

E. Mortar Sand: ASTM C 144.

1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in stone mortars.

G. Water: Potable.

1.12 MANUFACTURED REPAIR MATERIALS

A. Stone Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching stone.

1. Use formulation that is vapor and water permeable (equal to or more than the stone), exhibits low shrinkage, has lower modulus of elasticity than stone units being repaired, and develops high bond strength to all types of stone.

2. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.

B. Stone-to-Stone Adhesive: Two-part polyester or epoxy-resin stone adhesive with a 15- to 45-minute cure at 70 deg F (21 deg C), recommended in writing by adhesive manufacturer for type of stone repair indicated, and matching stone color.

1.13 ACCESSORY MATERIALS

A. Setting Buttons and Shims: Resilient plastic, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units, less the required depth of pointing materials unless removed before pointing.

B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

1.14 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Engineer's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

PART 2 - EXECUTION

2.1 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

2.2 STONE REMOVAL AND REPLACEMENT

A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair or is to be reused. Carefully remove entire units from joint to joint, without damaging surrounding stone, in a manner that permits replacement with full-size units.

B. Support and protect remaining stonework that surrounds removal area.

C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.

D. Notify Engineer of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole stone units as possible.

1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
3. Store stone for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.

F. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for stone replacement.

G. Replace removed damaged stone with other removed stone in good condition, where possible, matching existing stone, including direction of rift or natural bedding planes. Do not use broken units unless they can be cut to usable size.

H. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.

1. Maintain joint width for replacement stone to match existing joints.
2. Use setting buttons or shims to set stone accurately spaced with uniform joints.

I. Set replacement stone with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting, and set units in

full bed of mortar unless otherwise indicated. Replace existing anchors with new anchors of size and type indicated.

1. Rake out mortar used for laying stone before mortar sets according to Section 040140.62 "Stone Repointing." Point at same time as repointing of surrounding area.
2. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

2.3 CRACK INJECTION

A. General: Comply with cementitious crack-filler manufacturer's written instructions.

B. Drill 1/4-inch- (6-mm-) diameter injection holes as follows:

1. Transverse Cracks Less Than 3/8 inch (9 mm) Wide: Drill holes through center of crack at 12 to 18 inches (300 to 500 mm) o.c.
2. Transverse Cracks More Than 3/8 inch (9 mm) Wide: Drill holes through center of crack at 18 to 36 inches (500 to 900 mm) o.c.
3. Delaminations: Drill holes at approximately 18 inches (500 mm) o.c. both vertically and horizontally.
4. Drill holes 2 inches (50 mm) deep.

C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.

D. Place plastic injection ports in drilled holes and seal face of cracks between injection ports with clay or other nonstaining, removable plugging material. Leave openings at upper ends of cracks for air release.

E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible, begin at lower end of injection area and work upward. Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material and begin injecting filler at adjacent port, repeating process until all ports have been injected.

F. Clean cementitious crack filler from face of stone before it sets by scrubbing with water.

G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

2.4 STONE PATCHING

A. Patch the following stone units unless another type of repair or replacement is indicated:

1. Units indicated to be patched.

B. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch (6 mm) thick, but not less than recommended in writing by patching compound manufacturer.

C. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of stone unit.

D. Brush-coat stone surfaces with slurry coat of patching compound according to manufacturer's written instructions.

E. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch (6 mm) or more than 2 inches (50 mm) thick. Roughen surface of each layer to provide a key for next layer.

1. Simple Details: Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.

F. Keep each layer damp for 72 hours or until patching compound has set.

G. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

2.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Engineer's Project Representatives: Engineer will assign Project representatives to help carry out Engineer's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Engineer's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify inspectors in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

2.6 STONE WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess stone materials are Contractor's property.

B. Stone Waste: Remove stone waste and legally dispose of off Owner's property.

END OF SECTION 040140.61

SECTION 040140.62 STONE REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repointing joints with mortar.
2. Repointing joints with sealant.

1.3 DEFINITIONS

A. Rift: The most pronounced direction of splitting or cleavage of a stone.

1.4 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform stone repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean stone.
5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
6. Repair stonework, including replacing existing stone with new stone.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone according to Section 040140.61 "Stone Repair." Patch holes in mortar joints according to "Repointing Stonework" Article.

1.5 QUALITY ASSURANCE

A. Stone Repointing Specialist Qualifications: Engage an experienced stone repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repointing work.

1. Field Supervision: Stone repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repointing work is in progress.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on stone units as follows:

1. Provide test specimens as indicated and representative of proposed materials and existing construction.
2. Existing Stone: Test each type of existing stone indicated for repointing according to ASTM C 170/C 170M for compressive strength, wet and dry, perpendicular and parallel to rift; ASTM C 99/C 99M for modulus of rupture, wet and dry, perpendicular and parallel to rift; and ASTM C 97/C 97M for absorption and bulk specific gravity. Carefully remove one existing stones from locations designated by Engineer. Take testing samples from these stones.
3. Existing Mortar: Test according to ASTM C 295/C 295M, modified as agreed by testing service and Engineer for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength.
4. Temporary Patch: As directed by Engineer, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repoint mortar joints only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients and existing stone to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.

1.9 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for stone repointing (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

1.10 MORTAR MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91/C 91M.

D. Mortar Cement: ASTM C 1329/C 1329M.

E. Mortar Sand: ASTM C 144.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in stone mortars.

G. Water: Potable.

1.11 ACCESSORY MATERIALS

A. Sealant Materials:

1. Sealant manufacturer's standard elastomeric sealant(s) of base polymer and characteristics indicated below and according to applicable requirements in Section 079200 "Joint Sealants."

2. Colors: Provide colors of exposed sealants to match colors of mortar adjoining installed sealant unless otherwise indicated.

B. Joint-Sealant Backing:

1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended in writing by sealant manufacturer for preventing sealant from adhering to rigid, inflexible, joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

C. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

D. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

1.12 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Engineer's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

PART 2 - EXECUTION

2.1 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

2.2 REPOINTING STONEWORK

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints indicated as sealant-filled joints.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of indicated but not less than 1/2 inch (13 mm)] [3/4 inch (20 mm) or not less than that required to expose sound,

unweathered mortar. Do not remove unsound mortar more than 2 inches (50 mm) deep; consult Engineer for direction.

2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Engineer.

D. Notify Engineer of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm) until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch (9 mm). Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Pointing with Sealant: Comply with Section 079200 "Joint Sealants" and as follows:

1. After raking out, keep joints dry and free of mortar and debris.
2. Clean and prepare joint surfaces. Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant.

    a. Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.
    b. Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding stonework and matching the contour of adjoining mortar joints.

c. Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:

1) Fill joints to a depth equal to joint width, but not more than 1/2 inch (13 mm) deep or less than 1/4 inch (6 mm) deep.

d. Tool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant from surfaces adjacent to joint.

e. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

G. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

2.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Engineer's Project Representatives: Engineer will assign Project representatives to help carry out Engineer's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Engineer's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify inspector in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040140.62

SECTION 042613 - MASONRY VENEER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Clay face brick.
2. Stone trim units.
3. Mortar.
4. Ties and anchors.
5. Embedded flashing.
6. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in masonry veneer.
2. Steel lintels in masonry veneer.
3. Steel shelf angles for supporting masonry veneer.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for dovetail slots for masonry-veneer anchors.
2. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type and color of the following:

1. Clay face brick
2. Stone trim.

3. Mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.5 INFORMATIONAL SUBMITTALS

A. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.

B. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for typical exterior wall sizes approximately 48 inches long by 48 inches high.
2. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
3. Protect approved sample panels from the elements with weather-resistant membrane.
4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down face of veneer, and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work

2.3 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick:

1. Grade: MW or SW.
2. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
3. Application: Use where brick is exposed unless otherwise indicated.
4. Where shown to "match existing," provide clay face brick matching color range, texture, and size of existing adjacent brickwork.

2.4 STONE TRIM UNITS

A. Limestone: ASTM C 568/C 568M, Classification II Medium Density.

B. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.

1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

2.5 MORTAR MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Mortar Cement: ASTM C 1329/C 1329M.

E. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

G. Water: Potable.

2.6 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
5. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch- thick, steel sheet, galvanized after fabrication.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch thick, steel sheet, galvanized after fabrication

2. Tie Section: Triangular-shaped wire tie made from 0.25-inch diameter, hot-dip galvanized steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch-thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.

E. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication
3. Fabricate wire ties from 0.25-inch-diameter, hot-dip galvanized-steel wire unless otherwise indicated.
4. Fabricate wire connector sections from 0.25-inch-diameter, hot-dip galvanized, carbon steel wire.
5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC

B. Weep/Vent Products: Use the following unless otherwise indicated:

1. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet , 1/4 inch in 20 feet , or 1/2 inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet , 3/8 inch in 20 feet , or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet , 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

3.5 MORTAR BEDDING AND JOINTING

A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Lay CMUs with face shells fully bedded in mortar and with head joints of depth equal to bed joints. At starting course, fully bed entire units, including area under cells.

1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.

C. Set stone trim units in full bed of mortar with full vertical joints.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.
4. Rake out mortar joints for pointing with sealant.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire]in masonry joints.

3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches (o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.7 ANCHORING MASONRY TO CONCRETE

A. Anchor masonry to concrete, where masonry abuts or faces concrete to comply with the following:
   1. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   2. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 LINTELS

A. Install steel lintels where indicated.

3.9 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape.
   2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier, lapping at least 4 inches.
   3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
   4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use to form weep holes.
2. Space weep holes formed from plastic tubing16 inches o.c.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean stone trim to comply with stone supplier's written instructions.

8. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.12 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042613

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.

B. Related Requirements:

1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 PERFORMANCE REQUIREMENTS

1.9 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 572/A 572M, Grade 50 (345)

B. Channels, Angles Shapes: ASTM A 36/A 36M

C. Plate and Bar: ASTM A 36/A 36M

D. Welding Electrodes: Comply with AWS requirements.

1.10 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

1.11 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20

1.12 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

1.13 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1.14 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

1.15 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels attached to structural-steel frame and located in exterior walls.

1.16 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.

D. Prepare test and inspection reports.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

2.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

D. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspectbolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

2.5 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Composite floor deck.

B. Related Requirements:

   1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.

1.3 ACTION SUBMITTALS

A. Shop Drawings:

   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.5 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.6 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated
4. Span Condition: As indicated

1.7 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Galvanizing Repair Paint: ASTM A 780

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

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

2.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

H. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

2.3 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch (16 mm), nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
3. Weld Spacing: Space and locate welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

2.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Engineer.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

2.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 057300 – DECORATIVE METAL RAILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Galvanized Steel decorative railings with galvanized steel mesh infill.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

   1. Manufacturer's product lines of railings assembled from standard components.
   2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer, must be licensed in the state in which the railing is to be installed.

B. Welding certificates.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

D. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Galvanzied Steel Decorative Railings:

1. Ametco

2. Wagner, R&B, Inc.

3. Or approved equal.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to

adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Engineer, except with Engineer's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.

2. Aesthetic effects should match adjacent railing system on project site.

2.2 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Galvanized Steel: 72 percent of minimum yield strength.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Handrails and Top Rails of Guards:

      a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

   2. Infill of Guards:

      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
   1. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

2.4 GALVANIZED STEEL

A. Tubing: ASTM A 500/A 500M (cold formed) or ASTM A 513.

B. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

E. Woven-Wire Mesh: Intermediate-crimp, square pattern, 2-inch (50-mm) woven-wire mesh, made from 0.135-inch (3.5-mm) nominal diameter wire complying with ASTM A 510/A 510M.

2.5 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:
   1. Stainless-Steel Components: Type 316 stainless-steel fasteners.
   2. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
   3. Dissimilar Metals: Type 316 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

   1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primer for Galvanized Steel: Cementitious galvanized metal primer complying with MPI#26.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
5. \

I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:
1. By bending to smallest radius that will not result in distortion of railing member.

K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide galvanized steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

Q. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch (25-by-13-by-3-mm) metal channel frames.

1. Make wire mesh and frames from galvanized steel,unless otherwise indicated.
2. Orient wire mesh with wires horizontal and vertical, to match adjacent infill panels.

R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 GALVANIZED STEEL FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
   2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
   3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
   4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Do not apply primer to galvanized surfaces.

E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

   1. Color: to match adjacent existing railings.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.

E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
1. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

3.4 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

C. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.

3.5 CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 071700 - BENTONITE WATERPROOFING

ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED. INCLUDE PRODUCT SPECIFICATIONS AND MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.

B. SHOP DRAWINGS: SHOW INSTALLATION DETAILS FOR INTERFACE WITH OTHER WORK.

C. SAMPLES: FOR EACH OF THE FOLLOWING PRODUCTS, IN SIZES INDICATED:

1.1.1.1. WATERPROOFING: 6 INCHES SQUARE.

1.1.1.2. DRAINAGE PANELS: 6 INCHES SQUARE.

INFORMATIONAL SUBMITTALS

A. MATERIAL CERTIFICATES: FOR EACH TYPE OF BENTONITE WATERPROOFING, FROM MANUFACTURER.

B. PRODUCT TEST REPORTS: BASED ON EVALUATION OF COMPREHENSIVE TESTS PERFORMED BY MANUFACTURER AND WITNESSED BY A QUALIFIED TESTING AGENCY, FOR BENTONITE WATERPROOFING.

C. FIELD QUALITY-CONTROL REPORTS.

D. WARRANTY: SAMPLE OF SPECIAL WARRANTY.

E. CONTRACTOR CERTIFICATE: AT TIME OF BID, SUBMIT WRITTEN CERTIFICATION THAT INSTALLER HAS CURRENT APPROVED APPLICATOR STATUS WITH WATERPROOFING MATERIAL MANUFACTURER.

PROJECT CONDITIONS

A. WEATHER LIMITATIONS: PROCEED WITH INSTALLATION ONLY WHEN EXISTING AND FORECASTED WEATHER CONDITIONS PERMIT BENTONITE WATERPROOFING TO BE INSTALLED ACCORDING TO MANUFACTURERS' WRITTEN INSTRUCTIONS AND WARRANTY REQUIREMENTS.

1.1.1.1. DO NOT APPLY WATERPROOFING MATERIALS TO SURFACES WHERE ICE OR FROST IS VISIBLE. DO NOT APPLY BENTONITE WATERPROOFING MATERIALS IN AREAS WITH STANDING WATER.

1.1.1.2. PLACING BENTONITE CLAY PRODUCTS IN PANEL OR COMPOSITE FORM ON DAMP SURFACES IS ALLOWED IF APPROVED IN WRITING BY MANUFACTURER.

B. SUBSTRATE CONDITION: PROCEED WITH WORK ONLY WHEN SUBSTRATE CONSTRUCTION AND PREPARATION WORK IS COMPLETE AND IN CONDITION TO RECEIVE WATERPROOFING SYSTEM. ALL PLUMBING, ELECTRICAL, MECHANICAL AND STRUCTURAL ITEMS TO BE UNDER OR PASSING THROUGH THE WATERPROOFING SHALL BE POSITIVELY SECURED IN THEIR PROPER POSITIONS PRIOR TO WATERPROOFING SYSTEM INSTALLATION. SUBSTRATE PREPARATION SHALL BE PER WATERPROOFING MANUFACTURER'S GUIDELINES.

QUALITY ASSURANCE

A. SOURCE LIMITATIONS: OBTAIN BENTONITE WATERPROOFING SYSTEM FROM SINGLE SOURCE FROM SINGLE MANUFACTURER WITH A MINIMUM OF 30-YEARS DOCUMENTED EXPERIENCE IN THE DIRECT PRODUCTION AND SALES OF WATERPROOFING SYSTEMS. OBTAIN ACCESSORY PRODUCTS USED WITH BENTONITE WATERPROOFING FROM SOURCES ACCEPTABLE TO BENTONITE WATERPROOFING MANUFACTURER.

B. PREINSTALLATION CONFERENCE: CONDUCT CONFERENCE AT PROJECT SITE.

C. WATER SAMPLE TEST: WATERPROOFING CONTRACTOR SHALL SUPPLY PROJECT SITE WATER SAMPLE TO WATERPROOFING MEMBRANE MANUFACTURER FOR ANALYSIS. MANUFACTURER SHALL CONDUCT TEST FREE OF CHARGE. CONTRACTOR IS RESPONSIBLE FOR COLLECTION AND SHIPMENT 64-FLUID OUNCES (2-LITERS) OF ACTUAL SITE WATER. WATER SHOULD BE SHIPPED IN UNCONTAMINATED, SEALED PLASTIC CONTAINER TO MANUFACTURER.

WARRANTY

A. SPECIAL WARRANTY: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AND INSTALLER AGREE(S) TO REPAIR OR REPLACE COMPONENTS

OF BENTONITE WATERPROOFING SYSTEM THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD.

1. WARRANTY PERIOD: FIVE YEARS FROM DATE OF FINAL COMPLETION.

a. WARRANTY SHALL BE IN WRITTEN FORMAT FROM THE MANUFACTURER, NOT THE CONTRACTOR.

b. (5) FIVE YEAR NON-PRORATED WARRANTY, COVERING BOTH MATERIAL AND LABOR.

GEOTEXTILE/BENTONITE SHEETS

A. COMPOSITE GEOTEXTILE-HDPE/BENTONITE MEMBRANE: MINIMUM OF 1.1 LB/SQ. FT. (5.4 KG/SQ. M) OF BENTONITE CLAY GRANULES BONDED TO NONWOVEN GEOTEXTILE POLYPROPYLENE FABRIC, WITH HDPE BONDED TO SURFACE OF NONWOVEN FABRIC.

1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. CARLISLE; MIRAPLY

b. CETCO; VOLTEX DS.

c. OR APPROVED EQUAL.

2. GRAB TENSILE STRENGTH: 95 LBF ACCORDING TO ASTM D 4632.

3. PUNCTURE RESISTANCE: 140 LBF ACCORDING TO ASTM D 4833.

4. VAPOR PERMEANCE: 0.03 PERMS ACCORDING TO ASTM E 96.

INSTALLATION ACCESSORIES

A. GRANULAR BENTONITE: SODIUM BENTONITE CLAY CONTAINING A MINIMUM OF 90 PERCENT MONTMORILLONITE (HYDRATED ALUMINUM SILICATE), WITH A MINIMUM OF 90 PERCENT PASSING A NO. 20 (0.85-MM) SIEVE.

B. BENTONITE MASTIC: TROWELABLE CONSISTENCY, BENTONITE COMPOUND, SPECIFICALLY FORMULATED FOR APPLICATION AT JOINTS AND PENETRATIONS.

C. GRANULAR BENTONITE TUBES: MANUFACTURER'S STANDARD 2-INCH- (50-MM-) DIAMETER, WATER-SOLUBLE TUBE CONTAINING APPROXIMATELY 1.5 LB/FT. (2.2 KG/M) OF BENTONITE; HERMETICALLY SEALED; DESIGNED SPECIFICALLY FOR PLACING ON WALL FOOTINGS AT LINE OF JOINT WITH EXTERIOR BASE OF WALL.

D. TERMINATION BAR: EXTRUDED-ALUMINUM OR FORMED-STAINLESS-STEEL BARS WITH UPPER FLANGE TO RECEIVE SEALANT.

E. PLASTIC PROTECTION SHEET: POLYETHYLENE SHEETING COMPLYING WITH ASTM D 4397; THICKNESS RECOMMENDED BY WATERPROOFING MANUFACTURER TO SUIT APPLICATION BUT AT LEAST 6 MILS (0.15 MM) THICK.

F. CEMENT GROUT PATCHING MATERIAL: MANUFACTURER'S RECOMMENDED GROUT MIX COMPATIBLE WITH SUBSTRATE BEING PATCHED.

G. MASONRY FASTENERS: CASE-HARDENED NAILS OR HARDENED-STEEL, POWDER-ACTUATED FASTENERS. DEPENDING ON MANUFACTURER'S WRITTEN REQUIREMENTS, PROVIDE 1/2- OR 1-INCH- (13- OR 25-MM-) DIAMETER WASHERS UNDER FASTENER HEADS.

H. SEALANTS: AS RECOMMENDED IN WRITING BY WATERPROOFING MANUFACTURER.

I. TAPES: WATERPROOFING MANUFACTURER'S RECOMMENDED TAPE FOR JOINTS BETWEEN SHEETS, MEMBRANES, OR PANELS.

J. ADHESIVE: WATER-BASED ADHESIVE USED TO SECURE WATERPROOFING TO BOTH VERTICAL AND HORIZONTAL SURFACES.

K. FLASHING MEMBRANE: PROVIDE A SELF-ADHERING FLASHING MEMBRANE USED FOR GRADE AND THRU-WALL DETAILING APPROVED BY THE MANUFACTURER.

L. PROTECTION COURSE: ASTM D 6506, SEMIRIGID SHEETS OF FIBERGLASS OR MINERAL-REINFORCED-ASPHALTIC CORE, PRESSURE LAMINATED BETWEEN TWO ASPHALT-SATURATED FIBROUS LINERS, AND AS FOLLOWS:

1. THICKNESS: 1/8 INCH (3 MM), NOMINAL.

M. GEOTEXTILE PROTECTION COURSE: AS RECOMMENDED BY WATERPROOFING MANUFACTURER.

N. MOLDED-SHEET DRAINAGE PANEL: AS RECOMMENDED BY WATERPROOFING MANUFACTURER.

O. NONWOVEN-GEOTEXTILE-FACED, MOLDED-SHEET DRAINAGE PANEL: MANUFACTURED COMPOSITE SUBSURFACE DRAINAGE PANELS CONSISTING OF A NONWOVEN, NEEDLE-PUNCHED GEOTEXTILE FACING WITH AN APPARENT OPENING SIZE NOT EXCEEDING NO. 70 (0.21-MM) SIEVE LAMINATED TO ONE SIDE WITH A POLYMERIC FILM BONDED TO THE OTHER SIDE OF A STUDDED, NONBIODEGRADABLE, MOLDED-PLASTIC-SHEET DRAINAGE CORE, WITH A VERTICAL FLOW RATE OF 9 TO 15 GPM PER FOOT (112 TO 188 L/MIN. PER M).

WATERPROOFING GROUT

A. BENTONITE GROUT: CONSISTING OF BENTONITE CLAY AND POLYMER BLEND SPECIFICALLY DESIGNED TO SEAL BELOW-GRADE FOUNDATIONS. GROUT MATERIAL SHALL BE FLOWABLE GRADE WHEN MIXED AND SET UP TO A MODERATE PLASTIC CONSISTENCY WITHIN A SPECIFIED TIME.

1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. CARLISLE

b. CETCO; VOLCLAY BENTOGROUT.

c. OR APPROVED EQUAL.

2. PHYSICAL PROPERTIES OF MIXED GROUT:

a. COLOR: TO BE SELECTED FROM STANDARD

b. PERMEABILITY: 5X10-8 CM/SEC

c. MUD WEIGHT: 10.2 LBS/GAL

d. CONE PENETROMETER, 24-HOURS: 44MM

e. SPECIFIED TIME TO MIX TO A PLASTIC CONSISTENCY: 8 HOURS

EXAMINATION

A. EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR SUBSTRATE PREPARATIONS AFFECTING PERFORMANCE OF BENTONITE WATERPROOFING.

B. VERIFY THAT SUBSTRATE IS COMPLETE AND THAT WORK THAT WILL PENETRATE WATERPROOFING IS COMPLETE AND RIGIDLY INSTALLED.

C. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

PREPARATION

A. COORDINATE WORK IN THE VICINITY OF WATERPROOFING TO ENSURE PROPER CONDITIONS FOR INSTALLING THE WATERPROOFING SYSTEM AND TO PREVENT DAMAGE TO WATERPROOFING AFTER INSTALLATION.

B. FORMED CONCRETE SURFACES: REMOVE FINS AND PROJECTIONS. FILL VOIDS, ROCK POCKETS, FORM-TIE HOLES, AND OTHER DEFECTS WITH BENTONITE MASTIC OR CEMENT GROUT PATCHING MATERIAL ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

C. HORIZONTAL CONCRETE SURFACES: REMOVE DEBRIS, STANDING WATER, OILY SUBSTANCES, MUD, AND SIMILAR SUBSTANCES THAT COULD IMPAIR THE BONDING ABILITY OF CONCRETE OR THE EFFECTIVENESS OF WATERPROOFING. FILL VOIDS, CRACKS GREATER THAN 1/8 INCH (3 MM), HONEYCOMB AREAS, AND OTHER DEFECTS WITH BENTONITE MASTIC OR CEMENT GROUT PATCHING MATERIAL ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

D. EXCAVATION SUPPORT AND PROTECTION SYSTEM: IF WATER IS SEEPING, USE PLASTIC PROTECTION SHEETS OR OTHER SUITABLE MEANS TO PREVENT WETTING THE BENTONITE WATERPROOFING. FILL MINOR GAPS AND SPACES 1/8 INCH (3 MM) WIDE OR WIDER WITH WOOD, METAL, CONCRETE, OR OTHER APPROPRIATE FILLING MATERIAL. COVER OR FILL LARGE VOIDS AND CREVICES WITH CEMENT MORTAR ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

INSTALLATION, GENERAL

A. INSTALL WATERPROOFING AND ACCESSORIES ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

1. APPLY GRANULAR BENTONITE AROUND PENETRATIONS IN HORIZONTAL SURFACES AND CHANGES IN PLANE ACCORDING TO MANUFACTURER'S DETAILS IN PREPARATION FOR GRANULAR BENTONITE TUBES AND MASTIC.

2. APPLY GRANULAR BENTONITE TUBES, BENTONITE MASTIC, OR BOTH AT CHANGES OF PLANE, CONSTRUCTION JOINTS IN SUBSTRATE, PROJECTIONS, AND PENETRATIONS.

B. APPLY GRANULAR BENTONITE TUBES CONTINUOUSLY ON FOOTING AGAINST BASE OF WALL TO BE WATERPROOFED ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

C. PROTECT WATERPROOFING FROM DAMAGE AND WETTING BEFORE AND DURING SUBSEQUENT CONSTRUCTION OPERATIONS. REPAIR PUNCTURES, TEARS, AND CUTS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

D. INSTALL PROTECTION COURSE BEFORE BACKFILLING OR PLACING OVERBURDEN WHEN RECOMMENDED BY WATERPROOFING MANUFACTURER.

COMPOSITE GEOTEXTILE-HDPE/BENTONITE MEMBRANE INSTALLATION

A. GENERAL: INSTALL A CONTINUOUS LAYER OF WATERPROOFING MEMBRANE WITH ENDS AND EDGES LAPPED A MINIMUM OF 3 INCHES (75 MM). STAGGER END JOINTS BETWEEN MEMBRANES. SEAL JOINTS WITH PERMANENT SEAM TAPE.

B. BELOW STRUCTURAL SLABS-ON-GRADE: APPLY WATERPROOFING MEMBRANE WITH HDPE SIDE DOWN AND STAPLE ENDS AND EDGES.

1. INSTALL UNDER FOOTINGS, GRADE BEAMS, AND PILE CAPS; OR CONTINUE WATERPROOFING THROUGH KEY JOINTS BETWEEN FOOTINGS AND FOUNDATION WALLS, AND EXTEND A MINIMUM OF 8 INCHES (200 MM) UP OR BEYOND PERIMETER SLAB FORMS.

2. PROTECT WATERPROOFING FROM DAMAGE CAUSED BY REINFORCING BAR SUPPORTS WITH SHARP EDGES.

C. CONCRETE WALLS: STARTING AT BOTTOM OF WALL, APPLY WATERPROOFING MEMBRANE WITH HDPE SIDE FACING INSTALLER; OVERLAP SHEETS 3 INCHES (75 MM). SECURE WITH POWDER-ACTUATED FASTENERS OR CASE-HARDENED NAILS. EXTEND TO BOTTOM OF FOOTING, GRADE BEAM, OR WALL, AND SECURE.

1. TERMINATION AT GRADE: EXTEND WATERPROOFING MEMBRANE TO WITHIN 2 INCHES (50 MM) OF FINISH GRADE UNLESS OTHERWISE INDICATED. SECURE TOP EDGE WITH TERMINATION BAR. APPLY SEALANT TO TOP EDGE OF TERMINATION BAR.

D. EXCAVATION SUPPORT AND PROTECTION (PERMANENT SHORING): CUT, CLEAN, AND TREAT TIEBACKS AND SIMILAR PROJECTIONS. ENCASE TIEBACK RODS, NUTS, AND PLATES. IF WATER IS PRESENT, COVER SHORING AND LAGGING WITH PLASTIC PROTECTION SHEETS; REMOVE PLASTIC SHEETS BEFORE PLACING CONCRETE.

1. STARTING AT LOWEST POINT, INSTALL A LAYER OF WATERPROOFING MEMBRANE, WITH ENDS AND EDGES LAPPED AND MECHANICALLY SECURED TO SHORING.

2. INSPECT AND REPAIR WATERPROOFING MEMBRANE AFTER REINFORCING STEEL HAS BEEN PLACED. COORDINATE AND CONTROL CONCRETE PLACEMENT TO AVOID DAMAGE TO WATERPROOFING.

MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. PLACE AND SECURE MOLDED-SHEET DRAINAGE PANELS, WITH GEOTEXTILE FACING AWAY FROM WALL OR DECK SUBSTRATE. USE ADHESIVES OR MECHANICAL FASTENERS THAT DO NOT PENETRATE WATERPROOFING. LAP EDGES AND ENDS OF

GEOTEXTILE TO MAINTAIN CONTINUITY. PROTECT INSTALLED MOLDED-SHEET DRAINAGE PANELS DURING SUBSEQUENT CONSTRUCTION.

1. FOR VERTICAL APPLICATIONS, INSTALL PROTECTION COURSE BEFORE INSTALLING DRAINAGE PANELS.

WATERPROOFING GROUT INSTALLATION

A. INSPECTION

THE INSTALLER SHALL EXAMINE CONDITIONS OF SUBSTRATES AND OTHER CONDITIONS UNDER WHICH THIS SECTION WORK IS TO BE PERFORMED AND NOTIFY THE ENGINEER, IN WRITING, OF CIRCUMSTANCES DETRIMENTAL TO THE PROPER COMPLETION OF THE WORK. DO NOT PROCEED WITH WORK UNTIL UNSATISFACTORY CONDITIONS ARE CORRECTED.

2. PRIOR TO INJECTION WORK, OWNERS REPRESENTATIVE SHALL INFORM THE INJECTION CONTRACTOR AND PROVIDE PHYSICAL MARK OF THE LOCATION OF ALL UNDERGROUND ULTILITIES AND STRUCTURES THAT MAY BE DAMAGED BY OR HINDER GROUT INJECTION WORK. ESPECIALLY IMPORTANT TO IDENTIFY ELECTRICAL, NATURAL GAS AND OTHER SERVICE CONNECTIONS THAT MAY POSE A HEALTH RISK TO WORKERS.

A. WATERPROOFING GROUT INJECTION

1. BENTONITE REMEDIAL WATERPROOFING GROUT CAN BE INJECTED TO THE EXTERIOR OF THE FOUNDATION WALL FROM GRADE LEVEL WITHOUT EXCAVATION AND/OR FROM THE BUILDING INTERIOR VIA DRILLED HOLES THROUGH THE FOUNDATION.

SECTION 074100 – METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Standing seam metal roofing system.

B. Standing seam metal roofing accessories.

1.2 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

C. ASTM A 875 - Standard Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process

D. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

E. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

F. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.

G. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.

H. ASTM E 2140 - Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head.

I. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

J. FM 4470 Approval Standard for Class 1 Panel Roofs.

K. FM 4471 - Class 1 Panel Roof; Factory Mutual Research Corporation.

L. UL 263 - Fire Tests of Building Constructions and Materials.

M. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies.

N. UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.

O. UL 1897 - Uplift Test for Roof Covering Systems.

P. ICC-ES AC166 - Test Procedure for Wind Driven Rain Resistance of Metal Roof Coverings.

Q. SMACNA - Architectural Sheet Metal Manual.

R. National Coil Coating Association (NCCA)

S. NRCA - The NRCA Roofing and Waterproofing Manual.

1.3 SUBMITTALS

A. Product Data: Submit product data, test reports, and certifications in accordance with quality assurance and performance requirements specified herein.

B. Shop Drawings: Prepared specifically for this project; showing dimensions of metal roofing and accessories, fastening details and connections and interface with other products.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and textures.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001 approval.

B. Installer Qualifications: Certified and approved installer of the sheet metal roofing manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.5 PRE-INSTALLATION CONFERENCE

A. Convene a pre-roofing conference approximately two weeks before scheduled commencement of roofing system installation and associated work.

B. Require attendance of installers of deck or substrate construction to receive roofing, installers of rooftop units and other work in and around roofing which must precede or follow roofing work including mechanical work, Architect, Owner, roofing system manufacturer's representative.

C. Objectives include:
   1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
   2. Tour representative areas of roofing substrates, inspect and discuss condition of substrate, curbs, penetrations and other preparatory work.
   3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
   4. Review roofing system requirements, Drawings, Specifications and other Contract Documents.
   5. Review and finalize schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

6. Review required inspection, testing, certifying procedures.
7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing.
8. Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
   1. Store materials above ground, on skids.
   2. Protect material with waterproof covering and allow sufficient ventilation to prevent condensation buildup or moisture entrapment on the materials.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

A. Warranty:
   1. 25 year watertight warranty.
   2. Provide installer’s 2 year warranty covering roofing system installation and water-tightness.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The Garland Company, Inc.

B. Approved equal.

2.2 STANDING SEAM METAL ROOFING

A. R-Mer Loc: Panel with 1-3/4 inch high standing seam with 3/8-inch high clearance between panel and substrate.
   1. Seam Height: 1-3/4 inch.
   2. Panel width: 12”
   3. Slope: Slopes down to 3:12.
   4. Panel Clips: Minimum 18 gauge, galvanized steel. Two-piece clips are unacceptable.
   5. Passes:
      a. ASTM E 1592
      b. ASTM E 1680
      c. ASTM E 1646
      d. Class A Fire Rating, UL-790.
      e. UL (Class 90) 580.

6. Panel material:
   a. Galvalume steel, type AZ-55, smooth as per ASTM A 792, 24 gauge.
7. Flashing and flat stock material: Fabricate in profiles indicated on Drawings of same material, thickness, and finish as roof system, unless indicated otherwise.
8. Accessory Components:
   a. Gable anchor clips shall be minimum 18 gauge, galvanized steel.
   b. Fasteners:
      1) Concealed fasteners: Corrosion resistant steel fasteners (zinc plated or equal) designed to meet structural loading requirements. Provide #14 as minimum fastener size.
      2) Exposed fasteners: Series 410 stainless steel fasteners or one-eighth (1/8) inch diameter stainless steel waterproof rivets. All exposed fasteners shall be factory painted to match the color of the standing seam panels.
   c. Closures: Factory precut closed cell foam meeting ASTM D 1056 or ASTM D 3575, with metal trim matching panels when used at hip, ridge, jamb, and rake.
   d. Provide all miscellaneous accessories for complete installation.

2.3 STANDING SEAM METAL ROOFING ACCESSORIES

A. Framing Components:
   1. Hat Sections: Galvanized steel furring hat sections, 22 gauge minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive metal roofing. Notify the Architect in writing of any defective conditions encountered. Starting of work shall constitute acceptance of such conditions.

B. Structural Deck Substrate:
   1. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, and properly sloped.
   2. Verify deck is dry and joints are solidly supported and fastened.
   3. Verify wood nailers are installed and correctly located. Do not use pressure-treated wood containing salt-based preservatives or materials corrosive to steel.

C. Structural Framing Substrate:
   1. Verify hat channels are installed and fastened and properly aligned.
   2. Verify damaged shop coatings are repaired with touch up paint.

D. Verify reglets are in place and nailing strips located.

E. Correct defective conditions before beginning work.

3.2 INSTALLATION

A. Install in conformance with the NRCA Roofing and Waterproofing Manual and Manufacturers installation requirements.

B. Form panel shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.

C. Install underlayment and eave protection sheet underlayment as recommended by the Manufacturer.

D. Install all panels continuous from ridge to eave. Transverse seams are not permitted.

E. Panel lengths that exceed maximum shipping lengths shall be field rolled on equipment owned by the panel manufacturer. Seam sealant must be factory applied.

F. Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap, if required, and at trim details in accordance with the Manufacturer's requirements.

G. Where not otherwise indicated conform to SMACNA details including flashings and trim.

H. Install sealants where indicated to clean dry surfaces only without skips or voids..

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 075500 - MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Torch Applied 2-Ply Modified Bitumen Roofing System

B. Edge Treatment and Roof Penetration Flashings.

1.2 REFERENCES

A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

B. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

C. ASTM D 4586 Standard Specification for Asphalt Roof Cement, Asbestos-Free.

D. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.

E. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

F. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

G. ASTM D 6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

H. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

I. Factory Mutual Research (FM): Roof Assembly Classifications.

J. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

K. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

L. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.

M. Warnock Hersey (WH): Fire Hazard Classifications.

N. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

O. ASCE 7, Minimum Design Loads for Buildings and Other Structures

P. UL - Fire Resistance Directory.

Q. FM Approvals - Roof Coverings and/or RoofNav assembly database.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions.

B. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.

C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience.

D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.5 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

C. Inspect and make notes of job conditions prior to installation:
   1. Record minutes of the conference and provide copies to all parties present.
   2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
   3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Owner/Engineer.

F. Adhesive storage shall be between the range of above 50 degree F and below 80 degree F. Area of storage shall be constructed for flammable storage.

1.7 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

A. Upon completion of the work, provide the Manufacturer's written and signed NDL Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installing contractor, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition.
   1. Warranty Period:
      a. 25 years from date of acceptance.

B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.
   1. Warranty Period:
      a. 5 years from date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The Garland Company, Inc.

B. Other accepted Manufacturers:
   1. GAF
   2. Ecology Roof Systems
   3. Or, approved equal.

C. If Contractor proposes to use roofing products or systems other than the Basis of Design, it shall be treated as a substitution. See GENERAL CONDITIONS, GC-4.23 SUBSTITUTIONS (OR EQUAL) for substitution procedures and requirements. If proposed substitution is NOT APPROVED, Contractor shall provide Basis of Design products or systems.

2.2 TORCH APPLIED 2-PLY ASPHALT ROOFING

A. Nailable Base Sheet: One ply fastened to the deck per wind uplift calculations.
   1. HPR Premium Glasbase

B. Base (Ply) Sheet:
   1. HPR Torch Base:

C. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interplay adhesive.
   1. StressPly IV Plus Mineral:

D. Interply Adhesive:
   1. NA

E. Flashing Base Ply:
   1. HPR Torch Base:

F. Flashing Cap (Ply) Sheet
   1. StressPly IV Plus Mineral:

G. Flashing Ply Adhesive:
   1. N/A.

2.3 EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

A. Pre-Manufactured Coping Cap: R-Mer Edge Coping Cap Cover and Splice Plate.
   1. Aluminum, ASTM B209, alloy 3105-H14, in thickness of.050" nom.

B. Pre-Manufactured Coping Cap: R-Mer Edge Coping Chairs
   1. Zinc-coated steel, ASTM A653, coating designation G-90, in thickness of 0.0635 nom./ 16 gauge, 36" to 48" by coil length, chemically treated, commercial or lock-forming quality.

C. Pitch pockets and capes & Collars: 16 oz. copper. All joints should be welded/soldered watertight.

D. Drain Flashings should be 4lb. sheet lead formed and rolled.

E. Plumbing stacks should be 4lb. sheet lead formed and rolled.

F. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
   1. Tensile Strength, ASTM D 412: 400 psi
   2. Elongation, ASTM D 412: 300%
   3. Density @77 deg. F 8.5 lb/gal typical

2.4 INSULATION MATERIALS

A. General: Provide preformed, roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: Rigid, cellular Polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents complying with ASTM C 1289, classified by facer type as follows:
   1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.
   2. Minimum thickness polyisocyanurate insulation shall be 3.0” thick for areas with uniform thickness insulation and 2.0” for areas that are designated as tapered.
   3. Tapered insulation shall be ¼”:1’-0” slope
   4. Slope of cricket shall be ½” per 12” minimum.

C. Dens-Deck® Roof Board

   1. Qualities: Nonstructural glass mat faced, noncombustible, water-resistant treated gypsum core panel.
   2. Board Size: Four feet by four feet (4’x4’).
   3. Thickness: One half (1/2) inch.

2.5 INSULATION ACCESSORIES

A. General: Furnish roofing insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Tapered Edge Strips: Rigid, cellulosic-fiber insulation board, complying with ASTM C 208, Type 2.

C. Insulation adhesive: Manufacturer’s high rise urethane foam adhesive: Highly elastic, one step, VOC compliant high rise adhesive for use over irregular deck.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, roof drains, stack vents, vent outlets, nailers and surfaces and

elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Coordinate with Owner to shut down air intake equipment in the vicinity of the Work. Cover air intake louvers before proceeding with re-roofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

B. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

C. Verify that openings, curbs, pipes, conduit, sleeves, ducts, and other items which penetrate the roof are set solidly, and that cant strips, nailing strips, and reglets are set in place.

D. Gypsum Deck.
1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
3. Roof surface to receive roofing system shall be smooth, clean, free from loose dirt and debris, dry and structurally sound.
4. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
5. Base or ply sheets attached with fasteners require a minimum pullout capacity of 40 lb. per fastener.

E. Mechanically attached base sheet: Install the base sheet over the entire surface using suitable fasteners. Shingle in direction of slope of roof to shed water on each area of roof

F. Concrete Deck:
1. Penetrations through the deck or joints in the deck construction will be sealed to prevent materials penetrating the interior.
2.
3. One ply of the 180 mill membrane shall be torch applied with side laps of 4’’ and end laps of 6’’.
4.
5. Lap ply sheet ends eight (8) inches. Stagger end laps twelve (12) inches minimum.
6. Extend plies two (2) inches beyond top edges of cants at wall, roof projections and equipment bases.
7. Install base flashing ply to all perimeter and projection details. Properly seal all curb penetrations and perimeter, prior to installation of the roof insulation.

G. Insulation: Roof insulation

1. All joints between layers should be staggered when multiple layers of insulation are installed. Insulation greater than 2.5 inches shall be installed in multiple layers.
2. Insulation shall be kept dry at all times. Install only as much insulation as can be covered with completed roofing membrane before the end of the day's work or prior to onset of inclement weather.
3. Edges shall butt tightly and all cuts shall fit neatly against adjoining surfaces to provide a smooth overall surface. Gaps of greater than 1/4 inch width shall be filled with insulation.
4. Install tapered insulation between roof drains and around roof drains and penetrations to provide adequate slope for proper drainage.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 VAPOR BARRIER INSTALLATION:

A. Penetrations through the deck or joints in the deck construction will be sealed to prevent materials penetrating the interior.

B. One ply of the base sheet shall be applied with side laps of 4'' and end laps of 6''.

C. Using an approved fastener, nail each sheet every 9'' through the laps and stagger nail the remainder of the sheet on 9'' centers.

D. Install torch base sheet to the mechanically fastened base sheet. Shingle in proper direction to shed water on each area of roofing.

E. Lay out the roll in the course to be followed and unroll 6 feet.

F. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate.

G. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.

H. After the major portion of the roll is bonded, re-roll the first 6 feet and bond it in a similar fashion.

I. Repeat this operation with subsequent rolls with side laps of 4 inches and end laps of 8 inches.

J. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal

K. Extend underlayment 2 inches beyond top edges of cants at wall and projection bases.

3.5 INSTALLATION TORCH APPLIED 2-PLY MODIFIED BITUMEN ROOFING SYSTEM

A. Base Ply: Install torch base sheet to a properly prepared substrate. Shingle in proper direction to shed water on each area of roofing.
   1. Lay out the roll in the course to be followed and unroll 6 feet.
   2. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.
   3. After the major portion of the roll is bonded, re-roll the first 6 feet and bond it in a similar fashion.
   4. Repeat this operation with subsequent rolls with side laps of 4 inches and end laps of 8 inches.
   5. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.
   6. Extend underlayment 2 inches beyond top edges of cants at wall and projection bases.
   7. Install base flashing ply to all perimeter and projections details.

B. Top Ply: Over torch base sheet underlayment, lay out the roll in the course to be followed and unroll 6 feet. Stagger seams over the torch base sheet seams.
   1. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with

your foot to insure a proper bond.
2. After the major portion of the roll is bonded, re-roll the first 6 feet and bond it in a similar fashion.
3. Repeat this operation with subsequent rolls with side laps of 4 inches and end laps of 8 inches.
4. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.

C. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives.

D. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as required.
1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
2. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
3. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

E. Metal Work: Provide metal flashings, counter flashings and parapet coping caps as specified. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

F. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

G. Flashing Base Ply: Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
1. Prepare all walls, penetrations and other surfaces to be flashed with asphalt primer at the rate of 100 square feet per ¼ gallon. Allow primer to dry tack free.
2. Solidly adhere the entire sheet of flashing membrane to the substrate. Nail off at a minimum of 8 inches o.c. from the finished roof at all vertical surfaces.

H. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the base ply.
1. Adhere to the underlying base flashing ply. Nail off at a minimum of 8 inches o.c. from the finished roof at all vertical surfaces.
2. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
3. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
4. All stripping shall be installed prior to flashing cap sheet installation.
5. Reinforce all vertical seams with an application of silver roof cement – fiberglass fabric – silver roof cement.

6. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

I. Roof Walkways: Provide 3’ x 4’ x ½” TrafGard walkway pads in areas indicated on the Drawings.

3.6 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. Scupper Through Wall (Overflow):
1. Inspect the nailer to assure proper attachment and configuration.
2. Run one ply over nailer up the overflow, into the scupper hole and up flashing as in typical wall flashing detail. Assure coverage of all wood nailers.
3. Install scupper box in a 1/4 inch bed of mastic. Assure all box seams are soldered and have a minimum 4 inch flange. Make sure all corners are closed and soldered. Prime scupper at a rate of 100 square feet per gallon and allow to dry.
4. Fasten flange of scupper box every 3 inches o.c. staggered.
5. Strip in flange scupper box with base flashing ply covering entire area with 6 inch overlap on to the field of the roof and wall flashing.
6. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches on to the field of the roof. Apply a three-course application of silver mastic and mesh at all seams.

B. Coping Cap:
1. Remove the existing coping stones and discard. Install new 2x wood blocking to the top of the parapet wall. Minimum flashing height is 8 inches above finished roof height. Maximum flashing height is 24 inches. Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches
3. Install base flashing ply covering entire wall and wrapped over top of wall and down face with 6 inches on to field of roof and set in cold asphalt. Nail membrane at 8 inches o.c.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches on to the field of the roof. Apply a three-course application of silver mastic and mesh at all seams.
5. Install continuous cleat and fasten at 6 inches o.c. to outside wall.
6. Install new metal coping cap hooked to continuous cleat.
7. Fasten inside cap 24 inches o.c. with approved fasteners and neoprene washers through slotted holes, which allow for expansion and contraction.

C. Surface Mounted Counterflashing:
1. Minimum flashing height is 8 inches above finished roof height. Maximum flashing height is 24 inches Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches
3. Install base flashing ply covering wall set in bitumen with 6 inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches on to the field of the roof. Apply a three-course application of silver mastic and mesh at all vertical seams.
5. Apply butyl tape to wall behind flashing. Secure termination bar through

flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.

6. Secure counterflashing set on butyl tape above flashing at 8 inches o.c. and caulk top of counterflashing.

D. Equipment Support:
1. Minimum curb height is 8 inches above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches.
3. Install base flashing ply covering curb set in bitumen with 6 inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches on to the field of the roof. Attach top of membrane to top of curb and nail at 8 inches o.c. Apply a three-course application of silver mastic and mesh at all vertical seams.
5. Install pre-manufactured cover. Fasten sides at 24 inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.

E. Exhaust Fan:
1. Minimum curb height is 8 inches above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of 2 inches.
3. Install base flashing ply covering curb with 6 inches on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, 9 inches on to field of the roof. Attach top of membrane to top of wood curb and nail at 8 inches o.c. Apply a three-course application of silver mastic and mesh at all vertical seams.
5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

F. Roof Drain:
1. Remove the existing roof drains and install new Smith roof drains.
2. Plug drain to prevent debris from entering plumbing.
3. Taper insulation to drain minimum of 48 inches from center of drain.
4. Run roof system plies over drain. Cut out plies inside drain bowl.
5. Set lead flashing (30 inch square minimum) in 1/4 inch bed of mastic. Run lead into drain a minimum of 2 inches. Prime lead at a rate of 100 square feet per gallon and allow to dry.
6. Install base flashing ply (40 inch square minimum) in bitumen.
7. Install modified membrane (48 inch square minimum) in bitumen.
8. Install clamping ring and assure that all plies are under the clamping ring.
9. Remove drain plug and install strainer.

G. Plumbing Stack:
1. Minimum stack height is 12 inches.
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.

6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of 1 inch down inside of stack.

H. Heat Stack:
1. Minimum stack height is 12 inches.
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new copper sleeve. Install properly sized sleeves set in 1/4 inch bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install modified membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Install new copper collar over cape. Weld collar or install stainless steel draw brand.

I. Pitch Pocket:
1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one ply of base flashing ply. Extend 6 inches onto field of roof.
4. Install second layer of modified membrane extending 9 inches onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.

J. Liquid Flashing:
1. Mask target area on roof membrane with tape.
2. Clean all non-porous areas with isopropyl alcohol.
3. Apply 32 wet mil base coat of liquid flashing over masked area.
4. Embed polyester reinforcement fabric into the base coat of the liquid flashing.
5. Apply 48-64 wet mil top coat of the liquid flashing material over the fabric extending 2 inches past the scrim in all directions.
6. Allow the liquid flashing material to cure 15-30 days and then install reflective coating.

3.7 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles and other debris resulting from these operations.

B. Remove asphalt markings from finished surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.8 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be

not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.9 FIELD QUALITY CONTROL

A. Inspection: Provide manufacturer's field observations at start-up and a minimum of three (3) days a week. Provide a final inspection upon completion of the Work.
   1. Warranty shall be issued upon manufacturer's acceptance of the installation.
   2. Field observations shall be performed by a Sales Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.
   3. Provide observation reports from the Sales Representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
   4. Provide a final report from the Sales Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

END OF SECTION

SECTION 075510 – INFRARED MOISTURE ROOF SCAN

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Equipment required performing the infrared scan.
2. Contractor qualifications to perform the infrared scan, must be an independent subcontractor.
3. Infrared scan of all roof areas at the conclusion of the replacement and restoration work, prior to final inspection.

B. Related Sections include the following:
1. Division 7 Section "Modified Bituminous Membrane Roofing”.

1.3 EQUIPMENT SUBSTITUTIONS

A. The equipment outlined herein is the basis of design and the type of equipment that should be used on this project.

B. If Contractor proposes to use equipment or products other than the Basis of Design, it shall be treated as a substitution. See GENERAL CONDITIONS, GC-4.23 SUBSTITUTIONS (OR EQUAL) for substitution procedures and requirements. If proposed substitution is NOT APPROVED, Contractor shall provide Basis of Design equipment or products.

1.4 SUBMITTALS

A. Equipment Data: Provide manufacturer’s cut sheet on the make/model of all equipment being used for the infrared scan.

B. Report samples: Submit report sample of infrared moisture survey.

1. Include written example.
2. Include drawing sample.
3. Sample photographs of wet areas.

C. Any equipment submitted as an equal to specified equipment must also submit a list of five (5) documented jobs where the proposed material has been used in a similar

application and that is within fifty (50) miles of project location. These projects must be five (5) years old and be available for the Engineer to inspect.

1.5 QUALITY ASSURANCE

A. Verify all survey results by taking probes with specified equipment at selected locations.

B. Scanning contractor/sub-contractor must own and operate equipment and not be an employee of the roofing contractor.

C. Infrared scanner must have a minimum of 10 years documented experience as lead infrared camera operator conducting roof scans.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. Basis of Design: Equipment and/or manufacturer's name specified herein shall be regarded as the minimum standard of quality required for work of this section.

B. Contractor shall be required to perform the following:

1. Infrared scan of all roof areas (flat and sloped) at the conclusion of the replacement and restoration work, prior to final inspection.

2.2 ACCEPTABLE EQUIPMENT

A. Infrared Scanner

1. Agema 470
2. Or approved equal.

B. Moisture Meter (Penetrating Probe Type)

1. Delmhorst
2. Tramex
3. Or approved equal.

2.3 DESCRIPTION

A. Scans shall include the following:

1. All roof areas shall be scanned using the Agema 470 infrared scanner.
2. Verify survey results by taking probes with a Delmhorst or Tramex moisture meter at selected locations.

3. Spray paint all wet areas using a highly visible marking paint with a minimum visibility life of 60 days.
4. Provide a written report covering findings, observations and the following:

    a. Scale color drawings of each roof area showing the location and extent of each wet area.
    b. Four-dimensions for each wet area so it can be re-created in the future.
    c. Provide infrared photographs of selected areas of wet insulation.

2.4 AVAILABLE SUBCONTRACTORS

A. Subject to the compliance with requirements, subcontractors offering equipment and service that may be incorporated into the work include:

1. Professional Roof Services
   1145 Chew Road
   Waterford Works, NJ 08089
   Attn: Mike McGonigle
   (856) 809-1032

2. Jersey Infrared Consultants
   PO Box 39
   Burlington. NJ 08016
   Attn: Robert Zapisek
   (609) 386-1281

3. A2Z Inspection Services
   East Stroudsburg, PA 18301
   (570) 371-6696

4. Or approved equal.

PART 3 - EXECUTION – NOT USED

END OF SECTION 07 5510

SECTION 075553 – PLAZA DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes all labor, equipment and materials to remove the existing plaza deck overburden and waterproofing system(s) back to the existing concrete deck, prepare the concrete deck, install the specified modified bitumen membrane roofing system, drainage mat, insulation, protective board and concrete topping slab.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. American Society of Civil Engineers (ASCE):

1. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures.

C. American Society for Testing and Materials (ASTM):

1. ASTM D41, Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.

2. ASTM D312, Specification for Asphalt Used in Roofing.

3. ASTM D451, Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

4. ASTM D1079, Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

5. ASTM D1863, Specification for Mineral Aggregate Used as a Protective Coating for Roofing.

6. ASTM D2178, Specification for Asphalt Glass Felt Used as a Protective Coating for Roofing.

7. ASTM D2822, Specification for Asphalt Roof Cement.

8. ASTM D2824, Specification for Aluminum-Pigmented Asphalt Roof Coating.

9. ASTM D4601, Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.

10. ASTM D5147, Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

11. ASTM D6163, Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

12. ASTM E108, Test Methods for Fire Test of Roof Coverings.

D. Factory Mutual Research (FM):

1. Roof Assembly Classifications.

E. National Roofing Contractors Association (NRCA):

1. Roofing and Waterproofing Manual.

F. Underwriters Laboratories, Inc. (UL):

1. Fire Hazard Classifications.

G. Warnock Hersey (WH):

1. Fire Hazard Classifications.

1.4 MATERIALS AND SUBSTITUTIONS

A. The material performance criteria outlined herein are the requirements of the materials that must be used in this project. When a particular make or trade name is specified, it shall be indicative of the minimum standard required.

B. If Contractor proposes to use roofing products or systems other than the Basis of Design, it shall be treated as a substitution. See GENERAL CONDITIONS, GC-4.23 SUBSTITUTIONS (OR EQUAL) for substitution procedures and requirements. If proposed substitution is NOT APPROVED, Contractor shall provide Basis of Design products or systems.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site .

1. Meet with Owner, Engineer, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   a. Convene a pre-construction conference approximately two (2) weeks before scheduled commencement of the plaza deck modified bituminous roofing system installation and associated work.
2. Require attendance of installer of each component of associated work, installers of deck or substrate construction to receive work, installers of plaza deck units and other work in and around the plaza deck which must precede or follow plaza deck work (including mechanical work if any), Owner, Owner’s representative, roofing system manufacturer’s representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner’s insurers, testing agencies and governing authorities.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Tour representative areas of plaza deck substrates (decks), inspect and discuss condition of substrate, plaza deck drains, curbs, penetrations and other preparatory work performed by others.
5. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
6. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
7. Review structural loading limitations of roof deck during and after roofing.
8. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
9. Review governing regulations and requirements for insurance and certificates if applicable.
10. Review temporary protection requirements for roofing during and after installation.
11. Review roof observation and repair procedures after roofing installation.
12. Review and finalize construction schedule related to roofing work and verify availability of materials, installer’s personnel, equipment and facilities needed to make progress and avoid delays.
13. Review required inspection, testing, certifying and material usage accounting procedures.
14. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
15. Record discussion of conference including decisions and agreements (or disagreements) reached and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
16. Review notification procedures for weather or non-working days.

1.6 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data-substantiating that materials comply with specified requirements.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Insulation.
3. Crickets, saddles, and tapered edge strips, including slopes.

C. Samples for Verification: Submit two (2) samples of each product specified.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

2. Certify that modified membrane materials to be used on this project are physically manufactured by the distributing manufacturer in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

3. Submit a certified copy of the roofing manufacturer's ISO 9001:2000 compliance certificate.

C. Manufacturer's Fire Compliance Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.Product Test Reports: For components of roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77°F. Tests at 0°F will not be considered.

E. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

F. Waterproofing installer (sub and/or GC) shall submit certification letter by the approved manufacturer that they are in fact approved to install the system being specified.

G. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Company specializing in manufacturing the products specified in this section with minimum 12 years documented experience and having ISO 9001:2000 certification

2. The distributing manufacturer must be the actual company physically manufacturing the modified bitumen membranes and must have a current ratio of 5:1 (current assets to current liabilities) and demonstrated such with an audited financial statement supported by an affidavit from a third party. Manufacturer must not have been in Chapter 11 bankruptcy during the last five (5) years

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1. Company specializing in modified bituminous roofing installation with a minimum 5 years experience and certified by roofing system manufacturer as qualified to install manufacturer’s roofing materials

2. Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work and at any time roofing work is in progress. Maintain proper supervision of workmen. Maintain a copy of the specifications in the possession of the Supervisor/Foremen and on the roof at all times.

3. Immediately correct plaza deck leakage during construction. If the Contractor does not respond within twenty four (24) hours, the Owner has the right to hire a qualified contractor and backcharge the original contractor.

C. Insurance Certification: Assist Owner in preparation and submittal of plaza deck installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of all sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).

D. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

E. Do not leave unused materials on the plaza deck overnight or when work is not in progress unless protected from weather and other moisture sources and in a secured locked area.

F. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

G. It is the responsibility of the contractor to secure all material and equipment on the job site. If any material or equipment is stored on the plaza deck, the contractor must make sure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor will be the sole responsibility of the contractor and will be repaired or replaced at his expense.

1.11 MANUFACTURER’S INSPECTIONS

A. A.When the project is in progress, the roofing system manufacturer will provide the following:

1. Keep the Engineer, Owner and their representative’s informed as to the progress and quality of the work as observed.

2. Provide job site inspections a minimum of three (3) days a week and provide written reports with photographic documentation to the Engineer and Owner.

3. Report to the Engineer and Owner in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

4. Confirm after completion that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.12 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Proceed with work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

C. Do not apply insulation or membrane to damp deck surface.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

E. Field measurements and material quantities:

1. Contractor shall have SOLE responsibility for accuracy of all measurements, estimates of material quantities and sizes, and site conditions that will affect work.

F. Existing Conditions:

1. Building space directly under roof area covered by this specification will be utilized by on-going operations. Do not interrupt Owner operations unless prior written approval is received from Owner.

G. Waste Disposal:

1. Do not re-use, re-cycle or dispose of materials except in accordance with all applicable regulations. The use of products is responsible for proper use and disposal of product containers.

H. Safety Requirements:

1. All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.

2. Comply with federal, state, local and Owner fire and safety requirements.

3. Advise Owner whenever work is expected to be hazardous to Owner, employees, and/or operators.

4. Maintain a crewman as a floor area guard whenever roof decking is being repaired or replaced.

5. Maintain fire extinguisher within easy access whenever power tools, roofing kettles, fuels, solvents, torches and open flames are being used.

1.13 SEQUENCING AND SCHEDULING

A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other sections to ensure that plaza deck assemblies including accessories, flashing, trim and joint sealers are protected against damage from effects of weather, corrosion and adjacent construction activity.

1.14 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Upon completion of installation, and acceptance by the Owner and Engineer, the manufacturer will supply to the Owner a warranty covering the waterproofing membrane system.

2. Installer will submit a minimum of a two (2) year warranty to the membrane manufacturer with a copy directly to Owner.

3. At the request of the Owner, the manufacturer will provide an annual inspection of the plaza deck. These inspection requests can occur for the life of the warranty.

4. Warranty Period: 25 years NDL from date of Final Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. When a particular trade name or performance standard is specified it shall be indicative of the minimum standard required. Product names for the materials used in this section shall be based on performance characteristics of the modified bitumen roof system

manufactured by The Garland Company, Cleveland, OH, (1-800-762-8225) and shall form the basis of the contract documents.

B. This specification is based on the performance characteristics of the system identified herein.

C. Any item or materials submitted, as a substitution to the manufacturer specified must comply in all respects as to the quality and performance of the brand name specified.

D. Provide primary products, including each type of roofing membrane, flood coat, base flashings, flashing membrane ply and miscellaneous flashing materials from a single source roof manufacturer. A roof manufacturer is defined as the company who physically manufacturers the products. Provide secondary products (insulation, mechanical fasteners, etc.) only as recommended by the roof manufacturer of primary products for use with the roof system specified.

E. Provide products as manufactured by:

1. The Garland Company (Basis of Design)

2. Tremco

3. Ecology Roof Systems

4. Or, approved equal.

2.2 DESCRIPTION

A. Modified bituminous roofing work including but not limited to:

1. Prime concrete deck

2. Base Plies: Two (2) plies of 110 mil thick SBS Torch Grade Base Sheet fully adhered to approved torchable insulation with roofer's torches, covered with one (1) ply of SBS Smooth Surfaced Torch Modified Membrane.

3. Base Flashing Ply: One (1) ply of 110 mil thick SBS Torch Grade Base sheet covered by an additional layer of SBS rubber modified torch applied membrane.

4. Modified Membrane Flashing Ply: One (1) ply of 195 mil thick SBS (Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane with a dual fiberglass scrim. This membrane is designed for torch applications and has a burn-off backer that indicates when the material is hot enough to be installed.

5. Modified Membrane Top Ply: One (1) ply of 180 mil thick SBS (Styrene-Butadiene-Styrene) rubber modified roofing membrane with a dual fiberglass

scrim. This membrane is designed for torch applications and has a burn-off backer that indicates when the material is hot enough to be installed.

6. Install specified the insulation systems as specified.

7. Install protective board as manufactured by WR Meadows or approved equal.

8. Install sloped concrete topping slab (see drawings and specification)

2.3 BITUMINOUS MATERIALS

A. Asphalt Primer: V.O.C. compliant, ASTM D-41.

B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, Type II.

C. Elastomeric Asphaltic Sealant: GARLA-FLEX SEALANT or approved equal.

D. SILVER-FLASH – Aluminized asphalt mastic for the three-course application on vertical flashing seams.

2.4 SHEET MATERIALS

A. Base Plies (2 layers) and Base Flashing Ply

1. 110 mil SBS Torch Grade Base Sheet with woven fiberglass scrim reinforcement with
the following minimum performance requirements according to ASTM D-5147.

2. Properties: (Finished Membrane):

Tensile Strength (ASTM D-5147)		
2 in/min. @73.4 ± 3.6°F	MD 210 lbf/in	CMD 210 lbf/in
Tear Strength (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 250 lbf	CMD 250 lbf
Elongation at Maximum Tensile (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 4.0%	CMD 4.0%

B. Modified Membrane Flashing Ply

1. 195 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane with a dual fiberglass scrim. This membrane is designed for torch applications and has a burn-off backer that indicates when the material is hot enough to be installed. The membrane has the following minimum performance characteristics according to ASTM D 6163 Type III Grade G

Tensile Strength (ASTM D-5147) 2 in/min. @ 73.4 ± 3.6°F	MD 210 lbf/in	CMD 210 lbf/in
Tear Strength (ASTM D-5147) 2 in/min. @ 73.4 ± 3.6°F	MD 250 lbf	CMD 250 lbf
Elongation at Maximum Tensile (ASTM D-5147) 2 in/min. @ 73.4 ± 3.6°F	MD 6.0%	CMD 6.0%
Low Temperature Flexibility (ASTM D-5147)	Passes -20°F (-29°C)	

C. Modified Membrane Top Ply

1. 180 mil thick SBS (Styrene-Butadiene-Styrene) rubber modified roofing membrane with a dual fiberglass scrim. This membrane is designed for torch applications and has a burn-off backer that indicates when the material is hot enough to be installed. The membrane has the following minimum performance characteristics according to ASTM D 6163 Type III Grade S

Tensile Strength (ASTM D-5147) 2 in/min. @ 73.4 ± 3.6°F	MD 210 lbf/in	CMD 210 lbf/in
Tear Strength (ASTM D-5147) 2 in/min. @ 73.4 ± 3.6°F	MD 250 lbf	CMD 250 lbf
Elongation at Maximum Tensile (ASTM D-5147) 2 in/min. @ 73.4 ± 3.6°F	MD 6.0%	CMD 6.0%
Low Temperature Flexibility (ASTM D-5147)	Passes -30°F	

2.5 DRAINAGE MAT

A. Drainage Mat/Protection Board: ULTRA-SHIELD DRAIN 650 is a two-part prefabricated soil sheet drain and protection board consisting of a formed polystyrene core covered on one side with a woven, polypropylene filter fabric. The fabric allows water to pass into the drain core while restricting the movement of soil particles which might clog the core. The core allows water flow to designed exits.

1.	Grab Tensile Strength (ASTM D 4632)	365 x 200 lbs
2.	Puncture Strength (ASTM D4833)	105 lbs.
3.	Trapezoidal Tear (ASTM D4533)	115 x 75 lbs
4.	Mullen Burst Strength (ASTM D3786)	480 psi

5.	EOS (AOS) (ASTM D4751)	40 sieve
6.	Flow Rate (ASTM D4716)	18 gpm/ft
7.	Thickness	7/16 inch
8.	Compressive Strength (ASTM D1621 (Mod.))	21,000 lbs/ft2
9.	Viscosity (ASTM D 2556-93a)	22,000-60,000 cP
10.	Peel Strength (ASTM D 903)	17 lb/in
11.	Flexibility (ASTM D 816-82)	Pass @ -70°F

2.6 LIQUID APPLIED EXPANSION JOINT WATERPROOFING SYSTEM

A. WHITE*KNIGHT: Fully reinforced single-component, polyurethane system provided by the plaza deck waterproofing manufacturer. Install in accordance with manufacturer's instructions and guidelines.

2.7 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type VI, 1.8 lb/cu. ft. with two or four edges rabbeted.
   1. Thickness: minimum of 3"
   2. R-Value: minimum of 15
   3. Compliance: UL listed under Roofing Systems
   4. Acceptable Products:
      a. Owens Corning Foamular 404
      b. Or approved equal

2.8 PROTECTION COURSE

A. General: semi-rigid core comprised of a mineral-fortified asphalt core formed between two outside layers of asphalt-impregnated reinforced mats manufactured or approved by roofing manufacturer selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Waterproofing Protection Board: ASTM D5606, class B, Heavy Duty, 4'x8' Panels
   1. Puncture Strength: 365 N (82 1bf) min.
   2. Thickness: ¼"
   3. Water Absorption: 10% max
   4. Acceptable Products:

a. WR Meadows, Inc PC-3
b. or approved equal

2.9 RELATED MATERIALS

A. Nails and Fasteners: Non-ferrous metal or hot dipped galvanized fasteners complying with ASTM A153 and connectors complying with ASTM A653, Class G185; Type 304 or Type 316 stainless steel fasteners and connectors shall be used with new generation of pressure-treated wood; except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Fasteners shall be self-clinching type of penetrating type as recommended by the manufacturer of the wood blocking/nailer material. Nails and fasteners shall be flush-driven through flat metal discs of not less than one (1) inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than one (1) inch diameter are used.

B. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than twenty eight (28) gauge and not less than one (1) inch in diameter. Form discs to prevent dishing. Bell or cup shaped caps are not acceptable.

C. Metal Termination Bars:

1. Shall be aluminum unless otherwise recommended by membrane manufacturers.

2. Material shall be .125” x 1” (minimum) aluminum conforming to ASTM B-221, mill finish.

D. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07620 - Sheet Metal Flashing and Trim.

E. Urethane Sealant: One part, non-sag sealant as provided by or recommended by the membrane manufacturer for moving joints.

1.	Tensile Strength (ASTM D412)	250 psi
2.	Ultimate Elongation (ASM D412)	950%
3.	Hardness, Shore A (ASTM C920)	35
4.	Adhesion-in-Peel (ASTM C920)	25 pli
5.	100% Modulus (ASTM D412)	50 psi
6.	Bond (Durability-Class 25, ASTM C920)	Passes
7.	Service Temperature Range	-40°F to +180°F
8.	Stain and Color Change (ASTM C920)	Passes

9. Tack Free Time (ASTM C679 (max 72 hrs.) 16 hrs.

10. Weep and Sag (ASTM C920 (max 3/16”(4mm))) Passes

11. Weight loss after heat aging (ASTM C920 (max 10%)) Passes

F. Roof Drain: 8 diameter drain for conventional inverted promenade deck assembly. Dura-coated cast iron body, adjustable head, round grate, cast iron strainer collar and flashing clamp collar. Stainless steel drainage extension and hardware.
1. Acceptable products: Zurn Z135-6 or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate surfaces to receive modified bituminous membrane waterproofing system and associated work and conditions under which the plaza deck waterproofing system will be installed. Do not proceed with waterproofing installation until unsatisfactory conditions have been corrected in a manner acceptable to the manufacturer.

B. Prior to installing the finish modified bitumen membrane plies, the contractor must notify the roof system manufacturer representative, and Engineer, to examine the plaza deck area for high and low spots. It may be necessary to mist the deck with water to identify the problem areas. The contractor will correct all problem areas identified. This examination should take place no less than 24 hours in advance of installing the finished membrane.

C. Verify that deck surfaces and project conditions are ready to receive work of this section.

D. Verify that deck is supported and secured to structural members.

E. Verify that deck is clean and smooth, free of depressions, projections or ripples, and is plumb and level.

F. Verify that adjacent roof members do not vary more than 1/4 inch in height.

G. Verify that deck surfaces are dry, free of snow or ice, not rotten or deteriorated, do not have bacterial growth and are structurally sound.

H. Confirm that moisture content within concrete deck, wood blocking and nailers does not exceed twelve (12) percent by moisture meter tests.

I. Verify that openings, curbs, pipes, conduit, sleeves, ducts, and other items which penetrate the plaza deck are set solidly, and that wood fiber cant strips, wood nailing strips and reglets are set in place. Verify that all roof curb heights are satisfactory and

that the wood blocking height along the perimeter of the building and/or roof levels is satisfactory to provide positive roof pitch away from the building edge.

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

3.2 PREPARATION

A. Remove existing plaza deck system, metal edges, flashings, drains, expansion joints and all accessories back to the concrete deck and masonry walls.

B. Remove all existing drain assemblies and install new drain assemblies. Drains shall be installed prior to the plaza deck waterproofing system installation. Drain shall be Zurn Z135-6 or approved equal.

C. Clean substrate of debris and other substances detrimental to plaza deck waterproofing installation according to the waterproofing system manufacturer's written instructions. Remove sharp objects.

D. Protect other work from spillage of waterproofing materials and prevent materials from entering or clogging the drains. It is the responsibility of the Contractor to test and ensure that the existing drain pipes are in working order prior to the start of the project. Any drains found inoperable during or after the construction, it shall be the responsibility of the Contractor to clean, unclog and correct the drain. Use drain plugs as required to prevent materials from entering and clogging drains. Remove drain plugs at the end of each work day or when rain is forecasted. Replace or restore other work damaged by installation of the modified bituminous membrane waterproofing system.

E. All existing plaza deck waterproofing shall be torn off and removed completely down to the concrete structure decking. Dispose off-site in dumpsters.

F. Tear off only enough plaza deck waterproofing which can be successfully waterproofed with the temporary waterproofing system in a single day.

3.3 WOOD NAILERS/BLOCKING

A. Provide new wood blocking for any and all new nailers. Remove and replace all deteriorated, unsound and rotten wood blocking/nailers.

B. All wood shall be free of any warping or splits.

C. Mechanically fasten the wood nailers as per the current FM 1-90 requirements or the project specifications, using whatever is the more stringent requirements. Use only specified fasteners. Multiple layered wood nailers shall be staggered from the underlying courses. Fasteners shall run in a staggered fashion.

D. Install new wood blocking as shown on the project documents.

3.4 GENERAL INSTALLATION REQUIREMENTS

A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the plaza deck waterproofing system.

B. Insurance/Code Compliance: Where required by code, install and test the plaza deck waterproofing system to comply with governing regulation and specified insurance requirements.

C. Protect other work from spillage of waterproofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of the modified bituminous plaza deck membrane system.

D. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging plaza deck waterproofing system components or adjacent building construction.

E. Apply plaza deck waterproofing materials as specified by manufacturer's instructions.

1. Keep materials dry before and during application.

2. Begin and apply only as much insulation and the first ply of the waterproofing system in one day as can be completed that same day.

F. Cut-Offs/Envelope Waterstops: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Install waterstop/temporary flashing a minimum of 6 inches onto the uncompleted deck and/or temporary waterproofing membrane and wrapped up face and back a minimum of 6 inches from the face using the specified SBS Torch Base Roofing Ply. As required, top dress waterstop with asphalt mastic.

G. A minimum two-hour fire watch is required for each day that torch-applied membranes are installed.

H. Keep an approved rated fire extinguisher every 3,000 square feet maximum on the roof. The fire extinguisher shall be placed in a central location in that area where all workers know where it is and how to operate in properly.

3.5 TEMPORARY WATERPROOFING PLY INSTALLATION

A. Install one (1) layer of SBS Torch Grade Base Ply to a properly prepared concrete substrate to achieve one ply throughout the prepared substrate. Shingle in proper direction to shed water.

B. Over the entire deck surface, prime concrete surfaces with asphalt primer at the rate of 1 (one) gallon per one hundred (100) square feet.

C. To the prepared concrete deck, lay out the roll in the course to be followed and unroll six (6) feet. End laps of must be staggered 12 inches minimum.

D. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.

E. After the major portion of the roll is bonded, re-roll the first six (6) feet and bond it in a similar fashion.

F. Repeat this operation with subsequent rolls with side laps of four (4) inches and end laps of eight (8) inches.

G. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.

H. Extend temporary roof ply two (2) inches up all wall bases, and over all perimeter edge. Nail to the outside edge of the perimeter wood blocking.

3.6 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Engineer and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Retain paragraph below if coating flashing or if using fluid-applied bonding materials.

D. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.7 BASE PLIES INSTALLATION

A. Install two (2) layers of SBS Torch Grade Base Ply to a properly prepared substrate to achieve two plies throughout the prepared substrate. Shingle in proper direction to shed water.

B. To an approved recovery board, lay out the roll in the course to be followed and unroll six (6) feet. The second layer MUST be installed 90 degrees to the first layer. End laps of each layer must be staggered 12 inches minimum. Laps of the second layer must be staggered 12 inches minimum with the first layer.

C. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.

D. After the major portion of the roll is bonded, re-roll the first six (6) feet and bond it in a similar fashion.

E. Repeat this operation with subsequent rolls with side laps of four (4) inches and end laps of eight (8) inches.

F. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.

G. Extend base plies two (2) inches beyond top edges of cants at wall and projection bases, and over all perimeter edge (metal edge/gravel stop/parapet wall) wood blocking. Nail to the outside edge of the perimeter wood blocking.

3.8 MODIFIED MEMBRANE TOP PLY INSTALLATION

A. Install SBS Modified Membrane Top Ply as described below.

B. Over the second ply of the SBS Torch Grade Base Sheet underlayments, lay out the modified membrane top ply roll 90 degrees to the second layer of SBS Torch Base Sheet and in the course to be followed and unroll six (6) feet. End laps must be staggered 12 inches minimum. Laps of the top ply layer must be staggered 12 inches minimum with the second base ply layer.

C. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.

D. After the major portion of the roll is bonded, re-roll the first six (6) feet and bond it in a similar fashion.

E. Repeat this operation with subsequent rolls with side laps of four (4) inches and end laps of eight (8) inches. End laps of the SBS Modified Membrane Top Ply shall be staggered 12 inches minimum.

F. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal. Ensure a uniform and complete bleed out from the side and end laps.

3.9 FLASHING MEMBRANE INSTALLATION

A. Seal all curb, wall and perimeter flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.

B. Prepare all walls, drains, penetrations and where shown on the drawings to be flashed with asphalt primer at the rate of one hundred (100) square feet per gallon. Allow primer to dry tack free.

C. Install Base Flashing Ply to all perimeter and projections details.

D. Use the modified flashing ply membrane as the top flashing ply membrane and adhere to the underlying base flashing ply.

E. Solidly adhere the entire sheet of flashing membrane to the substrate.

F. Coordinate counter flashing, cap flashings, and similar work with modified bitumen plaza deck waterproofing work as specified in other sections.

G. Coordinate accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work as specified in other sections.

H. Install flashing system in accordance with the project details.

I. Metal Edge:

1. Inspect the new concrete spandrel beam to assure proper attachment and configuration.

2. Run complete plaza deck waterproofing system over the juncture of the concrete spandrel beam and insulation system. Assure coverage of new concrete spandrel beam.

3. Install new stainless steel metal edge in a full bed of mastic in accordance with the project specifications.

4. Install base flashing ply covering curb with six (6) inches on to field of the roof.

5. Install the modified flashing ply installed over the base flashing ply, nine (9) inches on to field of the roof. Seal outside edge of the flashing system to the metal edge with an elastomeric asphaltic sealant.

J. Pitch Pocket:

1. Install new wood blocking equal to the height of the insulation system and secure to the roof deck.

2. Run all plies up to the penetration.

3. Install new stainless steel metal pitch pocket over the penetration and fasten to the wood blocking. Prime all flanges.

4. Strip in flange of pitch pocket with one (1) ply of base flashing ply. Extend six (6) inches onto field of roof.

5. Install the modified membrane extending nine (9) inches onto field of the roof.

6. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with specified two-part pourable sealer.

7. Caulk joint between roof system and pitch pocket with an elastomeric asphaltic sealant.

K. Expansion Joint/Parapet Wall Detail:

1. Install new approved wood nailers and blocking to the configuration as shown in the project drawings. Assure proper attachment to the structure. Install wood fiber cant mechanically attached to the vertical and horizontal wood nailers.

2. Install self-adhering fire retardant bitumen membrane over wood and onto insulation system.

3. Install compressible insulation in neoprene cradle between wall and vertical wood nailer.

4. Run all field plies, including the modified membrane roofing ply, over the wood blocking.

5. Install base flashing ply by torch methods wrapped to top of wood nailer with six (6) inches on to field of the roof. Nail membrane at eight (8) inches o.c.

6. Install modified flashing ply by torch methods over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of Silver-Flash aluminized mastic and mesh at all vertical seams and allow to cure and aluminize.

7. Install new reinforced liquid applied expansion joint system in accordance with the manufacturer’s recommendations.

8. Install new 2-pc 1/8” stainless steel counterflashing/expansion joint system. Provide watertight transition at the end of the expansion joint. Cut a reglet in masonry one joint above flashing system to the proper depth to accept receiver. Install receiver and secure with lead plugs at 12” o.c.. Seal top of receiver with a continuous bead of specified urethane sealant. All edges to be rolled smooth.

9. Install the counter-flashing insert into the receiver and secure to the receiver.

3.10 DRAINAGE MAT INSTALLATION

A. Prior to installation of drainage mat, a water test must be performed to the entire plaza deck area per NRCA standards and/or a minimum of 48 hours. Obtain approval from manufacturer as to work completed.

B. Waterproofing system manufacturer's representative shall be present during the water test. Provide 48-hour notice to the Owner, Engineer and Waterproofing system manufacturer's representative.

C. Install specified drainage mat/protection board in accordance with the manufacturer's instructions/recommendation.

3.11 FIELD QUALITY CONTROL

A. Perform field inspection and testing as required by this specification.

B. Correct defects or irregularities discovered during field inspection.

C. Require attendance of waterproofing system manufacturers' representatives at site during installation of the waterproofing system.

D. Perform an infra-red scan of the roofing material prior to the installation of the concrete topping slab. Infra-red scan to be performed by an independent scanning company, report to be issued to the Engineer.

3.12 CLEANING

A. Remove bitumen adhesive drippings from all walls, windows, floors and finished surfaces.

B. In areas where finished surfaces are soiled by bitumen or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning instructions and conform to their instructions.

C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.13 FINAL INSPECTION

A. . At completion of plaza deck waterproofing installation and associated work, meet with Contractor, Owner, Engineer, waterproofing system manufacturer's representative, and other representatives directly concerned with performance of waterproofing system.

B. Walk plaza deck surface areas of the building, inspect perimeter building edges as well as flashing of penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. A thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Contractor included in the price.

D. If core cuts verify the presence of damp or wet materials, the Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace deteriorated or defective work found at time above inspection as required to produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

F. Notify the Engineer, Owner and waterproofing system manufacturer upon completion of corrections.

G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

END OF SECTION 075552

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manufactured through-wall flashing with counterflashing.
2. Manufactured reglets with counterflashing.

B. Related Requirements:
1. Section 07 5552 “Modified Bituminous Membrane Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including crickets, and counterflashings as applicable.
9. Include details of special conditions.
10. Include details of connections to adjoining work.
11. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2B (bright, cold rolled).

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275)]; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flatand with manufacturer's standard clear acrylic coating on both sides.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Grace Construction Products

2. Henry Company

3. Or approved equal.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn60 , with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch (75-mm) intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with snaplock receiver on exterior face to receive counterflashing.
1. Stainless Steel: 0.016 inch (0.40 mm) thick.

B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet].
1. Material: Stainless steel, 0.019 inch (0.48 mm) thick.
2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
4. Accessories:

a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

5. Finish: Mill With manufacturer's standard color coating.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Do not use graphite pencils to mark metal surfaces.

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Stainless Steel:-0.016 inch (0.40 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

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

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners[, solder], protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent

separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation

instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 6200

SECTION 078100 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes sprayed fire-resistive materials (SFRM).

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Framing plans, schedules, or both, indicating the following:

1. Extent of fireproofing for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of fireproofing after application.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Preconstruction Test Reports: For fireproofing.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups for preconstruction testing.

1. Build mockup of each type of fireproofing and different substrate as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on fireproofing.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.

1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

C. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.

1. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
2. Bond Strength: Minimum 1000-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
3. Density: Not less than 15 lb/cu. ft. (minimum density required by IBC) or as specified in the approved fire-resistance design, according to ASTM E 605.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.500 in.
5. Combustion Characteristics: ASTM E 136.
6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 10 or less.
    b. Smoke-Developed Index: 10 or less.
7. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
8. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
10. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E 859.
11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

G. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:

1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other

foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.

2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.

C. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Metal Decks:

1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.

J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

L. Cure fireproofing according to fireproofing manufacturer's written recommendations.

M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Test and inspect as required by the IBC, 1704.10.

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Final Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Final Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and

application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
   1. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
   2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Owner from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

   1. Sikasil WS-290, by Sika Corporation

   2. Dow Corning Corporation

   3. Or approved equal.

2.3 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

   1. BASF Corporation

   2. Construction Foam Product, Nomaco, Inc.

   3. Or approved equal

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
    a. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:
    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Other joints as indicated on Drawings.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Perimeter joints between materials listed above and frames of doors,windows, and louvers.
    c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Owner from manufacturer's full range of colors.

END OF SECTION 07 9200

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems.

1. Exterior Substrates:

a. Steel Lintels.
b. Metal grating

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

D. Provide 5 gallons of attic stock for all high performance coatings and color matched top coats for SDP use.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. Colors: As selected by School District from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

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

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 6/NACE No. 3.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

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

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates (see Construction Documents for products):

1. Epoxy System MPI EXT 5.1F:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.

b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.

c. Topcoat: Epoxy, gloss, MPI #77.

END OF SECTION 099600