SECTION 02 4119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Protection, removal of designated construction; dismantling and cutting as indicated and necessary for the completion of the Work; and disposal of materials.

B. Provide the necessary labor, materials, equipment and supervision for the removal of masonry materials indicated on the Drawings and as designated by A/E in the field.

1.02 RELATED SECTIONS

A. Section 04 0142 - Brick Masonry Repair and Restoration.

1.03 PROJECT CONDITIONS

A. Conduct operations with a minimum interference to public or private thoroughfares.

B. Maintain protected egress and access at all times.

C. Do not obstruct public roadways or sidewalks without proper permits.

D. No explosives will be allowed for dismantling in any way.

E. Hazardous Materials: If materials suspected of containing hazardous materials (e.g. asbestos-containing or lead-containing materials) are encountered, do not disturb; immediately notify Owner and A/E in writing. The Owner shall obtain the services of a licensed laboratory to verify the presence or absence of hazardous material reported by the Contractor and in the event that hazardous materials are found to be present, to cause them to be rendered harmless.

1.04 QUALITY ASSURANCE

A. Comply with all laws, rules and regulations of governmental authorities having jurisdiction over the demolition work.

B. Perform the demolition work in accordance with the applicable rules of the Safety Requirements for Demolition for Construction and Demolition Operations, American National Standard Institute (ANSI) A10.6-2006 - Safety and Health Program Requirements for Demolition Operations.

C. Demolition work shall include complete removal of all material and equipment to be abandoned unless otherwise instructed by the A/E.

PART 2 – PRODUCTS

2.01 EXISTING MATERIALS - REMOVAL

A. Remove, clean, store and protect from damage the following materials to be reinstalled:
   1. All existing bricks to the greatest extent possible. Perform the work to minimize damage to existing bricks which are to be salvaged and reused to the greatest extent possible.
   2. Existing coping stones.
   3. Existing clay roofing tiles.

B. Remove and discard all materials in the designated areas of work not scheduled to be reinstalled including but not limited to:
   1. Existing sealant and backer rod
   2. Existing mortar
   3. Existing bricks which cannot be salvaged
   4. Existing sheet metal flashings and roof underlayment at back sides of parapets

PART 3 - EXECUTION

3.01 EXAMINATION OF SITE

A. Visit the site and examine all conditions that may affect the Work. Observe the areas in which the Work is to be confined and all limitations. No additional compensation will be approved for items not included in the Contractor's bid.

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B. Notify the A/E of any existing defects or damage to adjacent areas prior to commencement of demolition work.

C. Note items to be saved, reinstalled, and/or turned over to Owner.

3.02 PROTECTION

A. Protect from damage adjacent property and all existing materials, equipment and fixtures that are to remain or be relocated.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

C. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Work.

D. Provide all temporary barricades, canopies, fences, railings, platforms, lights, etc., required to protect the workmen, Owner's personnel, and others, from injury due to the demolition work. Provide free and safe passage of persons to and from buildings and facilities which are to remain in use. Existing exits are to remain usable during the performance of Work.

E. Maintain regular traffic flow within and around the site unless otherwise directed.

F. Protect from damage and/or marring, all existing materials, equipment, fixtures, etc., which are to remain.

3.03 FIRE PROTECTION

A. Keep stairways and exitways unobstructed and available for use at all times.

B. Perform the demolition work in such a manner as to prevent fires. Remove debris promptly.

C. No materials shall be burned on the site.

D. Protect combustible materials against ignition during acetylene cutting operation.

E. Instruct employees in the following:
   1. The location of the fire alarm box and telephone; and how to call the Fire Department without delay in the event of fire.
   2. The use of hand pumps, hose, water buckets and other fire extinguishing equipment.
   3. Maintenance of fire protection equipment in serviceable condition, properly located and identified, so that it will be available for immediate use.

3.04 UTILITIES

A. Protect and maintain utility lines which are to remain in service:
   1. Notify utility companies, as necessary, before beginning demolition work.

B. Cap all utility lines abandoned or terminated by the demolition work in manner approved by utility companies and authorities having jurisdiction:
   1. Consult with A/E and Owner to determine status of utility lines.

3.05 SEQUENCING OF WORK

A. Notify the Owner and obtain written approval 72 hours before commencing any demolition work.

B. Dismantle indicated materials, appurtenances, building elements and structures in an orderly and careful manner and in compliance with authorities having jurisdiction.

C. Monitor on a regular basis for indications of shifting or movement due to the dismantling operations.

D. Store items to be reused in designated area until re-installed. Seal all loose items in strong cartons and identify.

E. Do not stockpile demolition material so as to overload the building's structure.

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3.06 DEMOLITION - GENERAL

A. A/E shall inspect all items to be removed from a close-up vantage point prior to commencement of Work.

B. A/E will designate the building elements requiring repair or replacement.

C. Remove building elements only to the extent required. Care shall be taken to avoid damaging materials to remain.

D. Remove indicated elements, preferably with hand tools, to reduce damage to elements being removed, or adjacent elements to remain.

E. Remove masonry units and pieces of units without chipping adjacent units that are to remain.

F. Remove all fastenings, anchors, etc., which project or otherwise interfere with final patching and/or reinstallation work.

G. Provide shoring, bracing, falsework or cripples prior to dismantling as necessary to protect persons and property and to retain pieces surrounding the removed material in existing, sound positions.

H. Notify A/E immediately if adjacent building elements appear to be endangered. Take precautionary measures to stabilize or protect endangered elements.

3.07 REPAIRS

A. Repair damage to property of the Owner which is to remain in use, to property of others, on or off the site, caused by the demolition work, without additional expense to the Owner.

3.08 DEBRIS AND WASTE REMOVAL

A. All materials resulting from the demolition work, except items to be relocated or reused, shall become the property of the Contractor and shall be removed from the site in such a manner as to avoid creating a nuisance.
   1. Regularly remove dismantled materials from site.
   2. Remove contaminated, vermin infested or dangerous materials encountered from site and dispose of by safe means.
   3. Clean up spillage and wind-blown debris from public and private lands.

B. Save designated materials for reuse.

C. Save items for the Owner, if any, as indicated on the Drawings or as requested by the Owner during demolition work.

D. Notify the Owner promptly upon encountering hazardous materials.
   1. Do not remove any hazardous materials until an approved abatement program is obtained.

E. Do not burn or bury materials on site.

F. Maintain site in clean and neat order and in condition acceptable to A/E and Owner.

G. Leave site in clean condition.

END OF SECTION

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SECTION 04 0142
BRICK MASONRY REPAIR AND RESTORATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Brick masonry installation.

B. Accessories for brick masonry installation.

1.02 RELATED SECTIONS

A. Section 04 0146 - Stone Repair and Restoration

B. Section 04 0532 - Mortar Repair and Restoration

1.03 REFERENCES

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries.

B. ASTM A82 - Specification for Steel Wire, Plain, for Concrete Reinforcement

C. ASTM A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

D. ASTM A167 - Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Plate, Sheet and Strip

E. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

F. ASTM C151

G. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale).

H. ASTM D412 - Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

I. ASTM D822 - Practice for Filtered Open-Flame Carbon-arc Exposures of Paint and Related Coatings.

J. ASTM D1056 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

K. Brick Industry Association (BIA) - Technical Notes on Brick Construction.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each masonry materials, reinforcing ties, anchors, flashing, and miscellaneous accessories specified.

B. Samples of Brick Masonry:

1. For new brick required to replace damaged existing brick, provide a minimum of 5 (five) samples of brick proposed by Contractor to be a close match to the existing. Each sample shall include a minimum of three (3) bricks to demonstrate full range of brick colors and textures.

C. Test Report: submit per requirements of Preconstruction Testing identified in this specification.

D. Qualifications: Contractor and Masonry Contractor.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: minimum of ten (10) years experience in construction or supervision of brick masonry repair/restoration, including work on at least three (3) historic masonry buildings listed on national or local registers of historic places. Experience installing standard unit masonry (new construction) is not sufficient experience for brick repair/restoration work.

1.06 PRECONSTRUCTION TESTING

A. Testing to be conducted per Section 01 4100 - Testing Laboratory Services.

B. Unless otherwise specified, brick samples tested shall be from brick manufactured specifically for this project.

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C. Test bricks or provide manufacturer's test data per ASTM C67 for:
   1. Compressive strength.
   2. Modulus of rupture.
   3. Initial rate of absorption.
   4. Efflorescence.
   5. Absorption (5 hour boiling and 24 hour cold water test).
   6. Saturation coefficient.
   7. Freezing and thawing. If required to verify conformance with ASTM C216 and or product specifications.

D. Test bricks or povide manufacturer's test data per ASTM C151, for:
   1. Coefficient of linear (autoclave) moisture expansion (before and after autoclaving).

E. If test data listed above cannot be provided by the manufacturer, contractor shall arrange for testing of bricks and report results at no cost to Owner.

1.07 MOCK-UPS

A. Full depth rebuild: 4 feet x 4 feet minimum at one (1) gable to illustrate the following:
   1. Bond pattern
   2. Joint reinforcement
   3. Anchorage of roof ridge beam and rafters
   4. Anchorage of coping stones
   5. Mortar color and tooling
   6. Cleaning of rebuilt masonry

B. Outer wythe rebuild: 4 feet x 4 feet minimum at one (1) gable to illustrate the following:
   1. Bond pattern
   2. Anchorage of outer wythe
   3. Mortar color and tooling
   4. Flashing and weeps
   5. Cleaning of rebuilt masonry

C. Mortar joint repointing: 4 feet x 4 feet minimum at one (1) gable to illustrate the following:
   1. Removal of existing mortar to consistent 3/4" depth
   2. Installation of new mortar in three (3) 1/4" lifts
   3. Color and tooling of new mortar
   4. Cleaning of repointed masonry

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect all materials from physical damage, rain, snow, ground water and from soilage or contamination by other deleterious materials that may cause staining or other defects.

B. Protect masonry from freezing when outside air temperature is lower than 40 degrees F.

1.09 FIELD CONDITIONS

A. Protection Of Work
   1. Protect masonry, masonry accessories, flashing and other related materials during storage and construction from damage, soilage or other deleterious circumstances.
   2. Protect partially completed work against weather and when work is not in progress, included but not limited to:
      a. Cover tops of walls with strong, waterproof, non-staining membrane.
      b. Extend covering down 24 inches on all sides.
      c. Anchor membrane securely.
   3. Prevent mortar from staining the face of masonry to be left exposed.
      a. Immediately remove mortar in contact with the finished surfaces of existing work.

B. Do not use frozen materials or materials mixed or coated with ice or frost.

C. Take proper procedures to protect masonry work from collapse, deterioration and damage.

D. Repair damaged or defective work to the satisfaction of the A/E.

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E. Do not perform the exterior masonry work when the ambient air temperature is less than, or is expected to be less than, 40 degrees F., unless otherwise approved by A/E.

F. Cold-Weather Requirements: Comply with BIA Technical Note 1 and the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
   1. When air temperature is below 40 degrees F heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 degrees F (4 and 49 degrees C).
   2. When mean daily air temperature is below 40 degrees F provide enclosure and heat to maintain temperatures above 32 degrees F within the enclosure for 7 days after repair and pointing.

G. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing 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 and above unless otherwise indicated.

H. Where masonry construction is indicated on Drawings or required by code to have fire resistant construction, provide masonry materials and methods in manner to obtain the necessary rating.

I. Repair masonry construction where required due to damage or defective Work and where required to accommodate Work of other trades, in an approved manner so that patching is not visually apparent.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with the requirements:

CODE	MANUFACTURER
BLK	Blok-Lok, a Hohmann & Barnard Company, www.block-lok.com
DRT	Diedrich Technologies, Inc, www.diedrichtechnologies.com
DCC	Dumond Chemicals, Inc., www.dumondchemicals.com
GRA	W.R. Grace and Company, https://grace.com
HEC	Heckman Building Products, Inc., www.heckmannbuildingprods.com
HOH	Hohmann & Barnard, Inc., www.h-b.com
HFX	Helifix, www.helifix.com
ILL	Illinois Products Corporation, www.illinoisproducts.com
PRO	Prosoco, Inc, www.prosoco.com
WIL	Williams Products, Inc., www.williamsproducts.net
WRB	Wire-Bond, www.wirebond.com
YOR	York Manufacturing, Inc., www.yorkmfg.com

B. Substitutions: per Section 01 1000 - Summary of Work

2.02 BRICK UNITS

A. Face Brick: ASTM C216
   1. Classification: Grade SW, Type FBS.
      a. Compressive Strength: 5,000 psi minimum average
      b. Saturation Coefficient: 0.78 maximum.
         1) The absorption alternate in ASTM C216 shall not be allowed unless specifically approved by the A/E.
      c. Initial Rate of Absorption: between 5 and 25 grams per 30 square inches per minute
      d. Efflorescence: brick rated as "not efflorescent" per ASTM C67.
   2. Size: To match existing sizes.
   3. Color and Texture: to match existing cleaned masonry to the satisfaction of A/E and Owner.
   4. Ends of brick used for headers shall match sides.
   5. Brick with bed faces exposed shall be solid.

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B. Building (Common) Brick: ASTM C62, back-up construction
   1. Classification: Grade SW.
      a. Compressive Strength: 5,000 psi minimum average
      b. Saturation Coefficient: 0.78 maximum.
         1) The absorption alternate in ASTM C216 shall not be allowed unless specifically approved by the A/E.
      c. Initial Rate of Absorption: between 5 and 25 grams per 30 square inches per minute
      d. Efflorescence: brick rated as "not efflorescent" per ASTM C67.
   2. Size: Modular or Standard Size

2.03 MORTAR

A. See Section 04 0532 - Mortar Repair and Restoration.

2.04 REINFORCING, ANCHORS, TIES

A. Joint Reinforcing: ASTM A82 and ASTM A153-B2
   1. Ladder type.
   2. Gauge: Min. No. 9 gauge deformed side rods with No. 9 gauge cross rods at max. 16" center to center.
   3. Width: 1½" to 2" less than wall thickness.
   4. Finish: Stainless Steel, Type 304 or 316.

B. Adjustable Veneer Assemblies: ASTM A82 and ASTM A153-B2
   1. Wall Plate: Min. 14 gage.
   2. Anchor Wire: Min. 3/16-inch.
   3. Finish: Stainless Steel, Type 304 or 316
   4. Acceptable Products:
      a. HOH HB-200 Adjustable veneer anchor

C. Corrugated ties are not acceptable.

2.05 SEALANT AND BACKER ROD

A. Per Section 07 9200 - Joint Sealants.

2.06 FLASHING

A. Membrane Flashing: ASTM D412 and ASTM D822
   1. Material: Rubberized Asphalt
   2. Acceptable Products:
      a. HOH Flex-Flash
      b. GRA Perm-A-Barrier Wall Flashing
      c. YOR York Seal

2.07 ACCESSORIES

A. Angles, channels, and other secondary support members that are not part of the structural frame: rolled steel sections, ASTM A36.

B. Rope Wick Weeps: cotton sash cord, 3/8 inch diameter, in length required to produce 2 inch exposure on exterior and 18 inches in cavity.

C. Termination Bar: 26 gage x 1 1/2 inches wide with flange on top to recieve sealant and 1/4 inch diameter holes at 8 inches on center, stainless steel (Type 304).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine all surfaces to receive the parts of the Work specified herein.

B. Verify dimensions of in-place and subsequent construction.

C. Notify A/E of all unsatisfactory conditions which may affect the Work.

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3.02 BRICK REMOVAL

A. At locations indicated, remove designated brick units that are damaged, spalled, or deteriorated. Cut out deteriorated brick units to be replaced in manner to prevent damage to remaining brick and adjoining materials. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

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

C. Support and protect remaining masonry that was supported by removed units. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

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

E. Protect opening from intrusion of foreign matter, debris and from weather including insulation for thermal protection of interior spaces and components. Provide temporary protection to prevent moisture penetration into structure where brick units are removed. cover uncompleted brick and backing with waterproof sheeting at end of each day and hold securely in place.

F. Remove corroded accessories.

3.03 PAINTING STEEL UNCOVERED DURING THE WORK

A. Notify A/E if steel is exposed during stone removal. Where A/E determines that steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:
   1. See Section 09 9115 - Painting of Exterior Metal
   2. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 2 "Hand Tool Cleaning" or SSPC-SP 3 "Power Tool Cleaning" as applicable to comply with paint manufacturer's recommended preparation.
   3. Anti-rust Coating: Immediately paint exposed steel with two coats of anti-rust coating.

B. If on inspection and rust removal, the thickness of a steel member is found to be reduced from rust by more than 1/16 inch (1.6 mm) notify A/E before proceeding.

3.04 MASONRY INSTALLATION

A. Construct masonry aligned, plumb and true making level courses:
   1. Maximum variation from level for lintel and other conspicuous lines:
      a. 1/4 inch in any direction.
      b. 1/2 inch in 40 feet.
   2. Where fresh masonry joints partially set or existing masonry:
      a. Remove loose brick and mortar to “sawtooth” new brick with existing without damaging adjacent sound brick.
      b. Dampen existing masonry to receive new mortar, but brick should not have any surface water.
   3. Rebuilt areas within existing areas shall blend and match surfaces of remaining masonry.
   4. Masonry shall be laid in a bond pattern to match existing joint articulation.
   5. Expansion Joints: minimum 1/2 inch wide, unless otherwise specified.
      a. Use compressible joint filler and maintain joints free of mortar or other debris that would prevent proper movement of the joint.

B. Construct brick to full thickness as shown, using whole units wherever possible:
   1. When cutting of brick is required, cut neatly to obtain sharp corners and a smooth surface without jagged edges.

C. Remove masonry units disturbed after laying, clean and reset with fresh mortar.

D. Keep minimum 3/4 inch space between masonry at structural steel free of mortar and debris unless specified otherwise.

E. Build in items furnished by other trades.

F. Leave accurate openings necessary for subsequent installation of other Work.

G. During cold weather, perform brickwork in accord with BIA Technical Notes 1.

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3.05 MORTAR BEDDING AND JOINTING

A. Head and bed joints:
   1. Laid full, nominally 3/8 inch wide.
   2. Mortar shall not be slushed into joints between units after laying.

B. Collar joints:
   1. Laid full only when existing collar joints are of similar construction.
   2. Do not parge backside of units in cavity walls.

C. Tooling:
   1. Exposed joints shall be flush, tooled to profile to match existing joints when “thumbprint” hard.
   2. Unexposed joints shall be cut flush.

3.06 REINFORCING AND ANCHORAGE

A. Provide joint reinforcement in horizontal joints at 16 inches center to center, end-lapped 6-inches min., interrupted only where control and expansion joints are required.

B. Install anchors and ties in accord with manufacturers recommendations:
   1. Maximum spacing for veneer anchors: 16 inches horizontally, 16 inches vertically.
   2. Embed ties at least 2 inch in horizontal joints.

3.07 FLASHING INSTALLATION

A. Install flashing in continuous bands in accord with manufacturer's recommendations:
   1. Provide minimum 4 inch laps, seal with mastic approved by manufacturer.
   2. Terminate flashing at through-wall expansion joints.
   3. Fully adhere flashing without gaps, bubbles or fishmouths.

B. Provide end dams at all flashing terminations.

C. Form membrane to correct profile without wrinkles or buckles:
   1. Carefully fit flashing around projections.
   2. Protect flashing from puncture applying mastic or sealant over sharp projections.

D. Mechanically anchor top edge of flashing with termination bar. Seal top edge.

E. Install sealant or mastic around anchors or ties that penetrate the flashing.

F. Protect flashing from tears, punctures, and other damage.

3.08 FINAL CLEANING OF NEW MASONRY AND MORTAR

A. Per Section 04 0532 - Mortar Repair and Restoration.

END OF SECTION

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SECTION 04 0146
STONE REPAIR AND RESTORATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Removal and reinstallation of existing stone.

B. Patching of existing stone.

1.02 RELATED REQUIREMENTS

A. Section 02 4119 - Selective Demolition

B. Section 04 0142 - Brick Masonry Repair and Restoration.

C. Section 04 0532 - Mortar Repair and Restoration .

1.03 REFERENCES

A. ASTM A167 - Specifications for Stainless Steel and Heat Resisting Chromium-Nickel Steel Plate, Sheet, Strip.

B. ASTM A479 - Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels

C. ASTM C97 - Test Methods for Absorption and Specific Gravity of Dimension Stone.

D. ASTM C99 - Test Method for Modulus of Rupture of Dimension Stone.

E. ASTM C119 - Standard Terminology Relating to Dimension Stone.

F. ASTM C170 - Test Method for Compressive Strength of Dimension Stone.

G. ASTM C616 - Standard Specification for Quartz-Based Dimension Stone.

H. International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specification for Hot Weather or Cold Weather Masonry Construction.

1.04 PRE-INSTALLATION MEETING

A. Conduct meeting at project site.

B. Review methods and procedures related to stone repair including, but not limited to, the following:
   1. Scope of stonework
   2. Sequencing of stonework
   3. Quality control program, mockup

1.05 SUBMITTALS

A. Product Data:
   1. Stone Materials: Provide test data for new stone if new stone is required to replace exisiting damaged stone.
   2. Repair Materials: manufacturer's literature, specifications and installation instruction for each accessory specified.
   3. Accessories: manufacturer's literature, specifications and installation instruction for each accessory specified.
   4. Fasteners and Anchors: manufacturer's literature, specifications and installation instruction for each accessory specified.
   5. Flashing: manufacturer's literature, specifications and installation instruction for each accessory specified.

B. Shop Drawing:
   1. Include plans, elevations, sections, and locations of replacement stone units
   2. Show partial replacement stone units (dutchmen).
   3. Indicate setting number of each new stone unit and its location on the structure in annotated plans and elevations
   4. Show provisions for expansion joints or other sealant joints.

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5. Show provisions for flashing, light fixtures, conduits, and weep holes as required.
6. Show replacement and repair anchors, including drilled-in pins. Include details of anchors within individual stone units.

C. Samples:
1. Each type of stone: Four (4) sets 12 inch x 12 inch x 2 inch, illustrating range of color, graining, and texture proposed for matching acceptably cleaned existing stone.

D. Qualification Statement: Installer.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility for Stone: Obtain limestone from a single quarry source with resources to provide materials of specified consistent quality. The fabricator and the quarry shall have sufficient capacity to quarry, cut, and deliver the stonework on schedule. The fabricator and quarry must be members in good standing of Indiana Limestone Institute.

B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality and from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Single Source Responsibility for Other Materials: Obtain each type of stone accessory, sealants and other materials from one manufacturer for each product.

D. Installer Qualifications: Engage a licensed masonry contractor with not less than 10 years documented experience and who has successfully completed stonework similar in scope, and extent of work to that indicated for this project. Submit list of completed projects; included project names, addresses, and names of A/E and Owners.
1. Employ only skilled craftsmen, experienced in the installation and repair of stone masonry.

1.07 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 C170/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 five (5) existing stones from locations designated by A/E. Take testing samples from these stones.
4. Temporary Patch: As directed by A/E, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

1.08 MOCK-UPS

A. Perform cleaning of 2 feet x 2 feet area as located by A/E, to serve as the basis for matching the color, graining and texture of existing and repaired or replaced stonework:
1. Clean with water or other approved method.
2. Re-clean as required to remove stains, carbon deposits, and hard-to-remove surface residues until an agreed upon degree of cleaning is achieved.
3. Define types of foreign material encountered, and log the methods employed and the quantities of cleaning materials used to remove the various types of foreign material for reference during future production cleaning operations.

B. Install mockups of the replacement/reinstalled stonework, Dutchmen and patches. Purpose of installed mockup is for confirmation of selections made for color and finish under sample submittals and establishing standard of quality for aesthetic effects expected in completed work. Install mockup to comply with the following:
1. Locate mockups where indicated or, if not indicated, as selected by A/E.

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2. Build mockup containing elements typical of the stonework or repairs in this project. Minimum mockup area shall be two full stones, or one of each type of patch and Dutchman installation.
3. Erect installed mockup only after notifying A/E when construction will begin.
4. Retain installed mockup during construction as standard for judging completed stonework or repairs. Acceptable mock-up may be incorporated into the work.

C. Prepare mockup of repairs to a sculptured unit at locations selected by A/E. Approved sculptured mortar repair will set minimum standard for remaining repairs.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store stone panels adequately to prevent damage.

C. Protect stone from the weather and visible discoloration.

D. Store and handle stone and related materials to prevent their deterioration or damage:
1. Do not use pinch or wrecking bars on stonework.
2. Lift with wide-belt type slings where possible; do not use wire rope or ropes containing tar or other substances which might cause staining.
3. Store stone on non-staining wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stone to distribute weight evenly and to prevent breakage or cracking of stones.
4. Store cementitious materials off the ground, under cover and in dry location.

1.10 FIELD CONDITIONS

A. Protection Of Work
1. Protect stone, accessories, flashing and other related materials during storage and construction from damage, soilage or other deleterious circumstances.
2. Protect partially completed work against weather and when work is not in progress, included but not limited to:
   a. Cover tops of walls with strong, waterproof, non-staining membrane.
   b. Extend covering down 24 inches on all sides.
   c. Anchor membrane securely.
3. Prevent mortar from staining the face of masonry to be left exposed.
   a. Immediately remove mortar in contact with the finished surfaces of existing work.

B. Do not use frozen materials or materials mixed or coated with ice or frost.

C. Take proper procedures to protect stone work from collapse, deterioration and damage.

D. Repair damaged or defective work to the satisfaction of the A/E.

E. Do not perform the exterior stone work when the ambient air temperature is less than, or is expected to be less than, 40 degrees F, unless otherwise approved by A/E.

F. Cold-Weather Requirements: Comply with BIA Technical Note 1 and the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
1. When air temperature is below 40 degrees F heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 degrees F (4 and 49 degrees C).
2. When mean daily air temperature is below 40 degrees F provide enclosure and heat to maintain temperatures above 32 degrees F within the enclosure for 7 days after repair and pointing.

G. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing 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 and above unless otherwise indicated.

H. Where stone construction is indicated on Drawings or required by code to have fire resistant construction, provide masonry materials and methods in manner to obtain the necessary rating.

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I. Repair stone construction where required due to damage or defective Work and where required to accommodate Work of other trades, in an approved manner so that patching is not visually apparent.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with the requirements:

Code	Manufacturer
AKE	Akemi NA; www.akemina.com
BMC	Bonstone Materials Corp; httpps://bonstone.com
BFG	B.F. Goodrich General Products Company
CSP	Cathedral Stone Products, Inc.; www.cathedralstone.com
CPC	Conproco Corporation; www.conproco.com
ECI	Edison Coatings Inc.; www.edisoncoatings.com
EMI	Emhart/Molly Industries
FBW	Clark/Hammerbeam Corp.; www.fiberwebflashing.com
HIL	Hilti, Inc.; www.us.hilti.com
HOH	Hohmann and Barnard, Inc. www.h-b.com
ITW	ITW Red Head; www.itwreadhead.com
LBI	Liebig International Inc.
RAW	Rawlplug Company Inc
RPG	Rubber Products Compound Company Inc.
STS	STS Coatings, Inc.; http://stscoating.com
WPC	Wire Product Company,
YOR	York Manufacturing, Inc. www.yorkmfg.com

B. Substitutions: per Section 01 1000 - Summary of Work.

2.02 MATERIALS

A. Sandstone: sound, durable without dries, open seams, or stratification or other defects that are likely to impair its structural integrity in its intended use. Natural building stone of variety, color, texture, grain, veining, finish, size, and shape that match existing stone and with physical properties as listed below: (subject to changes based on Preconstruction Testing)

1. Physical Properties (ASTM C616):
   a. Absorption by Weight: 8% per ASTM C97/C97M.
   b. Density: 125 lb/cubic foot minimum per ASTM C97/C97M.
   c. Compressive Strength: 4,000 psi minimum per ASTM C170/C170M.
   d. Modulus of Rupture: 350 psi minimum per ASTM C99.
2. Color and Graining: match the range of the approved fully cleaned existing stone.
   a. Measure color per ASTM D2244 with permissible variation as follows:
      1) Total Light Difference: not greater than 6 units of existing
      2) Total Hue/Saturation Difference: not greater than 2 units of existing.
3. Cutting New Stone:
   a. Cut each new stone to match the rift or natural bedding planes of the existing stones.
   b. Match existing stone face size, thickness and texture.
   c. Match existing drip, check, profile or carving as appropriate.

2.03 MORTAR

A. See Section 04 0532 - Mortar Repair and Restoration.

2.04 REPAIR MATERIALS

A. Stone Patching Compound: Premixed cementitious patching material formulated to match color and texture of existing limestone in accordance to manufacturers specifications.

1. Products: subject to compliance with requirements, provide one of the following:

	Code	Product
a.	CSP	Jahn M70 Limestone and Sandstone Repair Mortar.

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b. CPC Mimic.
c. ECI Custom System 45.

2. Formulation shall be vapor permeable frost and salt resistant, shrink resistant and physically compatible with substrate including but not limited to porosity, tensile and compressive strength.
3. Formulate patching compound in colors, textures and grain to match stone being patched. Provide sufficient number of colors to enable matching of each piece of stone.

B. Cementitious Crack Filler: Ultrafine superplasticized grout that can be injected into cracks, is suitable for application to wet or dry cracks, exhibits low shrinkage, and develops high bond strength to all types of stone.
1. Products: subject to compliance with requirements, provide one of the following:

	Code	Product
a.	CSP	Jahn M30 #32 Micro Injection Grout for Brick and Soft Stone
b.	ECI	Pump-X 53 Series.

C. Stone-to-Stone Adhesive: Two-part polyester or epoxy-resin stone adhesive with a 15- to 45-minute cure at 70 degrees F (21 degrees C), recommended in writing by adhesive manufacturer for type of stone repair indicated, and matching stone color.
1. Products: subject to compliance with requirements, provide one of the following:

	Code	Product
a.	AKE	Akepox Series
b.	BMC	Clear Gel Epoxy
c.	ECI	Flexi-Weld 520T.

2.05 STABILIZATION ANCHORS

A. Per Section 04 1510 - Post-Installed Anchors Into Masonry.

2.06 SEALANT AND BACKER ROD

A. Per Section 07 9200 - Joint Sealants.

2.07 FLASHING

A. Membrane Flashing: ASTM D412 and ASTM D822
1. Material: Rubberized Asphalt
2. Acceptable Products:

a.	HOH	Flex-Flash
b.	GRA	Perm-A-Barrier Wall Flashing
c.	YOR	York Seal

2.08 ACCESSORIES

A. Acceptable Manufacturers:
1. Heckman Building Products, Inc.
2. Wire Product Company
3. Hohmann & Barnard, Inc.

B. Lateral Ties and Anchors:
1. Provide stainless steel lateral ties and support anchors as shown and noted on the drawings including straps, rods, plates, cramps, channel slots and dowels (standard and spring loaded), conforming to AISI grade Type 302 or 304.

C. Channel Slots and Sections:
1. Provide 1/2 inch deep - 12 gauge stainless steel slot channels for weld on applications conforming to ASTM A479.
2. Provide 3/4 inch deep stainless steel channel sections with predrilled holes in web for screw on applications conforming to ASTM A479.

D. Repair Anchors and Pins: mechanical fasteners and pins of Type 316 stainless steel; designed for stone stabilization and pinning stone pieces.

E. Setting Buttons and Shims: resilient plastic, nonstaining to stone, sized to suit joint thickness and bed depths of stone units, less the required depth of pointing materials unless removed

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before repointing.

F. Weeps: Polypropylene grille type weephole. Color to be approved by Owner or A/E.

G. Weep Holes: preformed plastic tubes.

H. Wicks: cotton sash cord, 3/8 inch diameter, in length required to produce 2 inch exposure on exterior and 18 inches in cavity.

I. Drip Edge: 26 gage, factory-formed hemmed edge, stainless steel (Type 304).

J. Termination Bar: 26 gage x 1 1/2 inches wide with flange on top to recieve sealant and 1/4 inch diameter holes at 8 inches on center, stainless steel (Type 304).

2.09 FASTENERS AND ANCHORS

A. Acceptable Manufacturers:
   1. Liebig International Inc.
   2. Hilti Corp.
   3. ITW/Red Head
   4. Emhart/Molly Industries
   5. Rawlplug Co., Inc.

B. Expansion Anchors:
   1. Stainless steel expansion anchors as scheduled on drawing conforming to AISI Type 304.

C. Wedge Insert Bolts: Stainless steel askew head bolts, nuts and washers when existing wedge inserts are reused.

D. Clamping Anchors: 5/8 inch diameter x 6 inch long stainless steel clamping bolts with washers and nuts conforming to AISI Type 316 including all necessary tools to undercut new or existing headstones.

E. Self Drilling Screws: Stainless steel self drilling screws as shown and noted on drawings in conformance with AISI Type 304.

F. Sleeve Anchors: 3/8 inch diameter stainless steel anchors with hexagonal heads conforming to AISI Type 304 and ANSI 1318.6.4 (embedment shown and noted on drawings).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Visit the site and examine all conditions that may affect the work.

B. Observe the areas in which the work is to be confined and all limitations.

C. Note materials which will require protection.

3.02 PREPARATION

A. The Contractor shall thoroughly familiarize himself with the requirements of the Work by consulting the Drawings and Specifications.

B. Provide all equipment, tools, and construction means required to perform the work efficiently and safely, including platforms and equipment for hoisting and lowering stones.

C. Examine all construction to receive the parts of the work. Verify all dimensions of in-place construction. If adjacent or underlying construction is unsatisfactory, do not proceed until conditions have been corrected.

3.03 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.

B. Remove gutters and downspouts and associated hardware adjacent to stone and store during stone repair. Reinstall when repairs are complete.
   1. Provide temporary rain drainage during work to direct water away from building.

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3.04 GENERAL

A. Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by A/E.

B. Obtain approval prior to cutting or fitting any item not so indicated on Drawings.

C. Do not impair appearance or strength of stone work by cutting.

D. Do not perform work during adverse weather conditions which might be detrimental to existing or new materials.

3.05 REMOVING ABANDONED ANCHORS

A. Remove abandoned anchors, brackets, wood nailers, and other extraneous items no longer in use or designated to be removed.
   1. Remove items carefully to avoid spalling or cracking stone.
   2. Notify A/E before proceeding if an item cannot be removed without damaging surrounding stone. Do the following where directed:
      a. Cut or grind off item approximately 3/4 inch (20 mm) beneath surface and core drill a recess of same depth in surrounding stone as close around item as practical.
      b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.
      c. Immediately paint exposed end of metal per "Painting Steel Uncovered During the Work" Article.
   3. Patch hole where each item was removed unless directed to remove and replace stone unit.

3.06 STONE REMOVAL

A. Remove irreparable stones, as designated by A/E, and replace with new stones of same size, color, texture and profile:
   1. Provide temporary support for masonry above removed stonework by installing rods, blocking or other means to stabilize in vertical and lateral position.
   2. Protect opening from intrusion of foreign matter, debris, and from weather.
   3. Slot stone for all accessories in the field, to insure proper location.
   4. Remove corroded accessories and replace with stainless steel accessories designed to hold the stone in place without placing detrimental stresses on stone. Fasten anchors to back-up as detailed.
   5. Maintain the same joint size as in the existing stone masonry.

3.07 PAINTING STEEL UNCOVERED DURING THE WORK

A. Notify A/E if steel is exposed during stone removal. Where A/E 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 SSPC-SP 2 "Hand 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 1/16 inch (1.6 mm) notify A/E before proceeding.

3.08 STONE REPLACEMENT

A. Install each stone unit with full mortar coverage on all adjoining ends and bearing surfaces, as required to provide completely solid bed joints and head joints:
   1. Shim units with wet wood ???? wedges or plastic buttons. After setting, when mortar bed will maintain unit in position without movement, remove wedges.
   2. Rake mortar 1 inch to 1-1/2 inch deep for pointing:
      a. Rake 5/8 inch to 3/4 inch deep for sealant.

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3. Point flush with stone face as specified under repointing.
4. Provide weep hole ventilators above all flashing.

B. Install flashings where shown. Install in longest practical lengths:
1. Lap 6 inch with existing flashing.
2. Seal watertight to existing flashing and back-up.

C. Tolerances: Maximum variation:
1. Between face plane of adjacent panels: 1/16 inch.
2. Joint thickness: match original joint thickness.

D. Setting mortar: Type "N" per Section 04 0532 - Mortar Repair and Restoration.

3.09 PARTIAL STONE REPLACEMENT (DUTCHMEN)

A. Remove defective portion of existing stone unit (backing stone). Carefully remove defective portion of stone by making vertical and horizontal saw cuts at face of backing stone and removing defective material to depth required for fitting partial replacement (dutchman).
1. Make edges of backing stone at cuts smooth and square to each other and to finished surface; essentially rectangular. Make back of removal area flat and parallel to stone face.
2. Do not overcut at corners and intersections. Hand trim to produce clean sharp corners with no rounding and no damage to existing work to remain.
3. If backing stone becomes further damaged, remove damaged area and enlarge partial replacement as required.

B. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.

C. Cut and trim partial replacement to accurately fit area where material was removed from backing stone. Fabricate to size required to produce joints between partial replacement and backing stone of no more than 1/16 inch (1.6 mm) in width, and to produce joints between partial replacement and other stones that match existing joints between stones. Cut partial replacement so that, when it is set in final position, natural bedding planes will match the orientation of bedding planes of the backing stone unless otherwise indicated.

D. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4 inch (6 mm) diameter, threaded stainless-steel pins set into 1/4 inch (6 mm) diameter holes drilled at a 45-degree downward angle through face of partial replacement and into backing stone. Center and space pins 3 to 5 inches (75 to 125 mm) apart and at least 2 inches (50 mm) from any edge. Insert pins at least 2 inches (50 mm) into backing stone and 2 inches (50 mm) into partial replacement with end countersunk at least 3/4 inch (19 mm) from exposed face of partial replacement.

E. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of backing stone and partial replacement, completely filling all crevices and voids.

F. Apply partial replacement while adhesive is still tacky and hold securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of backing stone.

G. Clean adhesive residue from exposed surfaces and patch chipped areas as specified in "Patching of Existing Stone" Article.

3.10 PATCHING OF EXISTING STONE

A. Patch the following stone units unless another type of repair or replacement is indicated:
1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners.
4. Units with small areas of deep deterioration.

B. Remove and replace existing patches as designated by A/E.

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C. 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.

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

E. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.

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

G. 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.
   2. Carved Details: Build patch up 1/4 inch (6 mm) above surrounding stone, and carve surface to match adjoining stone after patching compound has hardened.

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

I. 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.

3.11 REPOINTING

A. See Section 04 0532 - Mortar Repair and Restoration.

B. Repointing joints in existing limestone masonry, as designated by A/E.

C. Remove mortar to sound mortar, but not less than 3/4 inch, by grinding with a power driven grinder or with hammer and chisel, to fully expose the joint sides of the masonry. Take extreme care to not damage the edges and corners of the stone.

3.12 CLEANING

A. See Section 04 0532 - Mortar Repair and Restoration.

B. Clean all finished surfaces of dirt and mortar droppings due to this work:
   1. Use fiber brushes or wooden paddle to remove excess mortar.
   2. Wash dirty surfaces with a mild non-staining cleaning solution. Flush with clean water.

C. Remove all equipment, tools, discards, and all manner of materials due to this work. Leave the site clean as far as this work is concerned.

3.13 PROTECTION

A. Protect stone from subsequent construction operations. If damage occurs, remove and replace damaged components as required to restore stone to original, undamaged condition.

END OF SECTION

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SECTION 04 0532
MORTAR REPAIR AND RESTORATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry joints.

B. Repointing of brick masonry and stone mortar joints.

C. Cleaning of mortar residue and debris.

1.02 RELATED SECTIONS

A. Section 02 4119 - Selective Demolition.

B. Section 04 0142 - Brick Masonry Repair and Restoration.

C. Section 04 0146 - Stone Repair and Restoration.

1.03 REFERENCES:

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

C. ASTM C150 - Standard Specification for Portland Cement; 2015.

D. ASTM C207 - Hydrated Lime for Masonry Purposes; 2011.

E. ASTM C233 - Standard Test Method for Air-Entraining Admixtures for Concrete.

F. ASTM C270 - Mortar for Unit Masonry; 2014a.

G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

H. ASTM C476 - Standard Specification for Grout for Masonry; 2010.

I. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

J. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2014b.

K. ASTM C 1019 - Standard Method of Sampling and Testing Grout; 2014.

L. ASTM C1329 - Standard Specification for Mortar Cement; 2010.

M. Brick Industry Association (BIA) - Technical Notes on Brick Construction.

N. NCMA TR-88 - Hot & Cold Weather Masonry Construction Manual.

1.04 PRE-INSTALLATION MEETING

A. Conduct meeting at project site.

B. Review methods and procedures related to masonry repair including, but not limited to, the following:
   1. Materials and material application
   2. Sequencing
   3. Quality control program, mockup

1.05 SUBMITTALS

A. Product Data: for each type of product.
   1. Construction details, material descriptions, dimensions of individual components
   2. Manufacturer’s standard data including product application and use.
   3. Performance/Test data substantiating compliance with requirements.

B. Samples:
   1. Mortar: 6 inches long by 1/2 inch wide set in aluminum or plastic channels indicating mortar color and range.
   2. Each set shall contain a close color range of six samples.

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3. Include precise measurements on ingredients, proportions, gradations, and source of sand use to create sample.

C. Preconstruction Test Reports: Submit reports on mortar indicating conformance with Preconstruction Testing requirements identified in this Section.

D. Material Certificates: Certify that products meet or exceed specified requirements.

E. Qualification Data: Repointing Specialist.

1.06 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

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.

C. Repointing Specialist Qualifications: All work shall be performed by workers experienced in the handling and setting of the material having not less than five (5) years satisfactory experience in comparable restoration work, including work on a minimum of three (3) projects similar in scope and scale to this project. 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 installing standard unit masonry is not sufficient experience for masonry restoration work.

1.07 PRECONSTRUCTION TESTING

A. Testing to be conducted per Section 01 4000 - Testing Laboratory Services.

B. Existing mortar analysis:
1. Remove large enough sample(s), at locations designated by A/E, to test according to methods of ASTM C1324, "Standard Test Method for Examination and Analysis of Hardened Masonry Mortar."
2. Provide a report on test results including:
   a. Chemical analysis to determine composition of mortar with narrative description of each component, including but not limited to:
      1) Paste
      2) Aggregate
      3) Air Content
      4) Additives for Color
   b. Volumetric Proportions
   c. Determination of Mortar Type

C. For new, premixed mortar, provide mortar manufacturer's test data for the properties below. For new job-mixed mortar, test production mortar and provide report indicating data for the properties below:
1. Indicate compressive strength, water retention and flow per ASTM C109 and ASTM C270.
   a. For job-mixed mortar, compressive strength testing shall be a laboratory test of dry mortar mix provided by Contractor. Contractor shall not pre-mix mortar with water and submit preformed mortar cubes.
2. Test water-soluble alkali content of the cement used in the mortar in accord with ASTM C114 or suitable certification furnished by the manufacturer of the cement, to establish that total water-soluble alkali content does not exceed 0.1% of the alkalis present.
3. Determine air content per ASTM C233.
4. Determine mortar characteristics per ASTM C780.
   a. For job-mixed mortar, perform tests for each type of production mortar. For compressive strength, test four 2-inch cubes; one cube at 24 hours, one at 3 days, one at 7 days and one at 28 days.
5. For job-mixed mortar, maintain complete records of proportions by volume of mortar constituents that achieve the properties determined by testing.

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1.08 MOCK-UPS

A. Provide samples of the repointing in an area designated by the A/E and Owner. Upon approval, the quality of work used in the mockup area shall be established as a standard for the project. No work shall be performed in the work area until the mockup is completed by the Contractor, and approved by the A/E and Owner. The mockup shall consist of the following:
   1. An area where existing mortar has been removed from joints for repointing.
   2. Sample area of properly cleaned masonry after repointing.
   3. An area where mortar joints have been prepared for repointing.
   4. Sample of the newly repointed mortar joints.
   5. Cleaning of newly repointed mortar joints.

1.09 DELIVERY, STORAGE, AND HANDLING

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

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

1.10 FIELD CONDITIONS

A. Cold-Weather and Hot-Weather Procedures: Comply with BIA, Brick Industry Association (BIA formerly Brick Institute of America), “Technical Notes on Brick Construction” or ACI 530/530.1/ERTA, whichever is more stringent.

B. 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 ACI 530.1/ASCE 6/TMS 602.
   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.

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

PART 2 PRODUCTS

2.01 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type I or Type II, provide white, gray, or both cement as required for color matching.

B. Hydrated Lime: ASTM C207, Type S, containing no air entrainment.

C. Coal Fly Ash: ASTM C618.

D. Granulated Blast Furnace Slag: ASTM C989

E. Masonry Cement: not acceptable.

F. Mortar Cement: not acceptable.

G. Aggregate for Masonry Mortar: ASTM C144.
   1. For mortar 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. For joints 3/8 inch thick (9.5 mm) or less, use aggregate graded with 100 percent passing the No. 8 sieve and 95 percent passing the No. 16 sieve.
   4. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
   5. Color: Natural sand, ground marble, granite, or other sound stone of color necessary to produce required mortar color.

H. Aggregate for Masonry Grout: ASTM C404, natural sand.

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1. Grading: Fine or Course.

I. Air-Entraining Admixtures: not acceptable.

J. Admixtures: not acceptable.

K. Mortar Pigments: ASTM C979, Inorganic compounds used in the proportions recommended by the manufacturer, but in no case exceeding 10% of the weight of the cement, carbon black shall not exceed 2% of the weight of the cement.

L. Water: clean, potable, free from deleterious amounts of acids, alkalies and organic materials.

2.02 MORTAR MIXES

A. General: Do not use admixtures, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use frozen materials mixed or coated with ice or frost.
   2. Do not use calcium chloride in mortar.
   3. Use Portland cement-lime mortar unless otherwise indicated.
   4. New mortar shall match original mortar in color, texture, variation and aggregate size. Do not match previous repointing or repair mortars unless otherwise specified.
   5. Replacement mortar shall be within a range of properties, established by pre-construction testing and approved by the A/E.

B. Preconstruction mortar testing shall be used to determine mortar type and properties.

C. Type "O" Mortar defined by property shall be in accordance with ASTM C270 and ASTM C1329:
   1. Mortar properties subject to revision per results of pre-construction testing of existing mortar and masonry units.
   2. Average compressive strength (3 cubes) at 28 days: 350 - 750 psi.
   3. Air Content: 14% maximum or 12% maximum for structurally reinforced masonry.
   4. Water Retention: minimum 75% of original flow.

D. Type "N" Mortar defined by property shall be in accordance with ASTM C270 and ASTM C1329:
   1. Mortar properties subject to revision per results of pre-construction testing of existing mortar and masonry units.
   2. Average compressive strength (3 cubes) at 28 days to be in the range of 750 - 1800 psi.
   3. Air Content: 14% maximum or 12% maximum for structurally reinforced masonry.
   4. Water Retention: minimum 75% of original flow.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Retempering: If water is lost by evaporation, re-temper only within two hours of mixing.

C. Maintain sand uniformly damp immediately before the mixing process.

D. Colored Mortar: Proportion selected pigments and other ingredients to match sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

E. Do not use anti-freeze compounds to lower the freezing point of mortar.

2.04 MASONRY CLEANERS

A. Acceptable Manufacturers

	Code	Manufacturer
1.	DRT	Diedrich Technologies, Inc.; www.diedrichtechnologies.com
2.	PRO	Prosoco, Inc.; www.prosoco.com
3.	DCC	Dumond Chemicals, Inc.; www.dumondchemicals.com

B. Applications: to remove mortar residue.

C. Masonry Cleaners:

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1. The following products are not permitted:
    a. Hydrochloric (Muriatic) Acid
    b. Hydrofluoric Acid
    c. Ammonium Biflouride
2. Acceptable Products:

Code	Product
a. DRT	Green Clean 250
b. PRO	SureKlean Limestone and Masonry Afterwash
c. DCC	Safe N' Easy Efflorescence Remover

PART 3 EXECUTION

3.01 PREPARATION

A. Protect face of adjacent walls and surfaces from water, mortar and grout.

B. Measure and batch materials by volume or weight, accurately controlled and maintained with consistency throughout the Work.

C. Retemper mortar as necessary for the required consistency. Add water to replace that which has evaporated. All mortar shall be placed within 2 ½ hours of initial mixing or discarded.

3.02 EXAMINATION

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

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

3.03 INSTALLATION

A. Install mortar and grout to requirements of the Section(s) in which masonry is specified.

B. Match approved mock-up or existing mortar joints: Match color of mortar and tooling from approved mock-up or existing installation.

C. Compact mortar with a tool to a smooth finish, tight to brick edges.
    1. Joint characteristics shall blend with adjoining existing Work.

D. Remove excess mortar and mortar smears as work progresses.

3.04 REPOINTING - GENERAL

A. Protection
    1. Comply with all City of Chicago ordinances and regulations regarding, but not limited to, noise and dust mitigation to surrounding areas.
    2. Provide and maintain means to prevent the spread to dust and excessive noise within the building.
    3. Provide erect and maintain temporary barricades and security devices.

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

C. Remove excess mortar from masonry and other affected surfaces as work progresses.

3.05 REPOINTING BRICK MASONRY AND TERRA COTTA

A. Preparation:
    1. Remove mortar in defective joints as designated by A/E:
        a. Defective mortar shall be removed to a uniform depth to sound mortar, but not less than 3/4 inch deep.
        b. Remove mortar from open, cracked and powdering joints.
    2. Take extreme care not to chip or otherwise damage existing masonry.
    3. Fully clean and cut-out joints to surface of masonry units.
    4. Remove dirt and dust with low pressure water:
        a. Alternate dust removal techniques must be reviewed by A/E.

B. Installation:

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1. Repointing mortar prehydration: Thoroughly mix all dry ingredients. Mix again adding only enough water to produce a damp consistency which will retain its form when pressed into a ball. Maintain mortar in dampened condition for 1 – 1 ½ hours, to prehydrate the mortar. Add enough water to bring it to proper consistency - somewhat drier than conventional setting mortar.
2. Dampen joints just prior to repointing:
   a. Do not wet beyond saturation.
3. Fill all deep voids in joints with mortar even with surface of existing mortar in prepared joints.
4. Apply mortar in thin layers (1/4 inch maximum per layer) until joints are completely filled. Allow each layer to become thumbprint hard before applying next layer.
5. Compact mortar with a tool to a smooth finish, tight to brick edges.
   a. Joint characteristics shall blend with adjoining existing work.

3.06 FINAL CLEANING OF NEW MASONRY AND MORTAR

A. Clean masonry surfaces only when air temperature is 40 degrees F and above and is predicted to remain so for at least 7 days after completion of cleaning.

B. Clean new masonry and mortar areas to remove dirt and mortar residue and debris 24 to 48 hours after installation.

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

D. Thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff nylon or fiber brushes.
   1. Do not use metal scrapers, trowels or brushes.
   2. Do not use acidic or alkaline cleaners.

E. Wash masonry surfaces with a mild, non-staining masonry cleaner:
   1. Protect adjacent surfaces from damage.
   2. Use cleaning solution per manufacturers written instructions. Use stiff fiber brushes to scrub wall area.
   3. Use stiff fiber brushes to scrub wall area.
   4. Thoroughly rinse walls with clean water applied by low pressure spray 100-400 psi or 4-6 gallons per minute to remove mortar, dirt, debris and cleaning solution.
   5. Do not allow cleaning solution to dry on wall.

F. Clean mortar debris and residue from all adjacent non-masonry surfaces. Use mild detergent and soft brushes or cloth that will not damage existing materials and finishes.

G. Clean all debris from surrounding area, gutters, drains, downspouts, roofs, etc. Rinse off roof and flush gutters and downspouts.

H. 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.

3.07 MASONRY WASTE DISPOSAL

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

3.08 SCHEDULE

A. Exterior, Above Grade, Load Bearing Brick Masonry Walls, Parapets: Type N or Type O based on preconstruction testing of existing mortar.

B. Exterior, Above Grade, Non-Load Bearing Brick Walls: Type N or Type O based on preconstruction testing of existing mortar.

C. Exterior, Above Grade, Load Bearing Stone Walls, Parapets: Type N or Type O based on preconstruction testing of existing mortar..

END OF SECTION

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SECTION 07 3213
CLAY ROOF TILES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clay roof tiles

B. Clay roof tile attachment

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim

B. Section 07 9200 - Joint Sealants

1.03 REFERENCE STANDARDS

A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing 2017.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.

C. NRCA (RM) - The NRCA Roofing Manual 2022.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets for all materials to be used, indicating test data, material characteristics, and installation instructions, limitations, and precautions.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Roof Tiles: Quantity equal to 5 percent of total installed, including appropriate quantities for each color, size, and shape.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing clay tile roofing, with at least 10 years of documented experience.
   1. One skilled clay tiler shall be present at all times during execution of the work and shall personally direct the work.

B. Comply with installation details and recommendations of the Clay and Concrete Tile Roof Systems of the NRCA Roofing and Waterproofing Manual.

1.06 MOCK-UPS

A. Provide a mock-up for evaluation of clay roof tile installation workmanship, including typical eave and ridge details.
   1. Mock-Up Size: Minimum of six (6) courses of tile, including new underlayment and new copper base and counter flashing.
   2. Locate where directed by A/E.
   3. Do not proceed with remaining work until workmanship has been approved by A/E.
   4. Revise mock-up area as required to provide acceptable work.
   5. Approved mock-up may be retained as part of this work.

1.07 PROJECT CONDITIONS

A. Perform all work under temperature and weather conditions recommended by the material manufacturer of the product being installed.

B. Do not install roofing materials when precipitation is imminent or expected prior to the anticipated time of completion for the work item.

C. Ensure that substrate materials are dry, in good condition, and free of contaminants. Do not commence with roofing installation unless substrate conditions are suitable. Contractor shall demonstrate that substrate conditions are suitable, or shall notify A/E if the Contractor feels substrate conditions may require repair or alteration.

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1.08 WARRANTY

A. Manufacturer's Warranty (for new tile): Provide manufacturer's standard 75-year material warranty. Manufacturer agrees to replace roof tiles which fail within the specified warranty period with no dollar limits "NDL".

B. Installer's Warranty: Provide 2-year "Workmanship Warranty" covering workmanship for all work of this section including installation of underlayment and clay tile. Installer agrees to repair or replace roofing which fails or leaks within the specified warranty period with no dollar limits "NDL".

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Clay Roof Tiles Manufacturers:
   1. Ludowici Roof Tile: www.ludowici.com

2.02 MATERIALS

A. Existing Clay Roof Tiles: Salvage and reuse existing clay tiles. Replace damaged existing clay tiles with new to match existing.

B. New Clay Roof Tiles:
   1. Field Tiles: Ludowici Shingle Tile to match existing.
   2. Proivide special roof tiles, such as under eave tiles, as recommended by the manufacturer to be compatible with field tiles and to match existing.

C. Asphalt-saturated Felt Underlayment: ASTM D226, Type II (#30), asphalt-saturated organic felt, smooth surfaced.

2.03 METAL FLASHING

A. Refer to Section 07 6200 Sheet Metal Flashing and Trim.

2.04 ACCESSORIES

A. Fasteners:
   1. Underlayment Fasteners: Stainless steel ring shank roofing nails with plastic caps, 11-gauge, 0.12-inch (3.05 mm) diameter, sharp pointed with barbed shanks, minimum 3/8-inch (9.5 mm) diameter head, and of length sufficient to penetrate 3/4 inch (19 mm) into solid substrate or completely through the top layer of the structural insulated panel roof deck.
      a. Underlayment fasteners shall have plastic caps with a nominal cap diameter of not less than 1 inch. Thickness of the outside edge of the plastic cap shall be not less than .035 inch.
   2. Tile Fasteners: Stainless steel ring shank nails, 10-gauge, 0.134-inch (3.40 mm) diameter, with minimum 3/8-inch (9.5 mm) diameter head, of sufficient length to penetrate 3/4 inch (19 mm) completely through the wood deck.

PART 3 EXECUTION

3.01 REMOVAL

A. Carefully remove existing clay tile in locations indicated on the drawings and as necessary to allow for gutter replacement. Carefully remove and handle clay tile to minimize breakage. Existing tiles will be reinstalled.

B. Discard broken clay tiles.

3.02 EXAMINATION

A. Examine structural roof deck for general condition prior to installation of new underlayment and reinstallation of clay tiles. Notify A/E if damage to roof deck is observed.

B. Do not begin installation of underlayment or tile roofing until substrates have been repaired.

3.03 PREPARATION

A. Broom clean deck surface prior to installation of underlayment.

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B. Prepare roof deck surfaces using methods recommended by tile manufacturer for achieving best results under project conditions.

3.04 INSTALLATION

A. Install clay tile roofing system as indicated in the Drawings and in accordance with manufacturers recommendations and NRCA (RM) applicable requirements.

B. Underlayment:
   1. Install two layers of asphalt-saturated felt underlayment where tiles are removed to allow for masonry work, perpendicular to roof slope. Provide 1" minimum headlap and 4" minimum endlap.
   2. Secure underlayment with stainless steel ring shank plastic cap nails in a 12-inch grid pattern.

C. Clay Tile:
   1. Install under eave tile and first row of field tile at eaves with minimum projection of 1 inch (25 mm).
   2. Lay tile square with building lines and parallel with roof slope, and install filler, closure, and mitered pieces as required.
   3. Unless otherwise indicated or recommended by tile manufacturer, install tile with minimum of 3-inch (75 mm) headlaps.
   4. Stagger joints between courses. Center joints on tiles of course below.
   5. Replace or set aside chipped tiles. Replace chipped tiles with new tiles. Chipped tiles may be used for cut tiles at hips.
   6. Nail tiles by driving nails to point where nail heads just clear surface of tile, so tiles hang on nails; do not overdrive niles by putting pressure on underlying tile, and do not underdrive nails and put strain on overlying tile.
   7. Cut and fit tiles neatly at valleys.
   8. Install accessories in accordance with manufacturer’s details and recommendations.

3.05 CLEANING

A. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, scratch marks, or other damage to tile or sheet me.

END OF SECTION

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SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Copper roof flashings.

B. Replacement copper ridge caps.

1.02 RELATED SECTIONS

A. Section 07 3213 - Clay Roof Tiles

B. Section 07 9200 - Joint Sealants

1.03 REFERENCES

A. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), “Architectural Sheet Metal Manual.”

B. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction

C. Copper Development Association: Copper in Architecture - Design Handbook.

1.04 COORDINATION

A. Coordinate installation of formed metal with adjacent construction. Align formed metal edges with adjacent construction to achieve aesthetically clean joints.

B. Coordinate sheet metal layout and seams with sizes and locations of features to be covered, and joints and seams in adjacent materials.

C. Coordinate sheet metal installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.05 PREINSTALLATION MEETINGS

A. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

B. Review details of existing construction that affect sheet metal installation, including locations of drains and vents.

C. Review structural loading limitations of cornices and substrates during sheet metal installation.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Manufacturer's literature, including descriptions of physical properties and test data for each type of metal, fastener and accessory specified.

B. Information Submittals:
   1. Qualification Data: For installer, documenting requirements listed below in "Quality Assurance".
   2. Product Test Reports: For each product, for tests performed by a qualified testing agency.
   3. Sample Warranty: For special warranty.

C. Closeout Submittals:
   1. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Sheet Metal Roofing Specialist/Installer: Work must be performed by a firm having not less than ten (10) years successful experience in comparable sheet metal work on historic buildings, and by personnel skilled in the installation processes indicated.
   1. One skilled sheet metal worker shall be present at all times during execution of the work and shall personally direct the work.
   2. All workers who intend to perform solder work shall complete a "soldering test". The soldering test shall consist of 1 linear foot each of a vertical flat-lock and soldered seam

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and a vertical riveted and soldered seam. The soldered seams will be cut to inspect for proper sweating of the seam.

B. Fabricator Qualifications (if other than installer): Employs skilled workers who fabricate sheet metal the same as that required for this Project and whose products have a record of successful in-service performance. Have a minimum of ten (10) years documented experience in the successful fabrication of metal work of comparable size and complexity as this project.

1.08 MOCKUP

A. Build mockups to verify selections, demonstrate aesthetic effects and set quality standards for fabrication and installation. Mockup shall be reviewed and accepted by A/E and Owner prior to proceeding with installation.

B. Mock-up shall consist of new copper base and counter flashings installed in conjunction with clay tile mock-up. Mock-up shall include underlayments and attachments.

C. Subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at the time of Substantial Completion.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing 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 PROJECT CONDITIONS

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

1.11 WARRANTY

A. Special Warranty: Warranty in which Installer agrees to repair of replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Wrinkling, buckling, or oil canning.
      b. Loose parts.
      c. Failure to remain weathertight, including uncontrolled water leakage.
      d. Failure to direct water to drains.
      e. Deterioration of metals, and other materials beyond normal weathering, including nonuniformity of color or finish.
      f. Galvanic action between sheet metal flashing and dissimilar meterials.
   2. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing 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 shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, 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, ambient; 180 deg F, material surfaces.

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

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2.02 MATERIALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Copper Sheet: ASTM B370
   1. Copper base flashing:
      a. Thickness: 16 oz. per square foot
      b. Alloy: cold-rolled temper H00
      c. Finish: natural weathering mill finished copper
   2. Copper counter flashing:
      a. Thickness: 20 oz. per square foot
      b. Alloy: cold-rolled temper H00
      c. Finish: natural weathering mill finished copper
   3. Copper ridge caps:
      a. Thickness: 20 oz. per square foot
      b. Alloy: cold-rolled temper H00
      c. Finish: natural weathering mill finished copper

2.03 UNDERLAYMENT MATERIALS

A. Asphalt-saturated Felt Underlayment: ASTM D226, Type II (#30), asphalt-saturated organic felts, smooth surfaced.

B. Slip Sheet: Rosin-sized building paper, 3lb/100 sq. ft. minimum. Shall be smooth, unsaturated build paper.

2.04 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 unless otherwise indicated.

B. Fasteners: Wood screws, bolts, self-locking rivets, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
   1. Fasteners for Copper Sheet and Brass Gutter Straps to Wood Substrates (nails and screws): Copper, brass, hardware bronze, or passivated Series 300 stainless steel.
   2. Rivets: 3/16" diameter, copper. Copper rivets with copper-plated steel mandrels are not acceptable.
   3. Bolts for Brass Gutter Straps: 3/8" diameter, brass. Round head, slotted. With brass nuts and washers.
   4. Expansion Inserts for Masonry: Nylon or suitable plastic.

C. Solder:
   1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

D. Flux:
   1. Muriatic acid killed with zinc (zinc-chloride) or rosin flux.

2.05 FABRICATION

A. Field measure site conditions prior to fabricating work.

B. Fabricate sheet metal flashings in shop to greatest extent possible.

C. Coordinate dimensions and attachment methods of formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned.

D. Form exposed sheet metal work to fit substrates with little oil canning; free of buckling and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   1. Lay out sheet metal flashings so transverse seams, if required, are made in direction of water flow, with higher panels overlapping lower panels.
   2. Offset transverse seams from each other 12 inches minimum.

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E. Form pieces in longest allowable lengths to minimize joints. Form with interlock seams, drips and other profiles as indicated.

F. Punch all holes (oblong) for through-fastening.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All copper shall be stored off the ground in an enclosed structure to maintain dry condition. Do not store copper under a tarp or in a manner that promotes or causes condensation to form.

B. Locate and place formed metal items level and in alignment with adjacent construction. Perform cutting, drilling and fitting required to install formed metal.

C. Use concealed anchorages where possible. Provide washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

D. Form tight joints with connections accurately fitted together.

E. Handle copper in a manner to reduce scratches, dents, etc.

F. Copper shall be protected during installation, repair and cleaning of adjacent masonry with tarps, polyethelene sheeting, etc. To prevent water stains, temporary protection shall be removed at the end of each workday.

3.02 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Examine wood substrates to verify that joints are supported by masonry, framing, or blocking, that tops of fasteners are flush with surface, and that installation is within flatness tollerances required for finished sheet metal installation.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Repair deteriorated substrates in kind.

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

3.03 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, in shingle fashion to shed water, with lapped joints of not less than 2 inches. Fasteners shall finish flush with the substrate.

B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal.

3.04 INSTALLATION, GENERAL

A. General: Install sheet metal flashings to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to installation characteristics required unless otherwise indicated on Drawings. Install fasteners, solder, sealants, and other miscellaneous items as required for a complete gutter system.
   1. Anchor sheet metal and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing system.
   2. Install sheet metal true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder.
   3. Install sheet metal to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   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

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separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

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.

3.05 CLEANING AND ADJUSTING

A. Clean exposed surfaces in accord with manufacturer's instruction in a manner that leaves an undamaged and uniform finish matching approved Sample. Do not chemically or abrasively clean copper; do not use soaps, detergents or other cleaning agents.

B. Clean off excess sealants.

C. Replace sheet metal components that have been damaged or have deteriorated beyond successful repair.

END OF SECTION

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SECTION 07 9200
JOINT SEALANTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Joint sealants for building envelope.

B. Sealant backing and accessories.

1.02 RELATED SECTIONS

A. Section 04 0142 - Brick Masonry Repair and Restoration

B. Section 04 0146 - Stone Repair and Restoration

C. Section 07 6200- Sheet Metal Flashing and Trim

1.03 REFERENCES

A. ASTM C717 - Standard Terminology of Building Seals and Sealants; 2017.

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2015.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008.

G. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

H. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness; 2015.

1.04 PRE-INSTALLATION MEETING

A. Conduct at Project Site. Installer, Manufacturer's Representative and A/E shall be present.

B. Discuss Warranty, Preconstruction Testing, Field Testing

1.05 PRE-AWARD SUBMITTALS

A. Manufacturer's Statement of Application: letter, on company letterhead, stating that the Manufacturer:
   1. has visited the Project Site and is aware of the job conditions;
   2. has reviewed the Drawings and Specifications related to sealant work;
   3. agrees that the specified materials are appropriate for the intended use;
   4. approves of the Installer;
   5. will perform necessary testing to verify adhesion of sealant with substrate materials
   6. will perform testing as necessary for warranty;
   7. agrees to provide specified Warranty

B. Contractor's Statement of Application: letter, on company letterhead, stating that the Contractor:
   1. has visited the Project Site and is aware of the job conditions;
   2. has reviewed the Drawings and Specifications related to sealant work;
   3. will coordinate necessary testing;
   4. agrees to provide necessary supervision or direction to ensure that installed products comply with specified requirements;
   5. agrees to provide specified Warranty.

C. Adhesion Testing: Submit lab test per ASTM C794 ,for each type of sealant, including: name of sealant, substrates, surface preparation, use of primer, average and peak peel strength.

D. Stain Testing: Submit lab test per ASTM C1248, for each type of sealant, including: name of sealant, substrates, surface preparation, use of primer, type and length of exposure and description of test effects observed.

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E. Sample Warranty: Contractor and Manufacturer.

1.06 ACTION SUBMITTALS

A. Product Data: Material description for each product including test reports indicating compliance with project requirements.

B. Samples: Furnish one sample of each product and available color chart or dollop board for color selection by the A/E.

C. Joint Sealant Schedule: indicate joint sealant location, joint sealant type, manufacturer, product name and color for each application. Use joint sealant designations included in the Section.

D. Installer's Qualifications.

1.07 INFORMATIONAL SUBMITTALS

A. Manufacturer's installation instructions.

B. Manufacturer's standard drawing illustrating Manufacturer's recommended sealant profile and dimensions.

C. Manufacturer's cleaning instructions.

1.08 CLOSEOUT SUBMITTALS

A. Manufacturer Warranty.

B. Contractor Warranty.

1.09 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 5 years experience in applying sealants and acceptable to the Sealant Manufacturer in writing.

B. Products: Obtain materials of this Section from one manufacturer where possible. Materials not available from the Manufacturer shall be approved by the Manufacturer.

1.10 PRE-CONSTRUCTION FIELD TESTING

A. Field-Adhesion Testing: Before installing sealants, field test sealant to substrate adhesion according to Method A, "Tail" Procedure, in ASTM C1521.
   1. Extent of Testing
      a. Locate test joints as directed by A/E.
      b. Conduct field tests for each kind of sealant and joint substrate.
      c. Notify A/E seven days in advance of dates and times when joints will be tested.
      d. Arrange for tests to be performed by Manufacturer's Representative.
      e. For joints with dissimilar substrates, verify adhesion to each substrate separately.
   2. Test Report
      a. 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.
      b. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate.
      c. Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates
      d. Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
      e. Include interpretation of test results and prior experience relative to material performance, primer and substrate preparation, potential staining from sealant, and dirt accumulation and dirt runoff from sealants
      f. Whether sealants filled joint cavities and are free of voids.
      g. Whether sealant dimensions and configurations comply with specified requirements.
      h. 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

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product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

1.11 MOCK-UPS

A. Install visual mock-ups at locations as directed by the A/E.

B. Mock-up shall constitute standard of acceptance for the remaining work.

C. Mock-up may remain if undisturbed at the time of Substantial Completion.

1.12 DELIVERY, HANDLING, AND STORAGE

A. Packaged material shall remain in original containers with labels intact and with seals unbroken until time of use. Stored material shall have readable labels for the duration of the Work:
   1. Protect to avoid damage to material caused by water and the effects of weather.
   2. Store materials on the Project Site above ground in a dry place and keep weatherproof.

1.13 PROJECT CONDITIONS

A. Consult the Manufacturer for specific instructions before proceeding.

B. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by Manufacturer or are below 40 degrees F (5 degrees C).
   2. When joint substrates are damp or wet.
   3. Where joint widths are less than those allowed by Manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.14 WARRANTY

A. Manufacturer warrants that sealants and accessory materials will provide a watertight weatherseal. Manufacturer agrees to replace defective materials during the Warranty Period.

B. Contractor warrants to remove defective materials and replace with new materials for the Warranty Period.

C. Contractor agrees to correct defective workmanship for the Warranty Period.
   1. Replacement includes responsibility for removal of other work (if any) which conceals or obstructs the proper placement of defective sealant materials.

D. Defective Materials or Workmanship are defined to include:
   1. Adhesive failures of sealant.
   2. Cohesive failure of sealant.

E. Warranty Period
   1. Warranty Period for silicone sealants and their accessory materials shall be ten (10) years from the date of Substantial Completion.
   2. Warranty Period for polyurethane sealants and their accessory materials shall be five (5) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

	Code	Manufacturer
1.	BASF	BASF Construction Chemicals ; www.buildingsystems.basf.com.
2.	DOW	Dow Corning Corporation: www.dowcorning.com/construction.
3.	MOM	Momentive Performance Materials, Inc ; www.momentive.com.
4.	PEC	Pecora Corporation ; www.pecora.com.
5.	TRE	Tremco Global Sealants: www.tremcosealants.com.
6.	SIK	Sika Corporation: www.usa-sika.com

B. Subject to compliance with the requirements, provide lead T-caps by the following:
   1. Weathercap, Inc.; www.weathercap.net
   2. Nuclead; www.nuclead.com

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C. Substitutions: Not Permitted.

2.02 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants and accessory materials that are compatible with one another, and with materials in close proximity under use conditions as demonstrated by Manufacturer per ASTM C1087.

B. Stain Test Characteristics: Where sealants are required to be nonstaining, provide sealants tested per ASTM C1248 as non-staining on porous joint substrates.

2.03 LIQUID JOINT SEALANTS

A. Type 1: Silicone Sealant, ASTM C920 - Type S, Grade NS, Class 50
   1. Stain: none on white marble per ASTM C1248.

	Code	Product
a.	DOW	756 SMS Building Sealant
b.	MOM	SCS-9000 Silpruf NB
c.	PEC	890 NST

B. Color of Liquid Joint Sealants: As selected by A/E from Manufacturers full range of available colors.

C. Lead T-caps:
   1. Lead flashing strips sized as recommended by T-cap manufacturer of sufficient size to cover the joint width.

2.04 ACCESSORIES

A. Backer Rod: ASTM C 1330, Type B, bicellular material with surface skin unless Sealant Manufacturer recommends an alternate type.
   1. Provide preformed compressible, resilient, non-waxing, non-extruding, non-staining rods (polyethylene foam, urethane foam) as recommended by the Sealant Manufacturer.
   2. Backer rod shall be sized and shaped to suit the various conditions and shall be compatible with sealant, primers, and substrates.

B. Joint Cleaner: Type recommended by the Sealant Manufacturer for the specific joint surface and conditions.

C. Primer and Sealer: Type recommended by Sealant Manufacturer for the specific joint surface and conditions.

D. Bond Breaker Tape: Type recommended by Sealant Manufacturer.

E. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 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. Do not start work until conditions are satisfactory.

3.02 PREPARATION

A. Surface Cleaning of Joints: Comply with Manufacturer's written instructions and the following requirements:
   1. Remove and clean only as much material as can be properly re-sealed in a normal working day.
   2. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paint (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by Manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   3. Clean joints immediately before installing joint sealants.

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4. Clean porous joint substrate surfaces, per ASTM C1193, 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.
5. Clean nonporous joint substrate surfaces, per ASTM C1193, with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjacent surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears.
1. Use masking tape to prevent staining of adjoining surfaces due to spillage and migration of compound out of the joints during installation.

3.03 INSTALLATION, GENERAL

A. Install materials per ASTM C1193 and Manufacturer's written instructions unless otherwise directed.

B. Masking: Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.

C. Joint Priming
1. Prime joint substrates where recommended by Manufacturer or as determined by Preconstruction Testing.
2. Apply primer to comply with Manufacturer's written instructions.
3. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjacent surfaces.

D. Sealant Backing
1. Install sealant backing (e.g. backer rod or bond breaker tape) to prevent three-sided adhesion of sealant.
2. Install sealant backing to support sealants during application and at a position required to produce optimal cross-sectional sealant profile as noted below.
a. Do not leave gaps between ends of sealant backings.
b. Do not stretch, twist, puncture, or tear sealant backings.
c. Remove sealant backings that have become wet before sealant application, and replace them with dry materials.

3.04 INSTALLATION

A. Install sealants at the same time joint backings are installed:

B. Use hand guns and pressure equipment with proper nozzle size. Deposit sealant in uniform and continuous bead, avoid gaps and air pockets.

C. Place sealants so they directly contact and fully wet joint substrates.

D. Apply sealant in a continuous operation and single direction.

E. Completely fill recesses in each joint configuration.

F. Produce uniform, cross-sectional shapes for optimum sealant movement capability. Unless otherwise directed, use the following width to depth ratios:
1. Joints up to 1/2 inch wide: 1:1, minimum 1/4 inch width and depth.
2. Joints greater than 1/2 inch wide: 2:1
3. Joints greater than 1 inch wide: depth shall not exceed 1/2 inch.
4. Joints greater than 2 inches wide: consult with Manufacturer and notify A/E.

G. Tooling:
1. Tooling is a required step in the installation of sealant. Tooling the sealant joint will assist to create an installation that has full "wetting" of the sealant onto the joint interfaces, to achieve the desired hour-glass shaped cross-sectional joint geometry, and to shape the visible surface of the sealant joint to a clean and consistent appearence. The sealant joint

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should be deliberately tooled to a shape to actively shed water and prevent the ponding of water on the surface of the joint.

2. Immediately after sealant installation and before skinning or curing begins, tool sealants with a shaped plastic or metal tool to form smooth, uniform beads to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
3. Tools shall be cleaned periodically to prevent build-up of old sealant and when changing colors or material.
4. Tooling liquid shall not be used without the prior express written approval from the Manufacturer and A/E.
5. Joint Profiles: Concave per ASTM C1193 Figure 8A unless otherwise indicated.
6. Remove excess sealant from surfaces adjacent to joints.
7. Remove masking material immediately after tooling.

H. Lead T-caps:
1. After joint is ground to the required depth, completely cleaned, and joint backing is installed, pre-fit and contour lead T-cap to joint.
2. Notch or cut shaft of T-cap as recommended by the manufacturer to form curves or anchles. Flanges of T-cap shall remain continuous around curves and angles. Do not cut flange of T-cap. Continue T-cap a minimum of 1" down the front and/or back face of stone.
3. Mark off the width of the T-cap on the substrate and apply masking tape, with the edge of the tap aligning with the marks.
4. Lift T-cap out of joint and apply primer, if recommended by the sealant manufacturer.
5. Prime substrate where recommended by the joint sealant manufacturer.
6. Place bead of sealant along each side of lead T-cap flange.
7. Fill joint with sealant approximately 1/8" above the face of the substrate.
8. Set lead T-cap in place, pressing firmly into sealant for sealing and shaping. Turn down at all angles and edges.
9. Remove excess sealant with a putty knife, leaving finished joint neat and clean. Allow sealant to cure for 48 hours prior to removing masking tape.

3.05 FIELD QUALITY CONTROL

A. Site Visits: by the Manufacturer's Representative are required to ensure the proper installation of the sealing compound throughout the duration of the project.

B. Field-Adhesion Testing: During construction, field test sealant to joint substrate adhesion according to Method A, "Tail" Procedure, in ASTM C1521 and as follows:
1. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
2. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
3. Replace 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.
4. In the event of failure:
   a. Remove sealants failing adhesion testing, clean substrates, reapply sealants and re-test.
   b. Retest until performance is satisfactory.
   c. Test one (1) additional area as selected by A/E.
5. Test Report: Submit per "Preconstruction Testing" Article, "Field-Adhesion Testing" Paragraph in Part I.

3.06 CLEANING

A. As work progresses, remove excess materials from adjacent surfaces with cleaning material recommended by the Manufacturer.

B. Leave finished work in neat and clean condition.

C. Prior to removal of swing-stage scaffold, inspect all glass and window frames removing all residue sealant from these surfaces.

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3.07 PROTECTION

A. Protect sealants during and after curing period from contact with contaminating substances.

B. Protect sealants from damage resulting from construction operations

C. Remove and repair damaged or deteriorated joint sealants immediately so repaired areas are indistinguishable from original work.

3.08 SCHEDULE - SEE DRAWINGS

END OF SECTION

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SECTION 09 9115
PAINTING OF EXTERIOR METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and the application of paint systems on exterior metal substrates including the following:
   1. Metal embedded in masonry walls
   2. Drive court metal gates and fences

B. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Glass.

1.02 RELATED SECTIONS

A. Section 02 4119 - Selective Demolition.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.

C. EPA – Environmental Protection Agency
   1. Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the EPA.

D. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; Society for Protective Coatings; Fourth Edition.

E. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; Fourth Edition.

F. SSPC-SP 2 - Hand Tool Cleaning

G. SSPC-SP 3 - Power Tool Cleaning

H. SSPC-SP 10 - Near-White Blast Cleaning

1.04 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Indicate VOC content.
   3. Manufacturer's surface preparation procedures and application instructions.

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Identify location of use.

C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
   1. Provide stepped samples defining each separate coat, including primers and intermediate coats. Use representative colors when preparing samples for review. Resubmit until required sheet, color and texture are achieved.

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2. Submit samples on the following substrates for A/E and Owner review of color and texture:
    a. Ferrous Metal: Provide two 4-inch-square samples of flat metal (min. 1/8" thick) for each color and finish.
3. List of material and application for each coat of each sample.

D. Applicator Qualifications.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: one (1) (3.8 L) gallon of each material and color approved.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum ten (10) years experience and approved by manufacturer. Applicator shall have completed high-performance coating system applications similar in material and extent to shoe indicated for this Project and a have a record of successful in-service performance.
1. Employ only tradesmen skilled in the particular type of work to be performed.
2. Workmanship shall comply with accepted industry standards.

1.07 MOCK-UPS

A. Demonstrate preparation techniques that will be used to prepare substrates for painting.

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

C. A/E will select an area to represent typical surfaces and conditions for application of each paint system specified in Part 3.
1. Mock-up area: Drive court fence, 25 square feet.
2. Final approval of color selections will be based on mockups.
    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by A/E at no added cost to Owner.

D. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless A/E specifically approves such deviations in writing.

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

F. Mock-up shall be prepared to meet paint manufacturer's warranty review process requirements.
1. Make arrangements to have paint manufacturer's technical representative present to review mock-up at various stages in order to meet warranty requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint materials in original containers with seals unbroken and labels intact. All containers shall have readable identifying labels for the duration of the Work.
1. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

B. Store all paint materials and equipment in one place. Keep space used for such storage clean. Do not store paint materials and equipment with any other materials. Any damage to storage space due to painting operations shall be repaired at the expense of the Contractor.
1. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

C. All damaged or otherwise defective material, when so ascertained, shall be removed immediately from the job site.

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1.09 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air tempuratues are between 50 and 95 degrees F.

B. Do not apply coatings when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

C. Do not apply coatings in snow, rain, fog, or mist.

D. Hazardous Materials: If materials suspected of containing hazardous materials (e.g. asbestos-containing or lead-containing materials) are encountered, do not disturb; immediately notify Owner and A/E in writing. The Owner shall obtain the services of a licensed laboratory to verify the presence or absence of hazardous material reported by the Contractor and in the event that hazardous materials are found to be present, to cause them to be rendered harmless.

1.10 WARRANTY

A. Provide a five (5) year material and labor warranty against peeling, cracking of coating over existing cracks, chalking and excessive fading. Warranty to exclude failure of the underlying substrate to which the paint is applied.

PART 2 PRODUCTS

2.01 MANUFACTURERS

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

	Code	Manufacturer
1.	TN	Tnemec Company, Inc.; www.tnemec.com
2.	SW	Sherwin-Williams/M.A.B. Paints; www.sherwin-williams.com
3.	PPG	PPG Industries, Inc.: www.ppgpaints.com

B. Primer Sealers: Same manufacturer as top coats.

C. Substitutions: See Section 01 1000 - Summary of Work.

2.02 PAINTS - GENERAL

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

B. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

C. Supply each paint material in quantity required to complete entire project's work from a single production run.

D. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

E. Colors:
   1. As selected by Owner from manufacturer's full range of available colors.
   2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.

2.03 PAINT REMOVER

A. Paint Stripper: chemical stripper intended to remove paint
   1. Peel-Away 7, Dumond Chemicals, www.dumondchemicals.com
   2. Fast Acting Stripper, Prosoco Sureklean, www.prosoco.com

B. Heat may not be used to remove paint from wood elements.

C. Trisodium Phosphate-type detergent solution.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

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B. Provide all materials, brushes, tools, ladders, scaffolds and equipment of any kind or necessary for the proper execution of painting work.

C. Shop Primers: Provide primers as specified in Part 3.

2.05 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 EXECUTION

3.01 EXAMINATION

A. The Contractor and Applicator shall familiarize themselves with the requirements of the painting work by consulting the Drawings and Specifications. Items requiring painting, and not specifically mentioned herein shall be finished as specified for similar items.

B. The Contractor shall consult with the paint manufacturer to verify compatibility and adhesion requirements of paint with all materials that are in contact or will come in contact with paint.

C. Verify that surfaces are ready to receive work as instructed by the product manufacturer. Notify A/E of unsatisfactory preparation before proceeding.

D. Do not begin application of paints and finishes until substrates have been properly prepared.

E. Starting of work will constitute acceptance of conditions and substrates.

3.02 PREPARATION

A. Complete designated metal repairs prior to painting.

B. Comply with manufacturer's written instructions and recommendations
   1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions including but not limited to:
      a. Metal embedded in masonry: SSPC-SP2 and SSPC-SP3
      b. Drive court fences and gates: SSPC-SP10

C. Before painting, remove or otherwise protect surrounding surfaces including window components, glass, masonry, etc., which are not to receive paint. In areas where paint is being applied, protect all surfaces with clean drop cloths and suitable masking.

D. Report to A/E defects that render any area or item unfit to receive finish.

E. Existing Steel and Iron Substrates:
   1. Inspect surfaces to be finished and the conditions of the building before starting the work.
   2. Remove rust, loose mill scale, weld spatter, paint and other surface contaminants. Completed surface preparation shall be as required by manufacturer for application of their materials.
   3. Clean using methods recommended in writing by the manufacturer including, but not limited to, the following:
      a. SSPC-SP2.
      b. SSPC-SP3.
      c. SSPC-SP10.
   4. Solvent clean according to SSPC-SP1.

F. Thoroughly inspect primed surfaces after drying and touch-up all bare spots, scratches, mars, or other damage using same products as initially applied.

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3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations.

B. Finishes shall not be applied in rain, snow, fog, mist, or when the relative humidity exceeds 85 percent. Paint shall not be applied when the temperature of the surfaces to be painted and of the surrounding atmosphere is below 50 degrees F or above 95 degrees F. Follow the manufacturer's application directions.

C. Finishes shall not be applied while dust or dirt is present. Coordinate with Contractor for facade rehabilitation project to avoid dust or dirt infiltration. Follow the manufacturer's application directions for cleaning surfaces of dust and dirt prior to application.

D. Do not paint during the operations of other trades, if such operations would be detrimental to painting work. During the painting work, protect from the operations of other trades by suitable coverings or other means.

E. Unless otherwise approved by the A/E. Apply all coating in compliance with the Dry Film Thickness (DTF) specified herein.

F. Only apply paint to surfaces that are dry.

G. Prime all exposed surfaces including: edges, ends, faces, underside and backside.

H. If multiple coats of the same material are to be applied, tint each coat a lighter shade to facilitate identification. Tint undercoats to match color of topcoat. Provide sufficient differences to distinguish each coat.

I. Allow each coat of primer/paint to dry thoroughly before application of the following coat. Remove any foreign matter before proceeding with the following coat.

J. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied and properly cured to receive paint.

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

L. Sand metal surfaces lightly between coats to achieve required finish.

M. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations

3.05 CLEANING

A. Collect oil rags, waste material, debris, etc., from the work site at the end of each day and remove from site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage surfaces being cleaned.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. At completion of construction activities, touch-up and restore damage or defaced painted surfaces.

E. Upon completion of Work, remove all debris and construction material from site. Leave site in clean condition.

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3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE

A. When more than one coat is scheduled, use products of same manufacturer for all coats.

B. Colors: as selected by Owner from manufacturer's full range of available colors.

C. Paint System A for use at steel substrates not exposed to UV, embedded in masonry or otherwise protected
   1. Prep: SP2/SP3
   2. Primer Coat DFT
      a. TN Series 135 3.0 - 5.0 mils
      b. SW Macropoxy 646 5.0 mils
   3. Finish Coat
      a. TN Series 135 3.0 - 5.0 mils
      b. SW Macropoxy 646 5.0 mils

D. Paint System B for use at drive court gates and fences
   1. Prep: SP10
   2. Primer Coat DFT
      a. TN Series 90E-92 Tneme-Zinc 2.0 - 4.0 mils
      b. PPG Dimetcoat 9 2.0 - 4.0 mils
   3. Intermediate Coat
      a. TN Series 73 Endura-Shield 5.0 - 8.0 mils
      b. PPG Amercoat 385 5.0 - 8.0 mils
   4. Top Coat
      a. TN Series 1072V Fluoronar 2.0 - 3.0 mils
      b. PPG Coraflon ADS 2.0 - 3.0 mils

END OF SECTION

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