

SECTION 044313 – STONE MASONRY VENEER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes stone veneer in the following applications:

1. On concrete retaining walls.
2. Anchored to concrete backup.
3. **[Anchored] [Adhered]** to unit masonry backup.
4. **[Anchored] [Adhered]** to wood framing and sheathing.
5. **[Anchored] [Adhered]** to cold-formed metal framing and sheathing.

- B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for dovetail slots in concrete for anchoring stone veneer.
2. Division 4 Section "Unit Masonry Assemblies" for **[cavity-wall insulation,]** concealed flashing, horizontal joint reinforcement, and veneer anchors.
3. Division 4 Section "Dimension Stone Cladding" for descriptions of stone types required by this Section.
4. Division 7 Section "Building Insulation" for insulation installed between stone veneer assemblies and backup material.
5. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
6. Division 9 Section "Stone Paving and Flooring."

- C. Products installed, but not furnished, in this Section include the following:

1. Steel **[lintels] [and] [shelf angles]** for stone veneer assemblies specified in Division 5 Section "Metal Fabrications."

1.3 SUBMITTALS

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

1. For stone varieties proposed for use on Project, include data on physical properties **[specified] [or] [required by referenced ASTM standards]**.

- B. Stone Samples for Verification: For each color, grade, finish, and variety of stone required.

- C. Colored Mortar Samples for Verification: For each color required. [**Label Samples to indicate types and amounts of pigments used.**]
- D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, sources of supply, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.
 - 1. Submittal is for information only. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- E. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.
- B. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. Obtain each variety of stone from a single quarry, whether specified in this Section or in another Section of the Specifications.
- C. Source Limitations for Mortar Materials: Obtain ingredients of a uniform quality for each mortar component from a single manufacturer and each aggregate from one source or producer.
- D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Build mockups for each type of stone veneer assembly in sizes approximately **48 inches** long by **48 inches** high by full thickness, including face and backup.
 - a. Include stone coping at top of mockup.
 - b. Include through-wall flashing installed for a **24-inch** length in corner of mockup approximately **16 inches** down from top of mockup, with a **12-inch** length of flashing left exposed to view (omit stone veneer above half of flashing).
 - 2. Protect accepted mockups from the elements with weather-resistant membrane.
 - 3. Approval of mockups is for color, texture, and blending of stone; relationship of mortar and sealant colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.

- b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
- 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 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.
- C. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone veneer assemblies when construction is not in progress.
 - 1. Extend cover a minimum of **24 inches** down both sides and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone veneer assemblies.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone veneer assemblies.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace stone veneer assemblies damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in [ACI 530.1/ASCE 6/TMS 602] [**Section 2104.3 of the Uniform Building Code**].

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F** and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 STONE SOURCES

- A. Varieties and Sources: Subject to compliance with requirements, provide one of the following stone varieties from one of the following sources:
1. Stone Type: **[Roaring Run Sandstone] [Bloom Run Sandstone]** by Russell Stone Products, Inc. 347 Greenville Pike Grampian, PA 16838 PH: 1-814-236-2449 or 1-434-760-1229.
- B. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Division 4 Section "Dimension Stone Cladding."

2.2 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.

2.3 STONE

- A. Match Architect's samples for variety, color range, finish, and other stone characteristics relating to aesthetic effects.
- B. Quartz-Based Dimension Stone Standard: ASTM C 616, Classification II Quartzitic Sandstone
- C. Other Stone: Provide stone that complies with the following physical characteristics:
1. Maximum Absorption, by Weight: 2.2 percent according to ASTM C 97.
 2. Minimum Compressive Strength: 6,560 psi according to ASTM C 170.

2.4 MORTAR MATERIALS

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

1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207 Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207.
- D. Mortar Cement: ASTM C 1329
- E. Masonry Cement: ASTM C 91
- F. For pigmented mortar, use a colored cement formulation as required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations.
1. Pigments shall be composed of natural or synthetic iron oxides, compounded for use in mortar mixes, and with a record of satisfactory performance in stone masonry mortars.
 2. Pigments shall not exceed 10 percent of Portland cement by weight.
 3. Pigments shall not exceed 5 percent of [**mortar cement**] [**or**] [**masonry cement**] by weight.
 4. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.
- G. Aggregate: ASTM C 144 and as follows:
1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
 2. White Aggregates: Natural white sand or ground white stone.
 3. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 - a. Match Architect's sample.
- H. Mortar Pigments: Natural or synthetic iron oxides, compounded for use in mortar mixes and with a record of satisfactory performance in stone masonry mortars.
- I. Latex additive (water emulsion) described below, serving as replacement for part of or all gaging water, of type specifically recommended by latex-additive manufacturer for use with job-mixed Portland cement mortar and not containing a retarder.
1. Latex Additive: [**Styrene-butadiene rubber**] [**or**] [**acrylic resin**].
- J. Cold-Weather Admixture: No chloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- K. Water: Potable.
- L. [**Available**] Products:
1. Colored Portland Cement-Lime Mix:
 - a. <**Insert manufacturer's name; product.**>

2. Mortar Cement:
 - a. <Insert manufacturer's name; product.>
3. Colored Mortar Cement:
 - a. <Insert manufacturer's name; product.>
4. Colored Masonry Cement:
 - a. <Insert manufacturer's name; product.>
5. Mortar Pigments:
 - a. <Insert manufacturer's name; product.>
6. Cold-Weather Admixture:
 - a. <Insert manufacturer's name; product.>

2.5 VENEER ANCHORS

A. Materials:

1. Hot-Dip Galvanized Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type [304] [316].
3. Hot-Dip Galvanized Steel Sheet: ASTM A 366/A 366M, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.
4. Stainless-Steel Sheet: ASTM A 666, Type [304] [316].

B. Corrugated-Metal Veneer Anchors: Not less than **0.030-inch**- thick by **7/8-inch**- wide [**hot-dip galvanized steel**] [**stainless-steel**] sheet with corrugations having a wavelength of **0.3 to 0.5 inch** and an amplitude of **0.06 to 0.10 inch**.

C. Wire Veneer Anchors: Formed from W1.7 or **0.148-inch**- diameter, [**hot-dip galvanized steel**] [**stainless-steel**] wire.

D. Adjustable, Screw-Attached Veneer Anchors: Units consisting of a wire tie section and a metal anchor section that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

1. Structural Performance Characteristics: Capable of withstanding a **100-lbf** load in both tension and compression without deforming or developing play in excess of **0.05 inch**.
2. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, **2-3/4 inches** wide by **3 inches** high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit veneer anchor section.
3. Anchor Section: Sheet metal plate with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
 - a. [**Plate 1-1/4 inches wide by 6 inches long with strap 5/8 inch wide by 3-5/8 inches long**] [**Plate 1-1/4 inches wide by 9 inches long with strap 5/8 inch wide by 5-1/2 inches long**]; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than **1/32 inch**.

4. Anchor Section: Gasketed sheet metal plate with screw holes top and bottom; top and bottom ends bent to form pronged legs to bridge insulation or sheathing and contact studs; and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
 - a. Plate **1-1/4 inches** wide by **6 inches** long with strap **5/8 inch** wide by **6 inches** long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than **1/32 inch**.
 - b. Provide veneer anchor manufacturer's standard, self-adhering, modified-bituminous gaskets manufactured to fit behind veneer anchor plate and to prevent moisture from penetrating sheathing at pronged legs and screw holes.
 5. Metal Sheet: Galvanized steel sheet, [**0.0598-inch**] [**0.0747-inch**] [**0.1046-inch**] base metal thickness.
 6. Metal Sheet: Stainless steel, [**0.0625 inch**] [**0.0781 inch**] [**0.1094 inch**] thick.
 7. Wire Tie Section: [**Triangular-**] [**Rectangular-**]shaped, [**0.1875-inch-**] [**0.25-inch-**] diameter, [**hot-dip galvanized steel**] [**stainless-steel**] wire tie sized to extend at least halfway through veneer but with at least **5/8-inch** cover on outside face.
- E. Screw-Attached Veneer Anchors: Units consisting of a wire tie section and a metal anchor section for attachment over sheathing to wood or metal studs, and as follows:
1. Structural Performance Characteristics: Capable of withstanding a **100-lbf** load in both tension and compression without deforming or developing play in excess of **0.05 inch**.
 2. Anchor Section: Zinc-alloy barrel section with flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie section and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
 3. Wire Tie Section: [**Triangular-**] [**Rectangular-**]shaped, [**0.1875-inch-**] [**0.25-inch-**] diameter wire tie sized to extend at least halfway through veneer but with at least **5/8-inch** cover on outside face.
- F. Seismic Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint, complying with the following requirements:
1. Structural Performance Characteristics: Capable of withstanding a **100-lbf** load in both tension and compression without deforming or developing play in excess of **0.05 inch**.
 2. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, **2-3/4 inches** wide by **3 inches** high; with projecting tabs having slotted holes for inserting vertical leg of connector section.
 3. Connector Section: Rib-stiffened, sheet metal bent plate with down-turned leg designed to fit in veneer anchor section slot and with integral tabs designed to engage continuous wire. Size connector to extend at least halfway through veneer but with at least **5/8-inch** cover on outside face.
 4. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, **2-3/4 inches** wide by **3 inches** high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit veneer anchor section. Size wire tie to extend at least **1-1/2 inches** into veneer but with at least **5/8-inch** cover on outside face.
 5. Connector Section: Sheet metal clip welded to wire tie with integral tabs designed to engage continuous wire.

6. Anchor Section: Gasketed sheet metal plate with screw holes top and bottom; top and bottom ends bent to form pronged legs to bridge insulation or sheathing and contact studs; and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
 - a. Plate **1-1/4 inches** wide by **6 inches** long with strap **5/8 inch** wide by **6 inches** long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than **1/32 inch**.
 - b. Provide veneer anchor manufacturer's standard, self-adhering, modified-bituminous gaskets manufactured to fit behind veneer anchor plate and to prevent moisture from penetrating sheathing at pronged legs and screw holes.
 7. Connector Section: Triangular-shaped, [**0.1875-inch-**] [**0.25-inch-**] diameter, [**hot-dip galvanized steel**] [**stainless-steel**] wire tie and rigid PVC extrusion with snap-in grooves for inserting continuous wire. Size wire tie to extend at least halfway through veneer but with at least **5/8-inch** cover on outside face.
 8. Metal Sheet: Galvanized steel sheet, [**0.0598-inch**] [**0.0747-inch**] [**0.1046-inch**] base metal thickness.
 9. Metal Sheet: Stainless steel, [**0.0625 inch**] [**0.0781 inch**] [**0.1094 inch**] thick.
 10. Continuous Wire: **0.1875-inch-** diameter, [**hot-dip galvanized steel**] [**stainless-steel**] wire.
- G. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, **No. 10**, in length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion-protective coating:
1. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.
- H. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene washer, **No. 10**, in length required to penetrate steel stud flange by not less than 3 exposed threads.
- I. Steel Drill Screws for Wood Studs: Self-drilling, bugle-head or wafer-head wood screws recommended by veneer anchor manufacturer for fastening to wood studs; not less than **No. 10**, **1-1/2 inches** long, and with the following corrosion-protective coating:
1. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.
- J. Steel Tapping Screws for Concrete Masonry: Self-tapping screws with specially designed threads for tapping and wedging into masonry, with hex washer head and neoprene washer, **3/16-inch** diameter by **1-1/2-inch** length, and with the following corrosion-protective coating:
1. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.

[Available]Products:

2. Adjustable, Screw-Attached Veneer Anchors:
 - a. <Insert manufacturer's name; product.>
3. Screw-Attached Veneer Anchors:
 - a. <Insert manufacturer's name; product.>
4. Seismic Veneer Anchors:
 - a. <Insert manufacturer's name; product.>
5. Organic-Polymer-Coated, Steel Drill Screws:
 - a. <Insert manufacturer's name; product.>
6. Stainless-Steel Drill Screws for Steel Studs:
 - a. <Insert manufacturer's name; product.>
7. Organic-Polymer-Coated, Masonry Screws:
 - a. <Insert manufacturer's name; product.>

2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
 1. Stainless Steel: 0.0156 inch thick.
 2. Copper: 10-oz./sq. ft. weight or 0.0135 inch thick for fully concealed flashing; 16-oz./sq. ft. weight or 0.0216 inch thick elsewhere.
 3. Fabricate through-wall metal flashing embedded in masonry with [sawtooth] [or] [dovetail] ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 4. Fabricate metal expansion-joint strips to shape indicated.
 5. Fabricate metal drip edges to extend at least 3 inches into wall and 1/2 inch out from wall, with a hemmed outer edge bent down 30 degrees.
 6. Fabricate metal flashing terminations to extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and then down into joint 3/8 inch to form a stop for retaining sealant backer rod.
- B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use [one of] the following, unless otherwise indicated:
 1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of [5-oz./sq. ft.] [7-oz./sq. ft.] sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 2. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of [5-oz./sq. ft.] [7-oz./sq. ft.] sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
 3. Rubberized-Asphalt Flashing: Manufacturer's standard composite flashing product consisting of a pliable and highly adhesive rubberized-asphalt compound, bonded to a

high-density, cross-laminated polyethylene film to produce an overall thickness of [**0.030 inch**] [**0.040 inch**].

4. Elastomeric Thermoplastic Flashing: Manufacturer's standard composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy [**0.040 inch thick**] [**0.025 inch thick with a 0.015-inch- thick layer of rubberized-asphalt adhesive**].
 - a. Provide flashing as a complete system with preformed corners, end dams, other special shapes, and seaming materials all produced by flashing sheet manufacturer.
5. EPDM Flashing: Manufacturer's standard flashing product formed from a terpolymer of ethylene-propylene-diene, complying with ASTM D 4637, **0.040 inch** thick.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

E. [**Available**] Products:

1. Metal Flashing:
 - a. <Insert manufacturer's name; product.>
2. Copper-Laminated Flashing:
 - a. <Insert manufacturer's name; product.>
3. Asphalt-Coated Copper Flashing:
 - a. <Insert manufacturer's name; product.>
4. Rubberized-Asphalt Flashing:
 - a. .
 - b. <Insert manufacturer's name; product.>
5. Elastomeric Thermoplastic Flashing:
 - a. <Insert manufacturer's name; product.>
6. EPDM Flashing:
 - a. <Insert manufacturer's name; product.>

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from [**neoprene**] [**urethane**] [**or**] [**PVC**].
- B. Damp proofing for Limestone: Cementitious formulations that are recommended by ILI and that are nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.

- C. Asphalt Damp proofing for Concrete Backup: Cut-back asphalt complying with ASTM D 4479, Type I, or asphalt emulsion complying with ASTM D 1227, Type III or IV.
- D. Weep Holes:
1. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch OD by thickness of stone veneer assembly.
 2. Rectangular Plastic Tubing: Clear butyrate, 3/8 by 1-1/2 inches by thickness of stone veneer assembly.
 3. Wicking Material: Cotton or polyester rope, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity behind stone veneer assembly.
 4. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into head joint and consisting of vertical channel with louvers stamped in web and with top flap to keep mortar out of head joint; painted to comply with Division 9 Section "[Painting (Consumer Line Products)] [Painting (Professional Line Products)]," before installation, in color approved by Architect to match that of mortar.
 5. Plastic Weep Hole/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, designed to fill head joint with outside face held back 1/8 inch from exterior face of stone veneer, in color selected from manufacturer's standard.
 6. Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible, injection-molded PVC, designed to fit into head joint and consisting of louvered vertical leg, flexible wings to seal against ends of stone units, and top flap to keep mortar out of head joint; in color approved by Architect to match that of mortar.
- E. Cavity Drainage Material: [3/4-inch-] [1-inch-] [2-inch-] thick, free-draining mesh made from polyethylene strands[and shaped to avoid being clogged by mortar droppings].
- F. Expanded Metal Lath: 3.4 lb/sq. yd., self-furring, diamond-mesh lath complying with ASTM C 847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G60.
- G. Woven-Wire Lath: ASTM C 1032, fabricated into 1-1/2-inch hexagonal-shaped mesh with minimum 0.0510-inch- diameter, galvanized steel wire.
- H. Welded-Wire Lath: ASTM C 933, fabricated into 2-by-2-inch mesh with minimum 0.0625-inch- diameter, galvanized steel wire.
- I. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.
- J. [Available]Products:
1. Aluminum Weep Hole/Vent:
 - a. <Insert manufacturer's name; product.>
 2. Plastic Weep Hole/Vent:
 - a. <Insert manufacturer's name; product.>
 3. Vinyl Weep Hole/Vent:
 - a. <Insert manufacturer's name; product.>

4. Cavity Drainage Material:
 - a. CavClear; CavClear Masonry Mat.
 - b. <Insert manufacturer's name; product.>

2.8 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of **1/2-cup** dry-measure tetra sodium polyphosphate and **1/2-cup** dry-measure laundry detergent dissolved in **1 gal.** of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by stone producer.
 1. [Available]Products:
 - a. <Insert manufacturer's name; product.>

2.9 STONE FABRICATION

- A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.
- B. [Cut] [Select] stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.
 1. Clean sawed backs of stone to remove rust stains and iron particles.
- C. Gage backs of stones for adhered veneer if more than **81 sq. in.** in area.
- D. Thickness of Stone Veneer: Provide thickness indicated, but not less than the following:
 1. Thickness: **4 inches** plus or minus [**1/4 inch**] [**1/2 inch**]. [**Thickness does not include projection of pitched faces.**]
 2. Thickness: **1 inch** plus or minus [**1/8 inch**] [**1/4 inch**].
- E. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated.
- F. Shape stone for type of masonry (pattern) as follows:
 1. Sawed-bed range ashlar with uniform course heights and uniform lengths as indicated on Drawings.
 2. Sawed-bed range ashlar with uniform course heights as indicated on Drawings and with random lengths.
 3. Sawed-bed, broken-range ashlar with uniform course heights as indicated on Drawings and with random lengths.
 4. [Sawed] [Split]-bed, random-range ashlar with random course heights and random lengths (interrupted coursed).
 5. Coursed rubble.
 6. Uncoursed rubble (fieldstone).

7. Polygonal or mosaic.
- G. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.
1. Finish: [**Split face**] [**Rock face (pitched face)**] [**Smooth**] [**Sandblast**] [**Honed**]
 2. Finish for Sills: [**Smooth, machine finish**] [**Sand-blasted finish**] [**Split face with sand-blasted finish on washes**] [**Rock face (pitched face) with sand-blasted finish on washes**] [**Rock face (pitched face) with smooth finish on washes**].
 3. Finish for Lintels: [**Smooth, machine finish**] [**Sand-blasted finish**] [**Split face**] [**Rock face (pitched face)**]
 4. Finish for Copings: [**Smooth, machine finish**] [**Sand-blast finish**] [**Split faces**] [**Rock face (pitched face), front and back; sand-blasted finish on top**] [**Rock face (pitched face), front and back;**
 - a. Finish exposed ends of copings same as front and back faces.
- H. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

2.10 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride.
 2. Add cold-weather admixture (if used) at same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Stone Masonry: Comply with [**ASTM C 270**] Proportion Specification.
- D. Mortar for Stone Masonry: Comply with [**ASTM C 270**] Property Specification.
1. Extended-Life Mortar: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.
 2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 3. Mortar for Setting Stone: Type [**S**] [**N**].
 4. Mortar for Pointing Stone: Type [**N**] [**O**].

- E. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- F. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.
 - 1. For latex-modified portland cement setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.
- G. Mortar for Scratch Coat over Metal Lath: 1 part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency. (Adhered Veneer)
- H. Mortar for Scratch Coat over Unit Masonry: 1 part portland cement, 1 part lime, 7 parts loose damp sand, and enough water to produce a workable consistency. (Adhered Veneer)
- I. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
 - 1. Mix to match Architect's sample.
 - 2. Pigments shall not exceed 10 percent of portland cement by weight.
 - 3. Pigments shall not exceed 5 percent of [mortar cement] [or] [masonry cement] by weight.
- J. Colored-Aggregate Mortar: Produce color required by combining colored aggregates with cementitious materials of selected color.
 - 1. Mix to match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone veneer assemblies, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in unit masonry or concrete and required for or extending into stone veneer assemblies are correctly installed.
 - 2. Examine wall framing, sheathing, and building paper or building wrap to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone veneer assemblies.

- B. Accurately mark stud centerlines on face of building paper or building wrap before beginning stone installation.
- C. Coat concrete backup with asphalt dampproofing.
- D. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING OF STONE VENEER, GENERAL

- A. Perform necessary field cutting as stone is set. Use power saws to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange[**and trim**] stones for accurate fit in range ashlar pattern with course heights as indicated, [**uniform**] [**random**] lengths, and uniform joint widths, with offset between vertical joints as indicated.
- D. Arrange[**and trim**] stones for accurate fit in broken-range ashlar pattern with uniform course heights, random lengths, and uniform joint widths.
- E. Arrange[**and trim**] stones for accurate fit in three-course, random-range ashlar pattern with random course heights, random lengths (interrupted coursed), and uniform joint widths.
- F. Arrange stones for good fit in [**courses**] [**uncoursed**] rubble pattern with joint widths within tolerances indicated.[**Insert small stones into spaces between larger stones as needed to produce joints as uniform in width as practical.**]
- G. Arrange and trim stones for accurate fit in polygonal (mosaic) pattern with uniform joint widths.
- H. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- I. Set stone to comply with requirements indicated on Drawings. Install veneer anchors, supports, fasteners, and other attachments indicated or necessary to secure stone veneer assemblies in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- J. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any. Lay walls with joints not less than [**1/4 inch**] [**3/8 inch**] at narrowest points nor more than [**3/8 inch**] [**1/2 inch**] [**5/8 inch**] [**1 inch**] [**1-1/2 inches**] at widest points.
- K. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Keep expansion and pressure-relieving joints free of mortar and other rigid materials.

2. Sealing expansion, control, and pressure-relieving joints is specified in Division 7 Section "Joint Sealants."
- L. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
1. At **[wood]** **[cold-formed metal]**-framed walls, extend flashing from exterior face of veneer, through the veneer, up the face of sheathing at least **8 inches**, and behind building paper or building wrap.
 2. At lintels and shelf angles, extend flashing full length of angles but not less than **4 inches** into masonry at each end.
 3. At heads and sills, extend flashing **4 inches** at ends and turn up not less than **2 inches** to form a pan.
 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than **1-1/2 inches** or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
 5. Extend sheet metal flashing **1/2 inch** beyond face of masonry at exterior and turn flashing down to form a drip.
 6. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing **1/2 inch** back from outside face of wall and adhere flashing to top of metal drip edge.
 7. Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing **1/2 inch** back from outside face of wall and adhere flashing to top of metal flashing termination.
 8. Cut flashing flush with face of wall after masonry wall construction is completed.
- M. Coat limestone with dampproofing as follows:
1. Stone at Grade: Beds, joints, and back surfaces to at least **12 inches** above finish-grade elevations.
 2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.
 3. Allow cementitious dampproofing formulations to cure before setting dampproofed stone. Do not damage or remove dampproofing in the course of handling and setting stone.
- N. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
1. Use **[round plastic tubing]** **[rectangular plastic tubing]** **[wicking material]** **[aluminum weep hole/vent]** **[plastic weep hole/vent]** **[vinyl weep hole/vent]** **[or]** **[open head joints]** to form weep holes.
 2. Use wicking material to form weep holes above flashing in stone sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 3. Space weep holes **[16 inches]** **[24 inches]** o.c.
 4. Space weep holes formed from **[plastic tubing]** **[or]** **[wicking material]** **16 inches** o.c.
 5. In cavities, place pea gravel to a height of **2 inches** above top of flashing embedded in the wall, as masonry construction progresses.
 6. Place cavity drainage material **[immediately above flashing in cavities]** **[in cavities for full height of cavity]**.

- O. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
- P. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use [**round plastic tubing**] [**rectangular plastic tubing**] [**aluminum weep hole/vent**] [**plastic weep hole/vent**] [**vinyl weep hole/vent**] [**or**] [**open head joints**] to form vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed **1/4 inch in 10 feet**, **3/8 inch in 20 feet**, or **1/2 inch in 40 feet** or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed **1/4 inch in 20 feet** or **1/2 inch in 40 feet** or more.
- B. Variation from Level: For [**bed joints and**] lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed **1/4 inch in 20 feet** or **1/2 inch in 40 feet** or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed **1/2 inch in 20 feet** or **3/4 inch in 40 feet** or more.
- D. Measure variation from level, plumb, and position shown in plan as variation of the average plane of the face of each stone from level, plumb, or dimensioned plane.
- E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.
- F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.
- G. Variation in Plane on Face of Individual Stone: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES

- A. Anchor stone veneer to concrete with corrugated-metal veneer anchors as follows:
 - 1. Secure veneer anchors by inserting dovetailed ends into dovetail slots in concrete.
 - 2. Embed veneer anchors in mortar joints to within **1 inch** of face.
- B. Anchor stone veneer to unit masonry with metal veneer anchors as follows:
 - 1. Embed corrugated-metal anchors in unit masonry mortar joints or grouted cells for distance at least one-half of veneer thickness.
 - 2. Secure wire anchors by inserting pintles into eyes of masonry wall reinforcement projecting from horizontal mortar joints.
 - 3. Secure triangular wire anchors with vertical rods inserted through anchors and through eyes of masonry wall reinforcement projecting from horizontal mortar joints.
 - 4. Embed anchors in veneer mortar joints to within **1 inch** of face.

5. Bend ends of wire anchors at right angles to form hooks not less than **2 inches** long.
- C. Anchor stone veneer to unit masonry with adjustable, screw-attached veneer anchors as follows:
1. Fasten each anchor section to unit masonry with two screws.
 2. Embed wire tie section in mortar joints to within **1-1/2 inches** of face.
- D. Anchor stone veneer to unit masonry with seismic veneer anchors as follows:
1. Fasten each anchor section to unit masonry with two screws.
 2. Embed connector section in mortar joints to within **1-1/2 inches** of face.
- E. Anchor stone veneer to [**wood**] [**cold-formed metal**] framing with adjustable, screw-attached veneer anchors as follows:
1. Fasten each anchor section through sheathing to framing with two screws.
 2. Embed wire tie section in mortar joints to within **1-1/2 inches** of face.
- F. Anchor stone veneer to [**wood**] [**cold-formed metal**] framing with screw-attached veneer anchors as follows:
1. Fasten each anchor section by screwing through sheathing into framing.
 2. Embed wire tie section in mortar joints to within **1-1/2 inches** of face.
- G. Anchor stone veneer to [**wood**] [**cold-formed metal**] framing with seismic veneer anchors as follows:
1. Fasten each anchor section through sheathing to framing with two screws.
 2. Embed connector section in mortar joints to within **1-1/2 inches** of face.
- H. Anchor stone veneer to [**wood**] [**cold-formed metal**] framing with metal veneer anchors as follows:
1. Fasten [**corrugated-metal**] [**or**] [**wire**] anchors through sheathing to wood studs with corrosion-resistant roofing nails.
 2. Fasten wire anchors to metal studs by tying.
 3. Embed anchors in mortar joints to within **1 inch** of face.
 4. Bend ends of wire anchors at right angles to form hooks not less than **2 inches** long.
- I. Space veneer anchors not more than **16 inches** o.c. vertically and **24 inches** o.c. horizontally. Install additional veneer anchors within **12 inches** of openings, sealant joints, and perimeter at intervals not exceeding **12 inches**.
- J. Space veneer anchors not more than **18 inches** o.c. vertically and **32 inches** o.c. horizontally, with not less than 1 veneer anchor per **2.67 sq. ft.** of wall area. Install additional veneer anchors within **12 inches** of openings, sealant joints, and perimeter at intervals not exceeding **12 inches**.
- K. Set stone in full bed of mortar with full head joints, unless otherwise indicated. Build veneer anchors into mortar joints as stone is set.
1. Install continuous wire reinforcement in horizontal joints indicated and attach to seismic veneer anchors as stone is set.

- L. Fill [**collar joint**] [**space between back of veneer and building paper or building wrap**] with mortar as stone is set.
- M. Provide [**1-inch**] [**2-inch**] air space between stone veneer assemblies and backup construction, unless otherwise indicated. Keep air space free of mortar droppings and debris.
 - 1. Place mortar spots in cavity at veneer anchors to maintain spacing.
 - 2. Slope beds toward air space to minimize mortar protrusions into air space. As work progresses, trowel mortar fins protruding into air space flat against back of veneer.
- N. Rake out joints for pointing with mortar to depth of not less than [**1/2 inch**] [**3/4 inch**] before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 INSTALLATION OF ADHERED STONE VENEER ASSEMBLIES

- A. Install flashing over sheathing and behind building paper or building wrap by fastening through sheathing into framing.
- B. Install lath over building paper or building wrap by fastening through sheathing into framing to comply with ASTM C 1063.
- C. Install lath over unit masonry and concrete to comply with ASTM C 1063.
- D. Install scratch coat over metal lath **3/8 inch** thick to comply with ASTM C 926.
- E. Coat backs of stone units and face of [**scratch coat**] [**masonry backup**] with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and [**scratch coat**] [**masonry backup**].
- F. Rake out joints for pointing with mortar to depth of not less than [**1/2 inch**] [**3/4 inch**] before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.7 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than **3/8 inch** deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers not more than **3/8 inch** deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: [**Concave**] [**Smooth, flat face slightly below edges of stone**] [**Smooth, flat face recessed 1/4 inch below edges of stone (raked joint)**] [**Flush, with a 3/8-inch half-round raised bead in middle of joint**] [**As indicated**].

3.8 ADJUSTING AND CLEANING

- A. Remove and replace stone veneer assemblies of the following description:
 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 2. Defective joints.
 3. Stone veneer assemblies not matching approved samples and mockups.
 4. Stone veneer assemblies not complying with other requirements indicated.
- B. Replace in a manner that results in stone veneer assemblies' matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone veneer assemblies.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 5. Clean stone veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.
 6. Clean stone veneer assemblies with proprietary acidic cleaner applied according to manufacturer's written instructions.
 7. Clean limestone veneer assemblies to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.9 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches in greatest dimension.

2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
 3. Do not dispose of masonry waste as fill within **18 inches** of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

END OF SECTION 044313