Exhibit B3 Preliminary Masonry Inspection Requirements

COOPER UNIVERSITY HEALTH CARE
COOPER UNIVERSITY HOSPITAL - TOWER A
CAMDEN, NEW JERSEY

SECTION 042100

MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Exterior, non-load bearing masonry veneer units and supplementary items necessary for installation.

1.2 DEFINITIONS

A. Masonry Veneer Terminology: Refer to BIA 2 and other referenced quality standards.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical literature for each type of product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

a. Kind, size, and color of masonry unit.
b. Manufactured accessory product.
c. Cleaning products, including application procedures.

B. Shop Drawings: Show details of construction and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work. Including, but not limited to, the following:

1. Flashing: Large-scale details for each element of flashing system showing layout, profiles, methods of joining, and anchorage details; including lintel units, shelf units, corner units, end dam units, conditions showing interface and relationship to adjacent materials, and other special applications.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification Purposes: Submit samples for each item listed below of size and construction indicated. Where products involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. Masonry Veneer: Full-size samples for each different unit indicated.
2. Pigmented and Color Aggregate Mortar: Make samples using same sand and mortar ingredients to be used on Project; label samples to indicate type and amount of pigments used.
3. Accessories: Samples of manufactured products, including anchors, ties, cavity drainage material, flashing materials, weeps, vents, and other accessories.
4. Flashing: Samples of each shape, profile, intersection and transition required, not less than 12 in (300 mm) long, including end dam, and splice/lap joint for lintel and shelf angle flashing; demonstrate soldering quality.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C67.

2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Mortar admixtures, if any.
4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Anchors, ties, and metal accessories.

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

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention.

D. Field Quality Control Reports: Written report of testing and inspection required by Field Quality Control.

1.5 QUALITY ASSURANCE

A. Quality Standards: In addition to specified requirements, comply with TMS 402/602 and local building code, whichever is more stringent.

B. Installer Qualifications:

1. Experience: Installer personnel with not less than 10 years of experience in the successful performance of Work similar to scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 10 years of experience installing products and systems similar to scope of this Project.

C. Hot and Cold Weather Work Plan: Written plan detailing methods, materials and equipment to be used to comply with weather requirements.

D. Masonry Veneer Cleaning Plan: Based on technical information provided by respective manufacturer for each masonry veneer unit to be cleaned, prepare written plan for cleaning exposed masonry veneer surfaces, prepared by commercial cleaning compound manufacturer, with signature of installer indicating acceptance and include following information:

1. Qualifications of applicators.
2. Products to be used and application procedures.

3. Masonry veneer surfaces to be cleaned and required preparations.
4. Environmental requirements by authorities having jurisdiction for use and discharge of cleaning effluents.
5. Protection of surrounding areas, landscaping, and building surfaces adjacent to area of cleaning.

E. Sample Panels: Prior to installing masonry, build as many sample panels as required to verify selections made under submittals and to demonstrate aesthetic effects using specified materials:

1. Build approximately 48 in (1200 mm) square for each type of exposed masonry units.
2. Locate at locations indicated or, if not indicated, as directed by Architect.
3. Clean exposed faces with masonry cleaner specified.
4. Where masonry is to match existing masonry, erect panels adjacent and parallel to an existing, south-facing wall.
5. Notify Architect 7 days in advance of the dates and times when panels will be constructed.
6. Protect accepted approved sample panels with weather-resistant membrane.
7. Maintain during construction in an undisturbed condition as a standard for judging completed Work.
8. Acceptance Approval of panels is for following aesthetic qualities; acceptance approval does not constitute acceptance approval of deviations from Contract Documents, unless specifically accepted approved by Architect in writing:

    a. Color, texture, and blending of masonry units.
    b. Color and blending of mortar.
    c. Relationship of mortar and sealant colors to masonry unit colors.
    d. Tooling of joints.
    e. Effectiveness of masonry cleaner.
    f. Other aesthetic qualities as determined by the Architect.

9. When directed, demolish and remove mock-up from Project site, including foundations.

F. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up using materials indicated for the completed Work.

1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.

    a. Show typical components, attachments to building structure, and requirements of installation.
    b. Include control joints and through wall flashing with drip edge.

2. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
3. Obtain Architect's acceptance of mock-ups before starting fabrication or installation.
4. Acceptance of mock-ups does not constitute acceptance of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor and accepted by Architect in writing.
5. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

1.6 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

a. Architect.
b. Contractor, including superintendent.
c. Installer, including project manager and supervisor.
d. If requested, Manufacturer's qualified technical representative.
e. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
b. Review Contract Document requirements.
c. Review approved submittals.
d. Review inspection and testing requirements.
e. Review environmental conditions and procedures for coping with unfavorable conditions.
f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Label pallets of masonry veneer units with manufacturers name, product name, and information required to identify products.

B. Storage:

1. Masonry Veneer Units: Store on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
2. Cementitious Materials: Store on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
3. Aggregates: Store where grading and other required characteristics can be maintained and contamination avoided.
4. Accessories: Store to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection during Work: Prevent excess moisture from entering Work in progress.

1. Cover tops of walls, projections, and sills with water-repellent tarps or heavy plastic sheets at end of each day's Work.
2. Cover partially completed masonry veneer when construction is not in progress.

3. Extend cover minimum of 24 in (600 mm) down both sides and hold cover securely in place.
4. Protect door and window frames from damage.

B. Stain Prevention: Prevent mortar and soil from staining exposed masonry veneer. Immediately remove mortar and soil from exposed masonry veneer.

1. Protect base of walls from rain-splashed mud and mortar splatter.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, and other adjacent with painted and integral finishes from mortar droppings.
4. Turn scaffolding planks near Work on edge at end of each day to prevent rain from splashing mortar droppings or dirt onto face of exposed masonry veneer.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602.

1. Do not apply when ambient temperature is less than 32 deg F (0 deg C) or when 40 deg F (4.4 deg C) or less and falling.
2. Provide heat and protection (temporary or permanent) as required to protect Work from freezing for not less than 48 hours after application.
3. Distribute heat uniformly to prevent concentration of heat near sources; provide deflection or protective screens.
4. Use liquid cleaning methods only when air temperature is 40 deg F (4.4 deg C) and above and will remain so until masonry veneer has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

1. Protect Work against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial.
2. Apply and cure work as required by climatic and job conditions to prevent dryout during cure period.
3. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

1.9 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section Substitution Procedures.

B. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other available manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Masonry Units: Obtain exposed masonry veneer units of a uniform texture and color, or a uniform blend within ranges accepted for these characteristics.

C. Cementitious Materials: Obtain cementitious ingredients of a uniform quality, including color, for each component.

2.3 MASONRY UNITS, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in standard. Do not install units where defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in completed Work or will impair quality of completed masonry veneer.

2.4 FACE BRICK MASONRY UNITS

A. Product Quality Standard: ASTM C 216 or ASTM C 652, Grade SW, Type FBS.

1. Unit Compressive Strength: Minimum 3000 psi (20.7 MPa) for average of 5 bricks, and 2500 psi (17.2 MPa) for individual brick, gross area, according to ASTM C 67, Section 7.
2. Hot and Cold Water Testing:

    a. Water Absorption: Maximum 17.0 percent for average of 5 bricks, and 20.0 percent for individual brick, according to ASTM C 67, Section 8 for 5 hour boiling test.
    b. Saturation Coefficient: Maximum 0.78 for average of 5 brick, and 0.80 for individual brick.
    c. Requirement Waivers:

        1) Absorption: Saturation coefficient requirement may be waived if there is maximum 8.0 percent absorption of random sampling of 5 bricks according to ASTM C 67, Section 8 for 24 hour submersion test.
        2) Freezing and Thawing: Water absorption and saturation coefficient requirements may both be waived if there is maximum 0.5 percent loss in dry weight of any individual brick according to ASTM C 67, Section 9, for 50 cycles of freezing and thawing.

3. Initial Rate of Absorption: Between 5 and 25 g/m per 30 sq in (0.02 sq m) according to ASTM C 67, Section 10. Use of coating to establish initial rate of absorption is not permitted and will not be allowed.
4. Efflorescence: Rated "not effloresced" according to ASTM C 67, Section 11.
5. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing according to ASTM C 67, Section 8, with no observable difference in applied finish when viewed from 10 ft (3 m) under an minimum illumination of 50 foot-candles (538 lumen/square meter).

B. Basis of Design: As scheduled or as indicated in Design Selections.

2.5 MORTAR MATERIALS

A. Portland Cement:

1. Material Quality Standard: ASTM C 150, Type I; except Type III may be used for cold-weather construction.
2. Color: Natural gray color or white cement as required to produce mortar color required.
3. Manufacturers:

a. LafargeHolcim.
b. Lehigh Cement Co.
c. Lone Star Industries, Inc.
d. Rinker Materials.
e. Royal White Cement.

4. Types of Cements Not permitted:

a. Masonry Cement: ASTM C 91.
b. Mortar Cement: ASTM C 1329.

B. Hydrated Lime:

1. Material Quality Standard: ASTM C 207, Type S.
2. Manufacturers:

a. Graymont Dolime (OH) Inc.
b. Rockwell Lime Co.

C. Aggregate for White Mortar: Natural white sand or ground white stone, as required to match approved sample.

D. Aggregate for Colored Mortar: Natural sand or ground marble, granite, or other sound stone, as required to match approved sample.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Quantity Limitations: Pigments shall not exceed 10 percent of Portland cement by weight for mineral oxides or 2 percent for carbon black.

2. Manufacturers and Products:

a. Bayer Corp., Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
b. Davis Colors; True Tone Mortar Colors.
c. Solomon Grind-Chem Service, Inc.; SGS Mortar Colors.

F. Colored Portland Cement-Lime Mix: Packaged blend made from Portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Quantity Limitations: Pigments shall not exceed 10 percent of Portland cement by weight or 2 percent for carbon black.
2. Manufacturers and Products:

a. Capital Materials Corp.; Riverton Portland Cement Lime Custom Color.
b. Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
c. LafargeHolcim; Eaglebond.
d. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

G. Water: Potable, clean and free of amounts of oils, acids, alkalies, salts, organic materials, or other substances that are deleterious to mortar or any metal within the wall.

2.6 REINFORCEMENT

A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

2.7 VENEER ANCHORS AND TIES

A. General: For attaching masonry veneer to a back-up structure, use two-piece assemblies that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall; suitable for attachment conditions indicated.

1. Corrugated ties are not permitted.

B. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 in (1.3 mm).

C. Adjustable Anchors for Connecting to Concrete, CMU or Structural Steel:

1. Description: Two-piece adjustable veneer anchoring system.

a. Anchors: Zinc alloy barrel, flanged head, screw and eye, with drilling threads suitable for structural substrate.
b. Ties: Hot-dip galvanized, carbon-steel wire, 3/16 in (5 mm) pre-coated diameter, triangular shaped ties, size as required to provide maximum bond, not less than 2 in (50 mm).

2. Basis of Design:

a. Heckmann Building Products, Inc.; POS-I-TIE Masonry Veneer Anchor System with Triangle Tie (with ThermalGrip CI Washers at Cavity Insulation).

b. Hohmann & Bernard, Inc.; Thermal Concrete 2-Seal Wing Nut Adjustable Thermal Veneer Anchor (with Wing Nut Anchor at Cavity Insulation).

D. Adjustable Masonry Veneer Anchors for Sheathed Steel Studs Walls with Insulation in Cavity:

1. Anchor Plate: Minimum 0.0713 in (14 gage) (1.81 mm) uncoated base metal thickness, with projecting horizontal tabs of length to allow for insulation thickness, with holes or slots to receive pintel legs, with two screw holes; with rubberized asphalt flexible flashing material either adhered to back of plate, or loose for separate mounting.
2. Insulation Retainer: Manufacturer's standard designed to hold cavity insulation in place.
3. Wire Pintel: Minimum 3/16 in (5 mm) diameter, bent into open-end rectangle box shaped tie with 2 legs bent down to slip into anchor slot; length as required to extend at least halfway through masonry veneer but with minimum 5/8 in (15 mm) cover on outside face of masonry veneer.
4. Manufacturers and Products:

a. Hohmann & Barnard, Inc.; HB-213-2X Adjustable Veneer Anchor (Anchor Plate, Insulation Retainer and Wire Pintel).
b. Prosoco; Masonry Veneer Tie (Anchor Plate, Insulation Retainer and Wire Tie).
c. Wire-Bond; RJ-711 Adjustable Veneer Anchor (2401 Anchor Plate, Insulation Retainer and 2402 Wire Pintel).

E. Polymer-Coated Steel Drill Screws for Steel Studs:

1. Material Quality Standard: ASTM C 954.
2. Description: Self-drilling, hex washer head with bonded EPDM washer, screw of size and length required to penetrate steel stud flange by not less than 3 exposed threads; corrosion protective organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
3. Manufacturers and Products:

a. Elco Construction Products; Dril-Flex with Stalgard finish.
b. ITW Buildex; Teks Maxiseal with Climaseal finish.

2.8 MISCELLANEOUS ANCHORS

A. Dovetail Slots in Concrete for Shelf Angles: As specified in Division 03 Section Concrete Accessories unless indicated otherwise.

2.9 EMBEDDED FLASHING MATERIALS

A. Sheet Metal Flashing: Metal flashing to comply with SMACNA's Architectural Sheet Metal Manual and as follows:

1. Material:

a. Quality Standard: ASTM A 240 / A 240M or A 666, Type 304.
b. Description: Stainless steel, 2D annealed finish, not less than 0.0250 in (24 ga) (0.64 mm) thick, unless noted otherwise.

2. Solder:

a. Material Quality Standard: ASTM B 32, Grade Sn60.
b. Description: Solder with acid flux of type recommended by stainless steel sheet manufacturer; use a noncorrosive rosin flux over tinned surfaces.

B. Sealant for Sheet Metal Flashing: Exterior non-sag silicone sealant, Class 100/50, as specified in Division 07 Section Joint Sealants.

C. Sealant for Use at Concealed Joints: Contractor's option, one of the following:

1. Butyl: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
2. Silicone: ASTM C 920, single-component, neutral cure silicone sealant.

a. Basis of Design: Dow; Dowsil 758 Silicone Weather Barrier Sealant.

D. Rubberized-Asphalt Flexible Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.02 mm).

1. Manufacturers and Products:

a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
b. Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
c. GCP Applied Technologies; Perm-A-Barrier Wall Flashing.
d. Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
e. Hohmann & Barnard, Inc.; Textroflash.
f. W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
g. Polyguard Products, Inc.; Polyguard 400.

2. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
3. Compatibility: Flexible flashing shall be compatible with air and water barrier and approved by air and water barrier manufacturer in writing.

E. 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.

2.10 ACCESSORIES

A. Weeps and Vents: Provide one of the following:

1. Plastic Weep and Vent:

a. Description: One-piece flexible extrusion made from ultraviolet light resistant polypropylene copolymer, consisting of honeycomb matrix of multiple cells, designed to fill head joint with outside face held back 1/8 in (3 mm) from exterior face of masonry veneer.
b. Color: As selected by Architect from manufacturer's standard colors available.
c. Manufacturers and Products:

1) Advanced Building Products, Inc.; Mortar Maze Weep Vents.
2) Heckmann Building Products, Inc.; No. 85 Cell Vent.
3) Hohmann & Barnard, Inc.; QV - Quadro-Vent.
4) Wire-Bond; Cell Vent

2. Mesh Weep and Vent:

a. Description: Compressed, 200 denier polyester with 90 percent open mesh and bonded with flame retardant adhesive.
b. Color: As selected by Architect from manufacturer's standard colors available.
c. Basis of Design: Mortar Net USA, Ltd.; Mortar Net Weep Vents.

B. Cavity Drainage Material:

1. Description: Composed of either reticulated, nonabsorbent mesh made from polyethylene strands, or, polymer core geomatrix composed of woven nylon strands, molded and shaped in open weave configuration to maintain drainage at weeps without being clogged by mortar droppings, size as required to extend across entire width of cavity.
2. Manufacturers and Products:

a. Advanced Building Products, Inc.; Mortar Break II.
b. Heckmann Building Products, Inc.; No. 84 Weep-Thru Mortar Deflector.
c. Mortar Net USA, Ltd.; Mortar Net.
d. Polyguard Products, Inc.; Termi-Net.
e. Wire-Bond; Cavity Net II.

C. Bond Breaker Strips:

1. Material Quality Standard: ASTM D 226, Type I.
2. Description: Asphalt-saturated organic roofing felt (No. 15 asphalt felt).

D. Termination Bars: ASTM A 666, Type 304 formed stainless steel flat bars; 1 in by 1/8 in (25 mm by 3 mm) thick; predrilled at 8 in (200 mm) centers. No aluminum or plastic bars allowed.
1. Anchors: Same type screws as used to attach veneer wall ties.

E. Cavity Wall Insulation: As specified in Division 07 Section Thermal Insulation.

F. Barrier Sealing Tape: Air and water barrier sheet material laminated to adhesive coated rubberized asphalt or butyl. Refer to Division 07 Section Air and Water Barriers.

G. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity provided by waterproofing manufacturer.

H. Asphalt Mastic Dampproofing: Water-based, cold-applied, non-flammable, asphalt mastic emulsion with refined asphalt, non-asbestos mineral fibers, and clay fillers complying with ASTM D 1227, Type II, Class 1. Brush, roller, or trowel grade allowed. Include primer and accessories as required.

2.11 MASONRY VENEER CLEANERS

A. Commercial Cleaning Compounds: Products as recommended and approved by masonry veneer and mortar manufacturers.

1. Description: Manufacturer formulated, general purpose cleaner for removing mortar stains, efflorescence, and other construction related stains from new masonry veneer surfaces, with following suitability requirements:

   a. Suitable for masonry veneer units and mortar installed, without discoloring or damaging masonry veneer materials.
   b. Suitable for conditions at project site, including, but not limited to, windows, doors, other exterior wall elements, and adjacent walks or landscaping.

2. Manufacturers:

   a. Diedrich Technologies, Inc.
   b. EaCoChem.
   c. Prosoco, Inc.

B. Cleaning Restrictions: Following methods are not permitted nor will they be allowed:

1. Hydrochloric acid.
2. Muratic acid.
3. Pressurized water blasting.
4. Abrasive blasting.

2.12 METAL FLASHING FABRICATION

A. Field Measurements: Where metal flashing is to fit, cope, or be tailored to other construction, check actual dimensions of other construction by accurate field measurements before fabrication of metal flashing.

B. Fabrication Procedures: Fabricate continuous flashings in sections 8 ft (2.4 m) long minimum, but not exceeding 12 ft (3.6 m). Provide splice plates at joints of formed, smooth metal flashing.

1. Shop form flashing on a bending brake.
2. Shape, trim and hand seam on bench as far as practical with proper tools.
3. Form exposed metal Work without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated.
4. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.
5. Form materials to shape indicated with straight lines, sharp angles and smooth curves.
6. Fold and hem exposed edges of flashings.

C. Flashing Joinery: Fabricate interior and exterior corners, intersections, and complex flashing conditions in shop, rather than in field, with properly folded, constructed and continuous soldered joints. Field fabricated units are not permitted and will not be allowed.

2.13 MORTAR MIX

A. General: Mix cementitious materials in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency for minimum 3 minutes to 5 minutes; do not hand mix.

1. Admixture Limitation: Do not use admixtures including air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, calcium chloride or other admixtures, unless otherwise indicated.

2. Cementitious Limitation: Limit cementitious materials in mortar to Portland cement and lime.
3. Ingredient Measurement: Measure in a one cubic foot batching box before mixing for component materials not pre-blended, prepackaged or containerized.
4. Aggregate Moisture Content: Monitor moisture content of aggregates and exercise caution when mixing to avoid over or under-sanding of mortar.

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

C. Mortar Mix:

1. Mix Quality Standard: ASTM C 270, Proportion Specification for Portland cement-lime mortars, Type N.
2. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required; limit mineral oxide pigments to maximum 10 percent of cement content by weight, and maximum 2 percent for carbon black pigment.
3. Colored Aggregate Mortar: Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Applicable portions of BIA Technical Notes on Brick Construction, if no other installation quality standard applies to condition.
2. TMS 602 and local building code requirements.
3. Respective manufacturer’s written installation instructions.
4. Accepted submittals.
5. Contract Documents.

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 INSTALLATION OF MASONRY VENEER

A. Installation Performance Requirements: Ensure masonry cavity is properly isolated from building interior to prevent water infiltration from infiltrating out of masonry cavity into other components of building such as window and door jambs and building interiors.

B. Openings: Leave for equipment to be installed before completion of masonry veneer; after installation of equipment, complete masonry veneer to match construction immediately adjacent to opening.

C. Cutting: Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, un-chipped edges. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Blending of Masonry Veneer Units: Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed. If color blending is a critical aspect of Work, manufacturer shall provide instructions for blending.

E. Mortar Workability: Maintain by remixing or retempering; mortar with added color pigments shall not be re-tempered. Discard mortar that has begun to stiffen or is not used within 2.5 hours after initial mixing.

3.5 SHELF ANGLES AND LINTELS

A. Steel Loose Lintels: Set where indicated or required, with not less than 8 in (200 mm) of bearing at each jamb, unless otherwise indicated.

3.6 LAYING MASONRY VENEER WALLS

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

B. Bond Patterns:

1. Exposed Masonry Veneer: One-half running bond or one-third running bond as indicated.
2. Concealed Masonry Veneer: Lay units in a wythe in running bond or bonded by lapping not less than 2 in (50 mm) lap.
3. Corners: Bond and interlock each course of each wythe. Do not use units with less than nominal 4 in (100 mm) horizontal face dimensions at corners or jambs.
4. Mitered corners are not allowed.

C. Stopping and Resuming Work: In each course, rack back one-half unit length for one-half running bond pattern or one-third unit for one-third running bond pattern; do not tooth. When resuming Work, clean masonry veneer surfaces that are to receive mortar, remove loose masonry veneer units and mortar.

D. Built-In Work:

1. As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry veneer around built-in items.
2. Fill space between steel frames and masonry veneer solidly with mortar, unless otherwise indicated.

3.7 MORTAR BEDDING AND JOINTING

A. General Procedures:

1. Do not disturb previously laid units.
2. Spread mortar for bed joint only so far ahead of laying units that mortar will be plastic when units are laid.
3. Butter end of unit with ample mortar so that head joint is completely filled with mortar when placed.
4. Do not deeply furrow bed joints or slush head joints.
5. Avoid over-plumbing and pounding of corners and jambs to fit stretcher unit after setting in place. Where adjustments must be made after initial setting, remove mortar and replace with fresh mortar.
6. Rock closures into place with both head joints and closure space spread with ample mortar. Place against adjacent units so that both horizontal and vertical joints are completely filled.

B. Mortar Joint Thickness: Minimum 3/8 in (10 mm) wide for head and bed joints.

C. Hollow Masonry Veneer Units: Lay with face shells fully bedded in mortar and with head joints of depth equal to bed joints; with entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

D. Solid Masonry Veneer Units: Lay with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and place into wall construction. Do not deeply furrow bed joints or slush head joints.

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

1. Make mortar joints straight, clean, and uniform in thickness. Tool joints to produce dense surface well bonded to edges.
2. Joints which are not tight at time of tooling shall be raked out, pointed, and then tooled.
3. Tool when mortar is partially set but still sufficiently plastic to bond.
4. Use a tool which compacts mortar, pressing excess mortar out of joint rather than dragging it out.
5. Tool vertical joint first.

3.8 MASONRY CAVITIES, WEEPS, AND VENTS

A. Cavity Cleaning: Keep cavity clean of mortar droppings and other materials. Strike joints facing cavity flush.

B. Mortar Protection: Install cavity drainage material at base of cavity to protect bottom of cavity from mortar droppings that would prevent weeps from draining infiltrated water.

C. Cavity Wall Insulation: As specified in Division 07 Section Thermal Insulation. In addition, install continuous strip of cavity insulation, minimum 3 in (75 mm) wide, at edges of cavities adjacent to jamb of through-wall openings.

D. Weeps: Install weeps at maximum 32 in (800 mm) on centers in head joints of first course of masonry veneer immediately above embedded flashings.

E. Vents: Install vents at maximum 32 in (800 mm) on centers in head joints of topmost course of masonry veneer immediately below shelf angles, and at top of each continuous cavity.

3.9 ANCHORING MASONRY VENEER

A. Adjustable Anchors for Connecting to Concrete, CMU or Structural Steel: Anchor masonry veneer to structural members where masonry veneer abuts or faces structural members to comply with following, with anchors embedded in masonry veneer joints and attached to structure:

1. Unless otherwise indicated, provide an open space not less than 1 in (25 mm) in width between back of masonry veneer and structural member. Keep open space free of mortar or other rigid materials.
2. Anchor masonry veneer to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors vertically and horizontally as required for coursing with one anchor for every 2 sq ft (1858 sq cm) of masonry veneer; stagger alternating anchors in each row.
4. Sheet Membrane Substrate: Apply a coating of liquid membrane behind through-wall attachments that penetrate sheet membrane.

B. Adjustable Masonry Veneer Anchors for Sheathed Steel Studs Walls: Anchor masonry veneer to sheathed steel studs with proper anchors.

1. Unless otherwise indicated, provide an open space not less than 2 in (50 mm) in width between back of masonry veneer and face of sheathing or 1 in (25 mm) from face of cavity insulation.
2. Keep open space free of mortar or other rigid materials.
3. Locate anchor plate portion of wall tie to allow maximum vertical differential movement of tie up and down.
4. Space anchors at 16 in (400 mm) on center vertically and 16 in (400 mm) on center horizontally as required for coursing.
5. Install additional anchors within 12 in (300 mm) of openings and at maximum 8 in (200 mm) on center around perimeter.
6. Attach each anchor through sheathing to steel studs with 2 metal fasteners each.

a. Air and Water Barrier: Install a strip of barrier flashing tape behind through-wall attachments that penetrate air and water barrier. Seal all penetrations with weather barrier sealant

7. Embed wall tie, in proper orientation, at least halfway through masonry veneer but with at least 5/8 in (15 mm) cover on outside face of masonry veneer.

3.10 EMBEDDED FLASHINGS

A. General: Drawings may not necessarily indicate or describe full extent of Work required for completion of embedded flashing.

B. Reglets and Nailers: Install for flashing and other related construction where they are shown to be built into masonry.

C. Scheduled Locations: In addition to conditions shown on Drawings, install embedded flashings within masonry cavity at following locations to direct downward flow of infiltrated water within cavity to exterior:

1. Shelf angles with end dams at through-wall openings; and with lap joints.
2. Lintels with end dams or laps.
3. Jambs at through-wall openings, full height from sill to head.
4. Other obstructions.

D. Preparation: Substrate surfaces shall be smooth and free from projections that could puncture flashing.

E. Flashing Installation: Provide continuous support for flashings and ensure positive drainage to exterior.

1. Install sheet metal flashing true to line and levels indicated; minimize quantity of lap joints by using longest units possible.
2. Set shaped sheet metal units in proper locations with outside hemmed edges flush with building face location indicated; attach cavity side flanges to sheathed steel stud wall with screw fasteners driven into studs.
3. At continuous shelf angles, terminate horizontal flashings at through-wall openings with properly folded and constructed sheet metal end dams with a depth equivalent to one masonry veneer course, with continuous soldered joints.
4. At lintels, terminate horizontal flashings at end of lintel with properly folded and constructed sheet metal end dams with a depth equivalent to one masonry veneer course, with continuous soldered joints.
5. At lap joints of horizontal flashings, form neat and aligned joints by interlocking splice plate within hemmed edge of sheet metal flashing profile; apply sealant and rubberized asphalt flashing as indicated to create water-resistant joint.
6. Set shaped sheet metal units at jambs of through-wall openings and lap inside of end dams at horizontal flashings below; coordinate installation with rigid cavity insulation.
7. Seal cavity edges of sheet metal flashings within masonry cavity to sheathing with continuous rubberized asphalt flashing.

F. Examination and Repair: Immediately prior to laying masonry veneer, examine exposed surfaces of flashing and seal penetrations and damaged areas with rubberized asphalt flashing material before covering with masonry veneer.

G. Asphalt Mastic Dampproofing Application: Apply continuous layer of product, without pinholes or holidays, at below grade masonry veneer locations and as indicated on drawings. Apply at coverage rate instructed by manufacturer.

1. Repair voids and damage. Patch with additional layer of asphalt mastic dampproofing extending 6 in (150 mm) beyond repaired areas in all directions.

3.11 MASONRY VENEER EXPANSION JOINTS

A. General: Install masonry veneer expansion joints materials as Work progresses. Do not allow materials to span masonry veneer expansion joints without provision to allow for in-plane wall or partition movement. Maintain joints free and clear of mortar.

B. Vertical Expansion Joints:

1. Locate where indicated but not to exceed 25 ft (7.6 m) on center, and within 10 ft (3 m), 4 ft (1.22 m) preferred, of each side of outside corner. Keep vertical joints straight, true, and continuous from top to bottom of masonry veneer.
2. Form open joint of width indicated for installation of sealant and backer rod specified in Division 07 Section “Joint Sealants”.

C. Horizontal Joints: Build in horizontal pressure-relieving joints below shelf angles and where indicated; construct of width required for installation of sealant and backer rod specified in Division 07 Section “Joint Sealants• .Locate not less than 3/8 in (9 mm) wide horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.12 INSTALLATION TOLERANCES

A. Conspicuous Lines:

1. Vertical: For such conditions as external corners, door and window jambs, reveals, and masonry veneer expansion joints, maximum variation of the following from plumb:

a. 1/8 in (3 mm) in 10 ft (3 m).
b. 1/4 in (6 mm) in 20 ft (6 m).
c. 1/2 in (12 mm) overall.

2. Horizontal: For such conditions as exposed lintels, sills, door and window heads, parapets, and reveals, maximum variation of the following from level:

a. 1/8 in (3 mm) in 10 ft (3 m).
b. 1/4 in (6 mm) in 20 ft (6 m).
c. 1/2 in (12 mm) overall.

B. Exposed Head Joints:

1. Vertical Alignment: Maximum variation of the following from plumb:

a. 1/4 in (6 mm) in 10 ft (3 m).
b. 1/2 in (12 mm) from plumb top to bottom of wall.

2. Thickness: Maximum variation from width indicated of plus or minus 1/8 in (3 mm); maximum variation from adjacent bed joint and head joint thicknesses 1/8 in (3 mm).

C. Exposed Bed Joints: Maximum variation from width indicated of plus or minus 1/8 in (3 mm), with a maximum thickness limited to 1/2 in (12 mm); maximum variation from bed joint thickness of adjacent courses of 1/8 in (3 mm).

D. Flush Alignment: Maximum variation of 1/16 in (1.5 mm) except due to warpage of masonry veneer units with tolerances specified for warpage of units.

3.13 FIELD QUALITY CONTROL

A. Testing Agency Field Service: The Owner will employ and pay a qualified independent testing agency to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor's expense.

1. Inspections and Testing: Special inspections in accordance with TMS 402/602 and the Building Code.

3.14 ADJUSTING

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

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

3.15 CLEANING

A. In-Progress Cleaning: As soon as practical, clean masonry veneer as Work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

B. Protection: Prior to Final Cleaning, protect surrounding areas, landscaping, adjacent surfaces, and vehicles from contact with cleaning products.

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

1. Protect adjacent and nearby materials, especially windows and glass, to avoid damage.
2. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
3. Test cleaning methods on mock-ups; leave one half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of permanent masonry veneer.
4. Clean masonry veneer by means recommended by cleaning product manufacturer using masonry cleaner compound as recommended and approved by masonry veneer and mortar manufacturers.
5. Avoid drifting of cleaning spray caused by wind.

a.

END OF SECTION

SECTION 042200

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Single wythe concrete unit masonry and supplementary items necessary for installation.

1.2 DEFINITIONS

A. Masonry Terminology: Refer to NCMA TEK 1-4 and other referenced quality standards.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each type of product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show details of construction, including dimensioned drawings, plans, elevations, sections, and details of components to be incorporated into Work including, but not limited to, the following:

1. Flashing: Large-scale details for each element of flashing system showing layout, profiles, methods of joining, and anchorage details; including lintel units, shelf units, corner units, end dam units, conditions showing interface and relationship to adjacent materials, and other special applications.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced masonry assemblies.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification Purposes: Submit samples for each item listed below of size and construction indicated. Where products involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. Accessories: Samples of manufactured products, including anchors, ties, cavity drainage material, flashing materials, and other accessories.
2. Flashing: Samples of each shape, profile, intersection and transition required, not less than 12 in (300 mm) long, including end dam, and splice/lap joint for lintel/shelf angle flashing; demonstrate soldering quality.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include data on material properties.
b. For masonry units, include data and calculations establishing average net-area compressive strength of units.

2. Integral water repellant used in CMU.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures, if any.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

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

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 402/602.

E. Field Quality Control Reports: Written report of testing and inspection required by “Field Quality Control”.

1.5 QUALITY ASSURANCE

A. Hot and Cold Weather Work Plan: Written plan detailing methods, materials and equipment to be used to comply with weather requirements.

1.6 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

a. Architect.
b. Contractor, including superintendent.
c. Installer, including project manager and supervisor.
d. If requested, Manufacturer's qualified technical representative.
e. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

   a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
   b. Review Contract Document requirements.
   c. Review approved submittals.
   d. Review inspection and testing requirements.
   e. Review environmental conditions and procedures for coping with unfavorable conditions.
   f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Label pallets of masonry units with manufacturers name, product name, and information required to identify products.

B. Storage:

1. Masonry Units: Store on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
2. Cementitious Materials: Store on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
3. Aggregates: Store where grading and other required characteristics can be maintained and contamination avoided.
4. Accessories: Store to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection during Work: Prevent excess moisture from entering Work in progress.

1. Cover tops of walls, projections, and sills with water-repellent tarps or heavy plastic sheets at end of each day's Work.
2. Cover partially completed masonry when construction is not in progress.
3. Extend cover minimum of 24 in (600 mm) down both sides and hold cover securely in place.
4. Protect door and window frames from damage.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602.

1. Do not apply when ambient temperature is less than 32 deg F (0 deg C) or when 40 deg F (4.4 deg C) or less and falling.
2. Provide heat and protection (temporary or permanent) as required to protect Work from freezing for not less than 48 hours after application.
3. Distribute heat uniformly to prevent concentration of heat near sources; provide deflection or protective screens.
4. Use liquid cleaning methods only when air temperature is 40 deg F (4.4 deg C) 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 TMS 402/602.

1. Protect Work against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial.
2. Apply and cure work as required by climatic and job conditions to prevent dryout during cure period.
3. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

1.9 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.

B. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other available manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within ranges accepted for these characteristics.

C. Cementitious Materials: Obtain cementitious ingredients of a uniform quality, including color, for each component.

2.3 MASONRY UNITS, GENERAL

A. Masonry Standard: Comply with TMS 402/602 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

C. Special Shapes: Provide shapes indicated and as follows for each form of masonry unit required:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. At interior locations, provide bullnosed units for outside exposed corners, unless otherwise indicated.

2.4 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119/NFPA 251/ UL 623 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

B. Regulatory Requirements: Comply with the provisions of the following codes, specifications, and standards, except as otherwise shown or specified:

1. TMS 402/602:

a. Maintain one copy of the standard in Project field office at all times during construction. Contractor's supervisory personnel are to be thoroughly familiar with this material as it applies to Project.

2.5 CONCRETE MASONRY UNITS (CMU)

A. Product Quality Standard: ASTM C 90, with following physical properties:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa).
2. Interior Location Weight Classification: Lightweight, unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 in (10 mm) less than nominal dimensions.
4. Exposed Faces: Manufacturer standard.

2.6 LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels as shown of the Drawings made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure prefabricated lintels before handling and installing.

2.7 MORTAR AND GROUT MATERIALS

A. Portland Cement:

1. Material Quality Standard: ASTM C 150, Type I; except Type III may be used for cold-weather construction.
2. Color: Natural gray color or white cement as required to produce mortar color required.
3. Manufacturers:

    a. LafargeHolcim.
    b. Lehigh Cement Co.
    c. Lone Star Industries, Inc.
    d. Rinker Materials.
    e. Royal White Cement.

4. Types of Cements Not permitted:

    a. Masonry Cement: ASTM C 91.
    b. Mortar Cement: ASTM C 1329.

B. Hydrated Lime:

1. Material Quality Standard: ASTM C 207, Type S.
2. Manufacturers:

    a. Graymont Dolime (OH) Inc.
    b. Rockwell Lime Co.

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

D. Aggregate for Standard Gray Mortar:

1. Product Quality Standard: ASTM C 144.
2. Mortar Exposed to View: Use washed aggregate consisting of natural sand or crushed stone.
3. Joints Less Than 1/4 in (6 mm) Thick: Use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable, clean and free of amounts of oils, acids, alkalies, salts, organic materials, or other substances that are deleterious to mortar or any metal within the wall.

2.8 JOINT REINFORCEMENT

A. Masonry Joint Reinforcement, General:

1. Product Quality Standard: ASTM A 951 / A 951M.
2. Interior Walls: Mill galvanized, carbon steel, ASTM A 641 / A 641M.
3. Wire Size for Side Rods: 0.148 in (3.77mm) diameter or as indicated.
4. Wire Size for Cross Rods: 0.148 in (3.77mm) diameter or as indicated.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 in (400 mm) on centers.
6. Lengths: Not less than 10 ft (3 m), with prefabricated corner and tee units.

B. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

C. Manufacturers:

1. Heckmann Building Products, Inc.
2. Hohmann & Barnard, Inc.
3. Wire-Bond.

2.9 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars Product Quality Standard: ASTM A 615 / A 615M or ASTM A 996 / A 996M, Grade 60 (Grade 420). Sizes as indicated on the Drawings.

2.10 ANCHORS AND TIES

A. Materials:

1. Interior Walls:

a. Mill Galvanized, Carbon Steel Wire, ASTM A 82 / A 82M with ASTM A 641 / A 641M, Class 1 coating.
b. Galvanized Steel Sheet, ASTM A 653 / A 653M, Commercial Steel, G60 (Z180) zinc coating.

B. Sizes and Thicknesses: If not indicated below, as shown on Drawings, required by building code, or required by TMS 602.

C. Adjustable Anchors for Connecting to Concrete or Structural Steel:

1. Description: Two-piece adjustable veneer anchoring system.

a. Anchors: Zinc alloy barrel, flanged head, screw and eye, with drilling threads suitable for structural substrate.
b. Ties: Hot-dip galvanized, carbon-steel wire, 3/16 in (5 mm) pre-coated diameter, triangular shaped ties, size as required to provide maximum bond, not less than 2 in (50 mm).

2. Basis of Design: Heckmann Building Products, Inc.; "POS-I-TIE Masonry Veneer Anchor System".

D. Rigid Anchors: Fabricate from steel bars 1-1/2 in (38 mm) wide by 1/4 in (6 mm) thick by 24 in (600 mm) long, with ends turned up 2 in (50 mm) or with cross pins, unless otherwise indicated, or bent to configuration indicated.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler:

1. Product Quality Standard: ASTM D 1056, Grade 2A1.
2. Description: Pre-molded filler strips formulated from neoprene; compressible up to 35 percent; of width and thickness indicated.

B. Pre-formed Control Joint Gaskets:

1. Product Quality Standard: ASTM D 2000, Designation M2AA-805.
2. Description: Formed from styrene-butadiene-rubber compound designed to fit standard sash block to maintain lateral stability in masonry wall.

C. Bond Breaker Strips:

1. Product Quality Standard: ASTM D 226, Type I.
2. Description: Asphalt-saturated, organic roofing felt (No. 15 asphalt felt).

D. Reinforcing Bar Positioners:

1. Description: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142 in (3.6 mm) steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.
2. Manufacturers and Products:

   a. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
   b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
   c. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.12 MORTAR AND GROUT MIXES

A. General: Mix cementitious materials in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency for minimum 3 minutes to 5 minutes; do not hand mix.

1. Admixture Limitation: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, calcium chloride, or other admixtures, unless otherwise indicated.

2. Cementitious Limitation: Limit cementitious materials in mortar and grout to Portland cement and lime.
3. Ingredient Measurement: Measure in a one cubic foot batching box before mixing for component materials not pre-blended, prepackaged or containerized.

4. Aggregate Moisture Content: Monitor moisture content of aggregates and exercise caution when mixing to avoid over or under-sanding of the mortar.

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

C. Mortar Mix:

1. Mix Quality Standard: ASTM C 270, Proportion Specification for portland cement-lime mortars, Types as follows for applications stated unless another type is indicated:

a. Non-Load-Bearing (Non-Reinforced) Masonry: Type N.
b. Other Applications: Type N where another type is not indicated.

2. Mortar Color: Standard gray, unless indicated otherwise.

a. Location: Interior, standard concrete masonry units.
3. Basis of Design: As scheduled or as indicated in Design Selections.

D. Grout for Unit Masonry:

1. Product Quality Standard: ASTM C 476.
2. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 402/602 for dimensions of grout spaces and pour height.
3. Use fine grout in grout spaces less than 2 in (50 mm) in horizontal dimension.
4. Use course grout in grout spaces 2 in (50 mm) or more in least horizontal dimension.
5. Provide grout with a slump of 8 to 11 in (200 to 275 mm) as measured according to ASTM C 143 / C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. TMS 602 and local building code requirements.
2. Applicable portions of NCMA TEK's.
3. Respective manufacturer's written installation instructions.
4. Accepted submittals.
5. Contract Documents.
6. PCA - Concrete Masonry Handbook, if no other installation quality standard applies to condition.

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 INSTALLATION OF CONCRETE UNIT MASONRY

A. Thickness: Build single-wythe masonry walls to actual widths of masonry units, using units of widths indicated.

B. Chases and Recesses: Build to accommodate items specified in this and other Sections.

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

D. Cutting: Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mortar Workability: Mortar with added color pigments shall not be retempered. Discard mortar that has begun to stiffen or is not used within 2.5 hours after initial mixing.

3.5 SHELF ANGLES AND LINTELS

A. Masonry Lintels: Construct in place using formwork and shoring of sufficient strength to support Work, until strength has been achieved and assembly is cured.

3.6 LAYING MASONRY WALLS

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

B. Bond Pattern for Exposed Masonry:

1. Exposed Masonry: Unless otherwise indicated, lay units in a wythe with all units in one-half running bond.
2. Concealed Masonry: Lay units in a wythe in running bond or bonded by lapping not less than 4 in (100 mm) lap.
3. Corners: Bond and interlock each course of each wythe. Do not use units with less than nominal 8 in (200 mm) horizontal face dimensions at corners or jambs.
4. Provide scheduled finish on all exposed surfaces, including corner units.
5. Mitered corners are not allowed.

C. Stopping and Resuming Work: In each course, rack back appropriate unit length for bond pattern; do not tooth. When resuming Work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar.

D. Built-in Work:

1. As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
2. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
3. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

E. Concrete Masonry Cores under Loads: Fill cores in hollow concrete masonry units with grout 24 in (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

F. Top of Fire-Rated Partitions: Treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems".

3.7 MORTAR BEDDING AND JOINTING

A. General Procedures:

1. Do not disturb previously laid units.
2. Spread mortar for bed joint only so far ahead of laying units that mortar will be plastic when units are laid.
3. Butter end of unit with ample mortar so that head joint is completely filled with mortar when placed.
4. Do not deeply furrow bed joints or slush head joints.
5. Avoid over-plumbing and pounding of corners and jambs to fit stretcher unit after setting in place. Where adjustments must be made after initial setting, remove mortar and replace with fresh mortar.
6. Rock closures into place with both head joints and closure space spread with ample mortar. Place against adjacent units so that both horizontal and vertical joints are completely filled.

B. Mortar Joint Thickness: Minimum 3/8 in (10 mm) wide for head and bed joints.

C. Hollow Concrete Masonry Units: Lay as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

D. Solid Concrete Masonry Units: Lay with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

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

1. Make mortar joints straight, clean, and uniform in thickness. Tool joints to produce dense surface well bonded to edges.
2. Joints which are not tight at time of tooling shall be raked out, pointed, and then tooled.
3. Tool when mortar is partially set but still sufficiently plastic to bond.
4. Use a tool which compacts mortar, pressing excess mortar out of joint rather than dragging it out.
5. Tool vertical joint first.

3.8 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 in (15 mm) on exterior side of walls, 1/2 in (12 mm) elsewhere. Lap reinforcement a minimum of 6 in (150 mm).

1. Space reinforcement not more than 16 in (400 mm) on centers.
2. Space reinforcement not more than 8 in (200 mm) on centers in parapet walls.
3. Provide reinforcement not more than 8 in (200 mm) above and below wall openings and extending 12 in (300 mm) beyond openings.

B. Installation Conditions:

1. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
2. Provide continuity at wall intersections by using prefabricated T-shaped units.
3. Provide continuity at corners by using prefabricated L-shaped units.
4. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Structural Anchors to Building Structure: Anchor masonry to structural members where masonry abuts or faces structural members to comply with following:

1. Unless otherwise indicated, provide an open space not less than 1/2 in (13 mm) in width between masonry and structural member. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 in (600 mm) on centers vertically and 36 in (900 mm) on centers horizontally.
4. Refer to Division 05 Section "Metal Fabrications" for requirements related to coordination between masonry and metal fabrications (Designation MF), including loose masonry lintel schedule, as shown on the Drawings.

3.10 CONTROL JOINTS

A. General: Install control joint materials as masonry progresses. Do not allow materials to span control joints without provision to allow for in-plane wall or partition movement. Maintain joints free and clear of mortar.

B. Control Joints: Form in concrete masonry using one of following methods:

1. Install preformed control-joint gaskets designed to fit standard sash block.
2. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
3. At structural bond beams, provide dummy groove or raked joint. Do not extend control joints through bond beams.

C. Control Joint Spacing: Locate control joints as indicated on the Drawings not to exceed 25 ft (7.5 m) on center. Keep control joints straight, true, and continuous from top to bottom of masonry. Form open control joint of width indicated for installation of sealant and backer rod specified in Division 07 Section “Joint Sealants”.

D. Horizontal Joints: Build in horizontal pressure-relieving joints as indicated; construct of width required for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants".

3.11 LINTELS

A. Concrete or Masonry Lintels: Provide lintels where shown and where openings of more than 24 in (600 mm) for block-size units are shown without structural steel or other supporting lintels.

1. Provide precast concrete lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars required to support loads indicated.
2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed and filled with coarse grout. Cure precast lintels before handling and installing.

B. Minimum Bearing: Provide 8 in (200 mm) at each jamb, unless otherwise indicated.

3.12 TOLERANCES

A. Conspicuous Lines:

1. Vertical: For such conditions as external corners, door and window jambs, reveals, and expansion joints, maximum variation of one of following from plumb:

   a. 1/8 in (3 mm) per 10 ft (3 m).
   b. 1/4 in (6 mm) per 20 ft (6 m).
   c. 1/2 in (12 mm) overall.

2. Horizontal: For such conditions as exposed lintels, sills, door and window heads, parapets, and reveals, maximum variation of one of following from level:

   a. 1/8 in (3 mm) per 10 ft (3 m).
   b. 1/4 in (6 mm) per 20 ft (6 m).
   c. 1/2 in (12 mm) overall.

B. Exposed Head Joints:

1. Vertical Alignment: Maximum variation of one of following from plumb:

a. 1/4 in (6 mm) per 10 ft (3 m).
b. 1/2 in (12 mm) from plumb top to bottom of wall.

2. Thickness: Maximum variation from width indicated of plus or minus 1/8 in (3 mm); maximum variation from adjacent bed joint and head joint thicknesses 1/8 in (3 mm).

C. Exposed Bed Joints: Maximum variation from width indicated of plus or minus 1/8 in (3 mm), with a maximum thickness limited to 1/2 in (12 mm); maximum variation from bed joint thickness of adjacent courses of 1/8 in (3 mm).

D. Flush Alignment: Maximum variation of 1/16 in (1.5 mm) except due to warpage of masonry units with tolerances specified for warpage of units.

3.13 FIELD QUALITY CONTROL

A. Testing Agency Field Service: The Owner will employ and pay a qualified independent testing agency to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor's expense.

1. Inspections and Testing: Special inspections in accordance with TMS 402/602 and the Building Code.

3.14 ADJUSTING

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

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

3.15 PROTECTION

A. Cleaning: During cleaning operations, protect surrounding areas, landscaping, adjacent surfaces, and vehicles from contact with cleaning products.

1. Clean surfaces prior to installation of windows and doors.
2. Avoid drifting of spray caused by wind.

3.16 CLEANING

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

END OF SECTION

SECTION 044200

EXTERIOR STONE CLADDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes exterior stone cladding system and supplementary items necessary to complete its installation, including but not limited to the following:

1. Dimension stone panels, mechanically anchored.

B. Related Requirements:

1. Refer to Division 1 Section Field Test for Air and Water Leakage.
2. Refer to Owner Building Enclosure Commissioning Plan for Field Observations and Performance Testing Activities.
3. Refer to Division 7 Section Joint Sealants for sealing joints in dimension stone cladding system with elastomeric sealants.

1.2 DEFINITIONS

A. Definitions contained in ASTM C 119 apply to this Section.

B. Dimension Stone Cladding Assembly: An exterior wall covering system consisting of dimension stone panels and trim together with anchors, backup structure, secondary weather barrier (sheathing), fasteners, and sealants used to secure the stone to the building structure and to produce a weather-resistant covering.

1.3 DELEGATED ENGINEERING REQUIREMENTS

A. Contract Documents Design Intent: Drawings and Specifications indicate design intent for products and systems and do not necessarily indicate or specify total Work required. Contract Documents shall not be construed as an engineered design; furnish and install all Work required for a complete installation.

B. Delegated Engineering Responsibility: Contractor shall employ a qualified professional engineer to provide engineering for products and systems including attachment to building structure required to meet design intent of Contract Documents.

1. Preparation of structural analysis data including engineering calculations, shop drawings and other submittals signed and sealed by the qualified professional engineer.

C. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated for products and systems similar to this Project and has a record of successful in-service performance.

D. Coordination of Work:

1. Product Variations: In the event of minor differences between products and systems of acceptable or available manufacturers, Contractor shall notify Architect of such differences and resolve conflicts in a timely manner. Failure of Contractor to provide notification shall be construed as acceptance of conditions indicated, and changes caused by minor differences between products and Contract Documents shall be included in the Work at no additional cost to Owner.
2. Allowable Adjustments: Minor dimension and profile adjustments may be made in interest of fabrication or erection methods or techniques or ability to satisfy design intent, provided design intent is maintained as determined by Architect. Proposed deviations shall include a detailed analysis of impact to adjacent substrates or other building systems, including related design or construction cost impacts. If accepted by Architect, deviations causing changes in materials, constructability, substrates, or conditions shall be included in the Work at no additional cost to Owner.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's / Fabricator’s technical literature for each variety of stone, stone accessory, and manufactured product.

1. Include manufacturer's / fabricator’s specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work.

1. Submit plans, elevations, sections, and details showing each stone panel, dimensions, stone retention system, joint size and treatment, finish, and any special cutouts for other trades.

    a. Indicate false joints, reveals and copings.
    b. Show direction of veining, grain, or other directional patterns.
    c. Show large-scale details as required.

2. Show locations and details of joints both within dimension stone cladding system and between dimension stone cladding system and other construction.
3. Include details of sealant joints.
4. Show locations and details of anchors and backup structure.
5. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.

C. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 in (300 mm) square.

1. Submit five sets consisting of at least five Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.

    a. One set of the accepted color and finish range samples shall be kept at the Project site for use by the Architect when reviewing the installed work.
    b. One set of the accepted color and finish range samples shall be kept at the Architect’s offices.

c. One set of the accepted color and finish range samples shall be kept at the quarry for use by the Architect when reviewing stone production.

D. Sealant Samples for Verification: For each type and color of joint sealant required.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required, and that a warranty will be issued.

B. Delegated Engineering Calculations: Informational submittal for products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation; test reports are not acceptable substitute for calculations.

C. Material Test Reports: Written reports based on evaluation of comprehensive tests performed by qualified testing agency indicating that each product complies with requirements.

1. Stone Test Reports: For each stone variety proposed for use on Project, provide test data indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous three years.
2. For metal components, indicate chemical and physical properties of metal.
3. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in Division 07 Section "Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

D. Preconstruction test reports.

E. Field Quality Control Reports: Written report of testing and inspection required by "Field Quality Control".

F. Warranty:

1. Provide manufacturer's written warranty covering materials and installation (labor) stating obligations, remedies, limitations and exclusions

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For stone cladding to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.7 QUALITY ASSURANCE

A. Manufacturer / Fabricator Qualifications: Manufacturer / Fabricator with not less than 10 years of experience in the successful production and in-service performance of products and systems similar in scope of this Project.

B. Installer Qualifications:

1. Experience: Installer's personnel with not less than 10 years of experience in the successful performance of Work similar in scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar in scope of this Project.

C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel, AWS D1.2/D1.2M, "Structural Welding Code - Aluminum or AWS D1.3, "Structural Welding Code - Sheet Steel."

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Stone Testing: If Material Test Reports are unavailable or unacceptable, Owner may engage a qualified independent testing agency to perform preconstruction testing.

1. Furnish test specimens that are representative of materials proposed for incorporation into the Work.
2. Physical Property Tests: For each stone variety proposed for use on Project, tested for compliance with physical property requirements, other than abrasion resistance, according to referenced ASTM standards.
3. Flexural Strength Tests: For each combination of stone variety, thickness, orientation of cut, and finish, proposed for use on Project, tested according to ASTM C 880/C 880M, in both wet and dry conditions.
4. Anchorage Tests: For each combination of stone variety, orientation of cut, finish, and anchor type proposed for use on Project, tested according to ASTM C 1354/C 1354M.

B. Preconstruction Field Testing of Sealants: Before installing joint sealants, field test their adhesion to joint substrates according to Division 7, Section "Joint Sealants."

1.9 MOCKUP

A. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up using materials indicated for the completed Work.

1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.

    a. Show typical components, attachments to building structure, and requirements of installation.
    b. Include window opening with stone returns and trim.
    c. Include sealant-filled joint complying with requirements in Division 07 Section "Joint Sealants." Include stone to dissimilar material joints.
    d. Include an area that has been damaged and repaired.

2. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
3. Obtain Architect's acceptance of mock-ups before starting fabrication or installation.

4. Acceptance of mock-ups does not constitute acceptance of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor and accepted by Architect in writing.
5. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

1.10 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

a. Architect.
b. Contractor, including superintendent.
c. Installer, including project manager and supervisor.
d. If requested, Manufacturer's qualified technical representative.
e. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
b. Review Contract Document requirements.
c. Review approved submittals.
d. Review inspection and testing requirements.
e. Review environmental conditions and procedures for coping with unfavorable conditions.
f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

a. Stone damaged or broken in shipment shall be replaced with new material to match the original material.

B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.

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

E. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

1.12 FIELD CONDITIONS

A. Protect dimension stone cladding during erection by doing the following:

1. Cover tops of dimension stone cladding installation with non-staining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 in (600 mm) down both sides and hold securely in place.
2. Prevent staining of stone from pointing mortar, sealants, and other sources. Immediately remove such materials without damaging stone.
3. Protect base of walls from rain-splashed mud and pointing mortar splatter by coverings spread on ground and over wall surface.
4. Protect sills, ledges, and projections from pointing mortar and sealant droppings.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace dimension stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.

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

D. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F (5 deg C) or when joint substrates are wet.

E. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1.13 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

1. Coordinate concrete ledge heights and locations with stone materials and project finish grade elevations.

B. Coordinate installation of inserts that are to be embedded in concrete or masonry, flashing regrets, and similar items to be used by dimension stone cladding Installer for anchoring, supporting, and flashing of dimension stone cladding assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.

C. Time delivery and installation of dimension stone cladding to avoid extended on-site storage and to coordinate with work adjacent to dimension stone cladding.

1.14 WARRANTY

A. Manufacturer's Warranty: Furnish manufacturers standard form, signed by exterior stone cladding manufacturer and installer, agreeing to repair or replace exterior stone cladding system that fails in materials and workmanship at no additional cost.

1. Coverage: Defects include, but are not limited to, evidence of the following:

a. Abnormal deterioration or aging.
b. Structural failure.
c. Permanent deformation or loosening of parts by winds within design criteria.
d. Deterioration or discoloration of finishes.

2. Warranty Period: 5 years from date of Substantial Completion.

B. Installer's Warranty: Furnish installer's written workmanship warranty signed by an authorized representative using installer's standard form agreeing to provide labor required to repair or replace work which exhibits workmanship defects. "Defects" is defined to include but not limited to deterioration or failure to perform as required.

1. Warranty Period: Installer shall warrant the installation to be free from workmanship Defects for a period of 2 years from date of Substantial Completion.

C. If exploratory work is required to determine the cause of the defects, the cost of such work shall be borne by the Contractor if the work is found to be defective as judged by the Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other available manufacturers/fabricators offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

2.2 MATERIALS, GENERAL

A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry, whether specified in this Section of in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.

1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
2. Quarry stone in manner to ensure that as-quarried block orientations yield finished stone with required characteristics.
3. Provide matched blocks for each type, variety, color, and quality of stone. Extract blocks from a single bed of quarry stratum reserved for Project unless stones from randomly selected blocks are acceptable to Architect.

B. Source Limitations for Other Materials: Obtain each type of stone accessory, sealant, and other material from single manufacturer for each product.

C. Provide secondary materials only as recommended by manufacturer of primary materials.

2.3 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of products and systems representing those indicated for this Project, without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. General: Design stone anchors and anchoring systems according to ASTM C 1242.

1. Stone anchors shall withstand not less than two times the weight of the stone cladding in both compression and tension.

C. Structural Loads: Engineer products and systems to withstand loads within limits of allowable working stresses of the materials involved under conditions indicated including, but not limited to gravity, wind, seismic, and erection design loads and thermal movements established by authorities having jurisdiction, applicable building codes, and as indicated.

1. Wind Loads: As indicated on Drawings or Wind Analysis Report.
2. Other Loads: As indicated on Drawings.

D. Structural Movement: Engineer system to withstand movements of supporting structure including, but not limited to inter-story drift, twist, column shortening, long-term creep and deflection from uniformly distributed and concentrated live loads:

1. Deflection Due to Weight of Stone Cladding Assembly:

a. Deflection: As indicated on Drawings.

2. Live Load Deflection: Accommodate differential vertical deflection of floors:

a. Deflection: As indicated on Drawings.

3. Inter-story Drift: Accommodate inter-story drift between adjacent floors perpendicular and/or parallel to the wall:

a. Design Displacement: As indicated on Drawings.

E. Seismic Performance: Systems shall withstand the effects of earthquake motions determined in accordance with the building code and authorities having jurisdiction.

F. Deflection of Assembly: Limit deflection in each assembly caused by the loads and thermal movements indicated, acting singly or in combination with one another, to not more than 1/720 of assembly's clear span or the following, whichever is smaller:

1. Deflection Parallel to Wall Plane: 1/16 inch (1.5 mm), measured in plane of wall.
2. Deflection Perpendicular to Wall Plane: 1/4 inch (6 mm), measured perpendicular to wall.

G. Maximum Water Leakage: No uncontrolled water penetrating assemblies. Water leakage does not include infiltration and condensation water controlled by flashing and gutters that is drained to exterior. Coordinate with other adjacent exterior wall components.

H. Thermal Movements: Provide dimension stone cladding system that allows for thermal movements resulting from ambient and surface temperatures changes by preventing displacement of stone, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

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

I. Safety Factors for Stone: Design dimension stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:

1. Safety Factor for Oolitic Limestone: 8.
2. Safety Factor for Dolomitic Limestone: 6.
3. Safety Factor for Concentrated Stresses: 4 for granite and 10 for stone varieties other than granite.

J. Design stone anchors, including framing systems and connections to building structure, to withstand loads indicated without exceeding allowable working stresses established by the following:

1. For Structural Steel: AISC 360.
2. For Cold-Formed Steel: AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
3. For Cold-Formed Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
4. For Aluminum: AA ADM-1, "The Aluminum Design Manual."
5. For Cast-in-Place and Postinstalled Fasteners in Concrete: One-fourth of tested capacity when installed in concrete with compressive strength indicated.
6. For Postinstalled Fasteners in Masonry: One-sixth of tested capacity when installed in masonry units indicated.

K. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system.

L. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials shall not stain exposed surfaces of stone and joint materials.

2.4 LIMESTONE

A. Material Standard: Comply with ASTM C568/C568M.

B. Varieties and Sources: Subject to compliance with requirements, provide the following:

1. Stone Types and Finish Descriptions: As scheduled or as indicated in Design Selections.

C. Cut:

1. Orientation of Veining: As indicated.

D. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

E. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

F. Thickness: Not less than 2 in (50 mm), unless otherwise indicated; thickness as required for project conditions.

2.5 ANCHORS AND FASTENERS

A. General:

1. Self-drilling, self-tapping TEK type fasteners are not allowed for wind or dead load connections.
2. Dielectric insulators, in addition to metal coatings, shall be used when connecting dissimilar metals.
3. Connections shall include locking devices which prevent movement due to dynamic or vibration loads, thermal or other cyclical conditions when appropriate.

B. Anchors in Direct Contact with Stone: Fabricate anchors, including shelf angles, from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 304; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A 276, Type 304.

C. Shelf Angles for Limestone: Fabricate shelf angles from hot-dip galvanized steel, ASTM A 36/A 36M for materials and ASTM A 123/A 123M for galvanizing.

D. Cast-in-Place Concrete Inserts Not in Direct Contact with Stone: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel, with capability to sustain, without failure, a load equal to 4 times the loads imposed as determined by testing per ASTM E 488, conducted by a qualified independent testing agency. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

E. Postinstalled Anchor Bolts for Concrete and Masonry: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group A1 or A4) for bolts and nuts; ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.

1. For stainless steel, use annealed stainless-steel bolts, nuts, and washers; for bolts, ASTM F 593 (ASTM F 738M); and for nuts, ASTM F 594 (ASTM F 836M), Alloy Group 1 (A1).

2. For galvanized-steel shelf angles and backup structure, use carbon-steel bolts, nuts, and washers; for bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); for nuts, ASTM A 563 (ASTM A 563M), Grade A; and for washers, ASTM F 436 (ASTM F 436M); all hot-dip or mechanically zinc coated.

G. Weld Plates for Installation in Concrete: Comply with Division 5 Section, "Metal Fabrications."

2.6 STONE ACCESSORIES

A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Setting Buttons: Resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

C. Concealed Sheet Metal Flashing: Fabricated from stainless steel and complying with Division 7 Section "Sheet Metal Flashing and Trim."

D. Cementitious Dampproofing for Limestone: Cementitious formulation recommended by ILI and nonstaining to stone; compatible with joint sealants and noncorrosive to anchors and attachments.

E. Weeps and Vents: Provide one of the following:

1. Cellular Plastic Weep Hole/Vents: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard. Hold back 1/8 in (3 mm) from exterior face of stone.

a. Manufacturers and Products:

1) Advanced Building Products, Inc.; Mortar Maze Weep Vents.
2) Heckmann Building Products, Inc.; No. 85 Cell Vent.
3) Hohmann & Barnard, Inc.; QV - Quadro-Vent.
4) Wire-Bond; Cell Vent.

2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.

a. Description: Compressed, 200 denier polyester with 90 percent open mesh and bonded with flame retardant adhesive.
b. Basis of Design: Mortar Net USA, Ltd.; Mortar Net Weep Vents.

F. Sealants for Joints in Dimension Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics that comply with applicable requirements in Division 7 Section "Joint Sealants" and do not stain stone.

1. Colors: Provide color of exposed sealants as scheduled or as indicated in Design Selections.

G. Sealant for Filling Kerfs: Same sealant used for joints in dimension stone

2.7 FABRICATION OF STONE

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.

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

B. Control depth of stone and back check to maintain minimum clearance of 1 in (25 mm) between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.

C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. All vertical control and expansion joints and joints at dissimilar materials shall be cut straight and smooth. Shape beds to fit supports.

D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.

E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

F. Cut stone to produce uniform joints in locations indicated.

1. Joint width: 3/8 in (10 mm).

G. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

H. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.

1. Produce moldings and molded edges with machines that use abrasive shaping wheels made to reverse contour of molding shape.

I. Clean backs of stone to remove rust stains, iron particles, and stone dust.

J. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

1. Review concrete ledge locations and elevations with stone materials and finish grade elevations.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Respective manufacturer written installation instructions.
2. Accepted submittals.
3. Contract Documents.

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

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 INSTALLATION OF STONE CLADDING, GENERAL

A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. 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.

B. Coat limestone with dampproofing to extent indicated below:

1. Stone at Grade: Beds, joints, and back surfaces to at least 12 in (300 mm) above finish-grade elevations.
2. Stone Extending Below Grade: Beds, joints, back surfaces, and face surfaces below grade.
3. Stone with Sloped or Horizontal Profile: Back surfaces.
4. Allow dampproofing to cure before setting dampproofed stone. Do not damage or remove dampproofing while handling and setting stone.

C. Execute dimension stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.

1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.

D. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.

E. Set stone to comply with requirements indicated on Drawings and Shop Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure dimension stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.

1. Maximum Shim Dimension: 1 inch.

F. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

1. Sealing expansion and other joints is specified in Section 079200 "Joint Sealants."

G. Seal all joints at dissimilar materials with sealants as specified in Section 079200 “Joint Sealants”.

H. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 in (150 mm) at ends and turn up not less than 2 in (50 mm) to form end dams.

I. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.

1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 in (600 mm). Use weeps and vents.
2. Place vents in cavity walls at tops of cavities, below shelf angles and flashing, and at intervals not exceeding 20 ft (6 m) vertically. Locate vents in joints at intervals not exceeding 60 in (1500 mm) horizontally. Use weeps and vents.

3.5 INSTALLATION OF MECHANICALLY ANCHORED STONE CLADDING

A. Set dimension stone cladding with mechanical anchors without mortar unless otherwise indicated.

B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.

C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.

D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.6 INSTALLATION OF JOINT-SEALANTS

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.7 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 in in 10 ft (6 mm in 3 m), 3/8 in in 20 feet (10 mm in 6 m), or 1/2 in in 40 feet (12 mm in 12 m) or more. For external corners, corners and jambs within 20 ft (6 m) of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 in in 10 ft (3 mm in 3 m), 1/4 in in 20 ft (6 mm in 6 m), or 3/8 in in 40 ft (10 mm in 12 m) or more.

B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 in in 10 ft (3 mm in 3 m), 1/4 in in 20 ft (6 mm in 6 m), or 3/8 in (10 mm) maximum.

C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 in in 20 ft (6 mm in 6 m) or 1/2 in in 40 ft (12 mm in 12 m) or more.

D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 in (6 mm).

E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 in (3 mm) or a quarter of nominal joint width, whichever is less. For joints within 60 in (1500 mm) of each other, do not vary more than 1/8 in (3 mm) or a quarter of nominal joint width, whichever is less from one to the other.

F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16 in (1.5 mm) difference between planes of adjacent units.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: The Owner may employ and pay a qualified independent testing agency to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor's expense.

1. Refer to Division 01 Section Field Test for Air and Water Leakage.
2. Refer to Owner's Building Enclosure Commissioning Plan for Field Observations and Performance Testing Activities.

B. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of stone panels.

C. Visually inspect field welds and test according to ASTM E165 or to ASTM E709 and ASTM E1444. High-strength bolted connections are subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 ADJUSTING AND CLEANING

A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and dimension stone cladding that does not match approved samples and mockups.

1. Damaged stone may be repaired if Architect approves methods and results.

B. Replace damaged or defective work in a manner that results in dimension stone cladding's matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean dimension stone cladding as work progresses. Remove excess sealant and smears as sealant is installed.

D. Final Cleaning: Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION