June 17, 2019

RE: New Hanover County Division of Juvenile Justice Facility
Building Envelope Commissioning, Special Inspections and Building Materials Testing - Scope of Services

Mr. Kevin Caison
New Hanover County
(via email)

Kevin,

Please find below a suggested scope of services for your use in obtaining a cost proposal for building envelope commissioning, special inspections and building materials testing services. In addition, the perspective bidders will need access to the project drawings and specifications in order to accurately determine the entire scope of work for these services.

Please let me know if you have any questions.

Sincerely,

Bryan Payne, Associate AIA
Project Manager
Project No. 571990
BUILDING ENVELOPE COMMISSIONING (BECx) SERVICES:

1. Perform commissioning of building envelope in accordance with ASHRAE Guideline 0-2005 (Commissioning Process) and NIBS Guideline 3-2012 (Building Enclosure Commissioning Process) excluding the commissioning associated with the design development phase of the project.

2. Commissioning intent is to confirm that the project achieves owner’s objectives for water, air, vapor, and thermal control outlined in the building construction documents.

3. Commissioning scope shall include all materials, components, and systems providing a separation between the building interior and exterior environment, including thermal insulation, sheathing, flashing, caulking, air/vapor barrier, window and storefront/curtainwall assemblies, exterior doors, and other openings/penetrations.

4. Include blower door testing, infrared thermography, water infiltration testing, sealant adhesion testing, and all other testing and inspections required to support the following activities and deliverables:
   a. Develop and oversee the implementation of a commissioning plan for envelope commissioning activities throughout construction.
   b. Conduct a working session with all appropriate parties to discuss the Commissioning Agent’s review and comments of the construction documents.
   c. Review contractor submittals for building envelope components for performance, durability, compatibility, and constructability.
   d. Review construction and performance testing of contractor’s integrated mockup panel for typical window and wall assembly.
   e. Develop construction checklists and system test procedures for envelope commissioning.
   f. Verify system test execution, and document all findings and recommendations for envelope commissioning activities.
   g. Perform site visits as needed to complete the above activities and deliverables. Commence site visits at the beginning of foundation installation.
   h. Maintain an issues log throughout the envelope commissioning process, noting date of issue identification and resolution, as well as means of resolution.
   i. Attend preinstallation meetings and construction progress meetings as needed.

5. Prepare a final building envelope commissioning report that includes, at a minimum, construction checklists, the system test procedures, system test documentation, and issues log.
SPECIAL INSPECTIONS SERVICES:

1. Perform all Special Inspections services required by the North Carolina Building Code as identified and outlined in the Statement of Special Inspections listed on Drawing Sheet S0.0.2.

BUILDING MATERIALS TESTING SERVICES:

SECTION 042000 - UNIT MASONRY (*AD-02)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS
   A. CMU(s): Concrete masonry unit(s).
   B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS
   A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
      1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.4 SUBMITTALS
   A. Product Data: For each type of product indicated.
      1. Submit product data for masonry cleaner products recommended by unit masonry manufacturer for proposed unit masonry.
      2. Submit product data for SPF cavity-wall insulation.
   B. Shop Drawings: For the following:
      1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
      2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
      3. Calcium Silicate Masonry Units: For a substitute product meeting ASTM C 90 to be considered, submit shop drawings of all elevations indicating locations of all control, expansion, and other movement joints.
      4. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, “Details and Detailing of Concrete Reinforcement.” Show elevations of reinforced walls.
      5. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
   C. Samples for Verification: Face brick and colored mortar will be verified in mock-up panel.
   D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
      1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
   E. Qualification Data: For testing agency.
   F. 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 C 67.
d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
e. For concrete masonry units, include data verifying compliance with ASTM C 33 for normal weight aggregates, and ASTM C 331 for lightweight aggregates, and ASTM C 618 for fly ash.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
7. Anchors, ties, and metal accessories.

G. 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 C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

H. 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 Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

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

J. Tie and Anchor Calculations: Engineering calculations specific to Project showing that masonry ties and anchors used in cavities will meet loading requirements without failure or buckling.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
B. Masonry Subcontractor Qualifications: The work of this section shall be bid and performed by a firm certified as a “North Carolina Masonry Contractors Association Certified Masonry Contractor” as described in the most current version of the NCMCA’s “Guide to Masonry Contractor Certification.” (North Carolina Masonry Contractors Association, PO Box 3463, Hickory, NC 28603-3463, (828) 324-1564, information@ncmca.com)
1. The masonry subcontractor shall at all times when work is in progress, provide an individual from its own staff designated by the North Carolina Masonry Contractors Association Masonry Contractor Certification Program as a “CMP-Certified Masonry Professional” or “CME-Certified Masonry Executive” (as described in the most current version of the NCMCA’s “Guide to Masonry Contractor Certification”) on-site to supervise work in progress.
C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

D. Aggregate for Concrete Masonry Units: If bottom ash is used as “aggregate” in the CMU, the “Source” for the bottom ash shall be a power station that has a minimum of ten (10) years continuous experience as a supplier of quality material as verified by independent certified laboratory testing and no defects in the marketplace.

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

F. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

G. Integrated Exterior Mockups: Attend preinstallation conference and provide masonry work for integrated exterior mockup as indicated on Drawings and specified in Division 1 Section “Quality Requirements.”

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination.”

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

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

D. In lieu of separate cementitious materials and aggregate, Contractor may deliver pre-blended dry mortar mix in moisture-resistant containers designed for use with dispensing silos.

   1. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover in a dry location or in a metal dispensing silo with weatherproof cover.

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

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress. Cover tops of foundation walls containing insulation to protect from exposure to sun. Protect tops of foundation walls from construction traffic damage.

   1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

   2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
3. Waterproofing sheet covering may be omitted at solid (fully grouted) CMU walls. (Walls with exposed open cells and cavity walls must be covered.)

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

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

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.


PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

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

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide bullnose units for exposed outside corners unless otherwise indicated. Provide square edge outside corners for all concealed conditions.
   3. Provide solid bullnose cap units at top of exposed free-standing walls as indicated on Drawings.

B. CMUs: ASTM C 90.
1. Density Classification: Lightweight unless otherwise indicated.
2. Aggregates:
   a. Lightweight Aggregates: Lightweight aggregate used shall strictly comply with ASTM C 331, ASTM C 151, and ASTM C 641. Drying shrinkage of aggregate shall not exceed 0.10 percent (%) at 100 days.
   c. Waste concrete, scoria, or aglite shall not be permitted.
   a. Width: Manufactured to dimensions 3/8 inch less than nominal dimensions.
   C. Concrete Building Brick: ASTM C 55.
      1. Density Classification: Lightweight, unless noted otherwise.

2.3 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 3 Section “Cast-in-Place Concrete” and with reinforcing bars indicated. Precast U-lintels fabricated in accordance with performance standards of PCI MNL-116 with 3500 psi concrete for standard lintels and 6000 psi concrete for prestressed lintels as manufactured by Cast-Crete are acceptable in lieu of rectangular section lintels. [www.casterrete.com](http://www.casterrete.com)

C. Masonry Lintels: Built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

2.4 BRICK

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

B. Face Brick: Facing brick complying with ASTM C 216.
   1. Grade: SW.
   2. Type: FBS or FBX.
   3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated “not effloresced.”
5. Application: Use where brick is exposed unless otherwise indicated.

6. Color and Texture: Provide one of the following bricks pre-approved by the Wilmington Historic Preservation Commission (WHPC), Owner and Architect. Any proposed substitutions shall be approved by the WHPC. No time extension shall be permitted due to the approval process.
   a. Brick:
      1) Palmetto Brick, “Old Marlborough.”
      2) Triangle Brick, “Full Color Antique.”
      3) General Shale, “Buckingham Tudor.”

C. Building (Common) Brick: ASTM C 62, Grade MW or SW.
   1. Size: Match size of face brick.
   2. Application: Use where brick is indicated for concealed locations. Face brick may be substituted for building brick.

2.5 CAST STONE MASONRY UNITS (CSMU)

A. General: Cast stone masonry veneer units duplicating the appearance of modular stone masonry, meeting the ASTM C 1364 standard specification for Cast Stone.  www.caststone.org

B. Color: Match Architect’s sample.

C. Sizes and Shapes - provide special shape outside corner units with end return typical.
   2. Water table: 8-inches high by 5-inches deep by 12-inches wide, as indicated on Drawings.
   3. Bullnose trim unit (1): 7-5/8 inches high by 7-5/8 inches deep by 23-5/8 inches long, with custom bullnose and cove shape as indicated on Drawings. Slope top ledge surface not less than 1/8 inch per foot (1:100 mm) to drain away from building.
   4. Running trim unit under bullnose: 2-1/4 inches high by 4-5/8 inches deep by 23-5/8 inches long, located under bullnose sill unit above, as indicated on Drawings.
   5. Window Sill unit: 7-5/8 inches high by 5-5/8 inches deep by 23-5/8 inches long, with 1-inch slope as indicated on Drawings.

D. Products and Textures:
   1. Smooth Texture with Beveled Edges:
      a. Available Products:
         1) Arriscraft International; “ARRIS.cast.” (ASTM C 1364)
         2) Reading Rock, Inc.; “RockCast Architectural PreCast” (ASTM C 1364)
         3) Russell Cast Stone; “Cast Stone.” (ASTM C 1364)
   2. For calcium carbonate products, provide matching dolomitic limestone courses for all CSMU indicated below grade.

2.6 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C 91.

B. Colored Cement Product: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Argos USA; Magnolia Masonry Cement.
   b. Holcim (US) Inc; Rainbow Mortamix Custom Color Masonry Cement.
   c. Lehigh Hanson; flamingo Colored Cement.
   d. Roanoke Cement; a division of Titan America; Colored Masonry Cement.
   e. York Building Products, a Stewart Company; Workrite Colored Masonry Cement.
2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.
4. Pigments shall not exceed 5 percent of masonry cement by weight.

C. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4-inch-thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.
   4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.


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

F. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.
   1. Interior Walls: Mill- galvanized, carbon steel.
   2. Exterior Walls: Hot-dip galvanized, carbon steel.
   5. Wire Size for Veneer Ties: 0.148-inch diameter.
   6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
   7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair side rods.

D. Masonry Joint Reinforcement for Multi-wythe Masonry:
   1. Composite Walls: Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches wide, plus 1 side rod at each wythe of masonry 4 inches wide or less. Use for above-grade walls.
   2. Cavity Walls: Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through
facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

3. Cavity Wall Alternate: In lieu of joint reinforcement with integral adjustable veneer anchors, Contractor may provide ladder joint reinforcement and individual screw-attached adjustable masonry-veneer anchors. (Refer to “Ties and Anchors” article of this section.)

4. Truss-type reinforcement consisting of four (4) side-rods welded to a continuous diagonally formed cross rod designed to bed rods at face shells of CMU, to suit CMU thicknesses and wall thickness. Use only for subgrade and composite walls; not for cavity wall construction.

5. Ladder-type reinforcement consisting of four (4) side-rods welded to individual cross rods at no more than 16 inches on center, designed to bed rods at face shells of CMU, to suit CMU thicknesses and wall thickness. Use only for subgrade and composite walls; not for cavity wall construction.

E. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch-diameter, hot-dip galvanized, carbon-steel continuous wire.

2.8 TIES AND ANCHORS

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

2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, with ASTM A 153, Class B coating.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.

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

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch-diameter, hot-dip galvanized steel wire.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch-thick, steel sheet, galvanized after fabrication 0.109-inch-thick, stainless-steel sheet.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch-diameter, hot-dip galvanized steel wire.

F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4-inch-thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.


G. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
   a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
   b. Size: Size anchor section and ties to accommodate indicated insulation thickness without interference with adjustability.

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section designed to be installed prior to cavity insulation or with no cavity insulation as indicated.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Heckmann Building Products Inc.; 213 + 282.
      2) Hohmann & Barnard, Inc.; HB-200 Series or BL-407 System.
      3) Wire-Bond; RJ-711 or 2407 System.
      4) Construction Tie Products; CTP-16.
   b. Anchor Section, Bent Plate Type: Rib-stiffened, sheet metal plate with screw hole(s) on vertical leg for attachment to backup; with projecting leg having slotted hole(s) for inserting companion triangular wire tie and allowing for vertical adjustment. Size projecting tabs to suit indicated insulation thickness, where insulation is shown.
   c. Fabricate sheet metal anchor sections and other sheet metal parts from engineered thickness steel sheet, galvanized after fabrication.
   d. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-diameter, hot-dip galvanized steel wire.
   e. Provide manufacturer’s recommended 2-inch long, 3/8-inch diameter mechanical expansion bolt for attachment to concrete or masonry.

3. Seismic Masonry-Veneer Anchor Clips: Clips or ties designed to engage a continuous wire embedded in the veneer mortar joint. Provide units designed specifically to work with respective veneer anchors.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Hohmann & Barnard, Inc.; DA 213S.
      2) Hohmann & Barnard, Inc.; Seismiclip for wire ties.
      3) Wire-Bond; Wire-Bond Clip.
      4) Construction Tie Products; CTP WT-Tie.
4. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of > 800 hours per ASTM B 117.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) ITW Buildex; Teks MaxiSeal with Climaseal finish.
      2) Textron Inc.; Elco Drill-Flex with Stalgard finish.

5. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      2) ITW Buildex; Scots long life Teks.

2.9 MISCELLANEOUS ANCHORS
A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
C. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.
D. Post-installed Anchors: Torque-controlled expansion anchors.
   1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.

2.10 EMBEDDED FLASHING MATERIALS
A. Metal Flashing: Provide metal flashing complying with Division 07 Section “Flashing, Sheet Metal and Roofing Accessories” and as follows:
   1. Stainless Steel: ASTM A 240, Type 304, 0.016 inch thick.
   2. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216-inch-thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
   3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   4. Fabricate through-wall flashing with snap-lock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall metal flashing with drip edge at exterior face of wall. Fabricate by extending flashing 1/4 inch out from wall, with outer edge bent down 30 degrees and hemmed. Fabricate separate sheet copper drip for use with flexible flashing, extended at least 3 inches into wall, also with outer edge bent down 30 degrees and hemmed.

6. Metal Drip Edge: Fabricate from 16 oz. copper. Extend at least 3 inches into wall and 1/4 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Flexible Flashing: Provide one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Provide non-asphalt lamination product. Use only where flashing is fully concealed in masonry and in conjunction with copper drip edge.
   a. Use polyether-based moisture-curing sealer products recommended by flashing manufacturer. Traditional mastic is not acceptable.
   b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
      1) Provide manufacturer’s recommended one-inch wide termination bar, fabricated of 0.125-inch PVC, 0.090-inch extruded aluminum or 0.075-inch stainless steel.
   c. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Advanced Building Products Inc.; “Copper Sealtite 2000.”
      2) Hohmann & Barnard, Inc.; “Copper-Fabric NA.”
      3) STS Coatings; “Wall Guardian Copper TWF.”
      4) York Manufacturing, Inc.; “Multi-Flash 500.”

C. Flexible Flashing/Wicking System: Use only where flashing is fully concealed in masonry for applications without another weep system. Provide one of the following unless otherwise indicated:

1. Copper-Laminated Flashing/Wicking System: 5-oz./sq. ft. copper sheet bonded between one layer of glass-fiber cloth and one layer of non-woven wicking fabric, laminated without asphalt.
   a. Use polyether-based moisture-curing sealer products recommended by flashing manufacturer. Traditional mastic is not acceptable.
   b. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) STS Coatings; “Wall Guardian Venting Copper TWF.”
      2) York Manufacturing, Inc.; “Flash-Vent Copper.”

2. Stainless-Steel-Laminated Flashing/Wicking System: Minimum 0.002-inch stainless steel core bonded between one layer of glass-fiber cloth and one layer of non-woven wicking fabric, laminated without asphalt.
   a. Use polyether-based moisture-curing sealer products recommended by flashing manufacturer. Traditional mastic is not acceptable.
   b. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) STS Coatings; “Wall Guardian Venting Stainless Steel TWF.”
      2) York Manufacturing, Inc.; “Flash-Vent Stainless-Steel.”

D. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge.
4. Where flashing is fully concealed, use flexible flashing.

E. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section “Flashing, Sheet Metal and Roofing Accessories.”

F. Adhesives, Primers, and Seam Tapes for Flashings: Provide polyether-based, 100% solids, moisture-curing elastomeric products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates, and that are compatible with asphalt-free flashing materials and air barrier materials. Traditional mastic is not acceptable.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF; MasterSeal NP 150.
   b. STS Coatings; GreatSeal LT-100 Liquid Tape.
   c. York Manufacturing; UniverSeal US-100 Liquid Tape.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; width and thickness indicated; formulated from closed cell neoprene or urethane.

1. Provide 3-inch wide by 3/8-inch thickness at nominal 4-inch masonry veneer unless indicated otherwise.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall. Provide nominal 2.5-inch “standard” and “tee” configurations to suit application unless indicated otherwise.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use one of the following unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from UV-resistant synthetic fiber, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.

2. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standards.

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Advanced Building Products Inc.; Mortar Break weep mesh.
      2) Archovations, Inc.; CavClear Weep Vent.
      3) Blok-Lok Limited; Cell-Vent.
      4) Heckmann Building Products Inc.; No. 85 Cell Vent.
      5) Hohmann & Barnard, Inc.; Quadro-Vent.
      6) Wire-Bond; Cell Vent.

E. Cavity Drainage Material (Mortar Dropping Collection Device): Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Provide a configuration of strips, 2-inch thickness for use with cavity-wall insulation and 10 inches tall, with dovetail shaped notches not less than 6 inches deep designed to prevent mesh from being clogged with mortar droppings.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Advanced Building Products, Inc; “Mortar Break DT."
         2) Heckmann Building Products; “WallDefender.”
         3) Hohmann & Barnard, Inc.; “Mortar Trap.”
         4) Mortar Net Solutions; “MortarNet.”
         5) Wire-Bond; “Cavity Net DT (3611D).”
   2. At cavity walls with 2-3/4-inch cavity, provide companion drainage product by one of the manufacturers above; nominal 1/2-inch thickness by 20-inches wide, to be field inserted into cavity in a “U” configuration. Basis-of-Design is “Mortar Catch 352” by Advanced Building Products, Inc.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
      c. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

G. Protection Board: ASTM D 6506, semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
   1. Thickness: 1/8-inch, nominal.
   2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection board.

2.12 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. APOC, Inc; a division of Gardner Industries.
   2. BASF Corporation; Construction Systems.
   4. ChemMasters, Inc.
   5. Euclid Chemical Company (The); an RPM company.

B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
D. Miscellaneous Dampproofing Materials:
   2. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
   3. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
   4. Patching Compound: Epoxy or latex-modified repair mortar, or manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

2.13 CAVITY-WALL INSULATION
A. Refer to Division 7 Sections “Sprayed Polyurethane Foam Air Barrier” for cavity insulation.

2.14 MASONRY CLEANERS
A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Diedrich Technologies, Inc.
      b. EaCo Chem, Inc.
      c. Prosoco, Inc.

2.15 MORTAR AND GROUT MIXES
A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use masonry cement mortar unless otherwise indicated.
   3. For exterior masonry, use masonry cement mortar.
   4. For reinforced masonry, use masonry cement mortar.
   5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type S.
2. For non-security reinforced masonry and where indicated, use Type S.
3. For concrete masonry unit walls and partitions designated as “secure perimeter,” “interior security wall,” or partitions tagged on Drawings with “S” (secure), use Type M, 2500 psi mortar.
4. For mortar parge coats, use Type S.
5. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
6. For interior non-load-bearing partitions, Type O may be used instead of Type N.
7. Comply with requirements for mortar for fire-resistance rated assemblies.

D. Pigmented Mortar: Use colored cement product.
1. Application: Use pigmented mortar for exposed mortar joints with the following units:
   a. Decorative CMUs.
   b. Pre-faced CMUs.
   c. Concrete facing brick.
   d. Face brick.
   e. Cast stone trim units.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
   a. Decorative CMUs.
   b. Pre-faced CMUs.
   c. Concrete facing brick.
   d. Face brick.
   e. Cast stone trim units.

F. Grout for Unit Masonry: Comply with ASTM C 476 and notes on Structural Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that foundations are within tolerances specified.
   2. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

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

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

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

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

G. Ground-Face Masonry Unit Work: Provide specified decorative ground finish CMU for applications indicated, placed undamaged faces, edges and ends of exposed surfaces. (Do not include in exposed work chipped or cracked units permitted within manufacturing tolerances of ASTM C90 for 5% of shipped units. The defective units shall culled from the pallets and the cost of the 5% wastage is included in the overhead of this subcontract.) Place units plumb, parallel, in bond pattern indicated, and with properly tooled joints of uniform 3/8-inch thickness. Keep exposed surfaces clean and free from blemishes or defects.
   1. Provide finish coat of specified clear acrylic sealer to completed walls after cleandown and when walls are dry. Apply the acrylic evenly to cover entire surface without forming drips or runs. Use airless spray.

H. Protection Board: Provide protection board at face of masonry that will be in contact with backfill soils. Trim protection board just below finish grade. Install prior to Division 32 backfill in accordance with manufacturer instructions.

I. When erecting masonry partitions, chases, and pilasters adjacent to steel columns, keep spaces between columns and masonry free of mortar droppings.

J. Sleeves: Install sleeves in walls to allow for the passage of piping and conduits.

3.3 TOLERANCES

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

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

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

D. Sleeves: Install sleeves in walls to allow for the passage of piping and conduits.

3.4 LAYING MASONRY WALLS

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

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

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

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

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

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated. Mix mortar (or grout) to a 4-inch maximum slump consistency and hand trowel into place in accordance with Steel Door Institute (SDI-100).

G. 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.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Grout all hollow masonry and cavities solid below grade except where protected by waterproofing.

J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. At 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. Provide security terminations at security partitions as indicated on Drawings.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry 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.

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

C. Provide polyethylene bond-breaker between clay masonry and other masonry types. Rake back joint for sealant.

D. Set APC trim units in full bed of mortar with full head joints unless otherwise indicated. Fill dowel, anchor, and similar holes solid. Clean soiled APC surfaces with fiber brush and soap powder and rinse thoroughly with clear water. Wet APC-joint surface thoroughly before setting. (Refer to Division 3 Section “Architectural Precast Concrete.”)

E. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
   1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
   2. Allow cleaned surfaces to dry before setting.
   3. Wet joint surfaces thoroughly before applying mortar.
4. Provide sealant joints at copings, window sills, and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
   a. Keep joints free of mortar and other rigid materials.
   b. Build in compressible foam-plastic joint fillers where indicated.
   c. Form joint of width indicated, but not less than 3/8 inch (10 mm) but not more than 1/2 inch (13 mm).
   d. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
   e. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Division 07 Section "Joint Sealants."

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

G. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:
      a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.

B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
   1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
   1. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3.7 BELOW-GRADE FOUNDATION WALLS

A. Bond wythes of below-finish-grade foundation masonry together using one of the following methods unless indicated otherwise:
   1. Masonry Joint Reinforcement: In horizontal mortar joints.
      a. Where bed joints of both wythes align, use continuous truss-type or ladder-type reinforcement consisting of four (4) side-rods welded to a continuous diagonally formed cross rod (truss) or individual cross rods (ladder). Install at 8 inches on center vertically maximum below finish grade.

B. Tie wythes of below-finish-grade foundation masonry to concrete foundations with rigid anchors at no more than 8 inches on center vertically maximum.

C. Where insulation between or behind wythes is indicated, coordinate work with insulation installer.
D. Collar Joints: Solidly fill collar joints, and joints between wythes and rigid insulation, with grout.

E. Intersecting and Abutting Walls: Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3.8 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:
   1. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Parage cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

D. Bituminous Dampproofing: Apply bituminous dampproofing to substrates for applications indicated. Brush or spray apply coat of asphalt emulsion dampproofing at a rate of 1.5 to 2.5 gal./100 sq. ft., depending on substrate texture, to produce a uniform, dry-film thickness of not less than 15 mils. Apply in 2 coats, if necessary, to obtain required thickness, allowing time for complete drying between coats.
   1. Provide at masonry wall construction applications indicated.

E. Apply air barrier to face of backup wythe to comply with Division 07 Section “Fluid-Applied Membrane Air Barriers.”

F. Cavity-wall insulation is included in Division 7 Section “Sprayed Polyurethane Foam Air Barrier.” Coordinate masonry and insulation/air barrier construction.
   1. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.
   2. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on Drawings. Passes shall be not less than 1/2 inch and not greater than 2 inches.
   3. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
   4. Finished surface of foam insulation to be free of voids and embedded foreign objects.
   5. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
   6. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.
   7. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.
   8. Do not permit adjacent work to be damaged by work of this section. Damage to work of this section caused by other sections shall be repaired by this section at the expense of the subcontractor causing the damage.

G. Installing XEPS Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in
cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.
2. Tape horizontal and vertical joints of insulation board with board insulation manufacturer’s butyl tape.

3.9 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.10 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide anchors on each face of columns and beams where abutting or facing masonry.
2. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
3. Anchor masonry with anchors embedded in masonry joints and attached to structure.
4. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.11 ANCHORING MASONRY VENEERS

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

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener. Provide screw-applied or barrel-shank anchor type. Coordinate installation of veneer anchor components with spray-applied polyurethane foam insulation and air/vapor barrier as indicated.
2. Embed tie sections in veneer masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter. Install additional screw-applied adjustable anchors within 12 inches of
openings and at intervals, not exceeding 16 inches o.c. horizontally and 8 inches o.c. vertically, around perimeter.

3.12 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
   1. Principal movement joints are indicated on Drawings, generally for exterior masonry veneer, column details, and “aesthetic locations.”
   2. Provide control joint spacing in above grade exposed concrete masonry (CMU) wall in accordance with NCMA recommendations (TEK 10-2B) of the lesser of wall length-to-height ration of 1.5 to 1, or 25 feet. Confirm project-specific joint locations and details of additional expansion and control joints with Architect prior to installation to comply with TEK standard.
      a. Provide at least one control joint within 24 inches of door and window openings 6 feet wide or less. Provide a control joint within 24 inches of each jamb for door and window openings over 6 feet wide.

B. Form control joints in concrete masonry as follows:
   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.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section “Joint Sealants,” but not less than 1/4 inch.
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.13 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry or concrete lintels where indicated and in accordance with structural notes for opening sizes.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.14 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer. Repair damaged flashing as recommended by flashing manufacturer. Coordinate with installation of sprayed polyurethane foam insulation and air/vapor barrier and its ancillary transition membranes. Coordinate with installation of XEPS cavity insulation and taped joints where occurs. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows. Coordinate flashing with air barrier installation.
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed
of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. At multi-wythe masonry walls, including cavity walls, extend flexible flashing through outer wythe, turned up a minimum of 16 inches and mechanically fasten to back-up wythe with pre-drilled extruded aluminum termination bar fastened at 16 inches on center and capped with sealant. Adhere vertical flexible flashing to prepared substrate with manufacturer’s recommend adhesive and primer. Coordinate flashing installation and air barrier continuity and terminations at masonry openings.

3. At masonry-veneer walls, extend flexible flashing through veneer in conjunction with copper drip edge, across air space behind veneer, and up face of sheathing at least 16 inches; secure flashing with pre-drilled extruded aluminum termination bar fastened at 16 inches on center and capped with sealant. Adhere vertical flexible flashing to prepared substrate with manufacturer’s recommend adhesive and primer. Coordinate with installation of SPF and XEPS cavity insulation.

4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams. Construct end dam terminations to be entirely embedded within veneer masonry head joints; do not extend end dam construction to be exposed at outside face of wall. Only the formed copper drip edge extends beyond exterior face of wall.

5. Install copper drip edges beneath flexible flashing at exterior face of wall. Set metal edges in thin slurry of mortar or beads of compatible sealant as recommended by the flexible flashing manufacturer. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of copper drip edge. In all cases provide exposed hemmed edge for formed copper drip edge pieces. At exterior masonry corners, notch copper drip piece at base of wall and form exterior corner to eliminate exposed cut metal edges.

6. In lieu of drip edge at stepped flashing locations provide reglets of profile required, formed to provide secure interlocking of separate reglet and counter-flashing pieces, and compatible with embedded flexible flashing indicated.
   a. Reglets and counterflashing units are specified in Division 07 Section “Flashing, Sheet Metal and Roofing Accessories”.

7. Provide copper-laminated flashing/wicking system for (composite) masonry applications without cavity and weep holes, such that wicking conducts water from saturated masonry to exterior face of wall at exterior stair, ramp & retaining wall applications as indicated.

8. Use a compatible sealant or trowel-on mastic to hold flashings in place during construction operations.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

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

E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
   1. Use specified weep/vent product to form weep holes in brick. Space weep holes 24 inches o.c., unless otherwise indicated.
2. Use wicking material to form weep holes at cast stone and brick rowlock and soldier coursing (non-standard height units). Space weep holes formed from wicking material 16 inches o.c. Trim wicking material flush with outside face of wall after mortar has set.

3. Install bed-joint weep system continuous over flashing in bed joints indicated and per manufacturer directions.

F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in “Miscellaneous Masonry Accessories” Article.

3.15 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.

3.16 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
   1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
   1. Payment for these services will be made by Owner.
   2. Retest materials failing to comply with specified requirements at Contractor's expense.

C. Testing Frequency: Tests and Evaluations for masonry units listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof. Other testing will be performed at frequencies required in paragraphs below.

D. Mortar properties will be tested per ASTM C 780. Perform testing for first three days of construction and whenever mortar mix is altered or mixing techniques differ from accepted material test reports.

E. Sample and test grout compressive strength per ASTM C 1019. Perform testing for first three days of construction and whenever grout mix is altered or mixing techniques differ from accepted material test reports.
F. Concrete Masonry Unit Tests: For primary bearing concrete masonry units utilized in project, units will be tested according to ASTM C 140. Primary bearing unit size(s) are 8-inch for project, and additional size units if so required by Architect.

G. Testing Agency: Owner will engage a qualified independent testing agency to perform testing indicated: (*AD-02)
   1. Water Penetration: Testing agency shall test representative areas of each water and moisture control element of the building envelope, including, but not limited to, flashings, joint sealants, air barriers, copings and edge metals, and storefront/curtainwall elements. Testing for water penetration shall include both testing under dynamic pressure per AAMA 501.1 and static pressure per ASTM E331 and ASTM E1105.
   2. Contractor shall coordinate with Owner’s testing agency at the beginning of construction to develop a schedule of building envelope elements requiring field testing. Provide advance notice, of no less than 7 days, to Owner and Owner’s testing agency of when completed building envelope elements will be completed for testing. Maintain building envelope open and accessible to Owner’s testing agency.
   3. After testing agency completes testing and inspection and provides written approval, Contractor may proceed with installation of building elements concealing water and moisture control layers. Contractor shall ensure that tested elements are thoroughly vented and dried from any test procedures prior to covering.
   4. Repair or remove work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.17 PARGING
   A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
   B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
   C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.18 REPAIRING, POINTING, AND CLEANING
   A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
   B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide neat, uniform appearance. Prepare joints for sealant application, where indicated.
   C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
   D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
      1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
      2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's “Indiana Limestone Handbook.”

3.19 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
SECTION 072727 - SPRAYED POLYURETHANE FOAM AIR BARRIER GENERAL (*AD-02)

1.1 RELATED DOCUMENTS
A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS
A. ABAA: Air Barrier Association of America.
B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PERFORMANCE REQUIREMENTS
A. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) (0.02 L/s x sq. m @ 75 Pa.) when tested according to ASTM E 2178.
   1. Design R value minimum of R-6 per inch.
   2. Density of 1.9 pounds per cubic foot.
   3. Smoke development not greater than 450 and flame spread not greater than 25 when tested in accordance with ASTM E 84.
C. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage rate not to exceed 0.040 cubic feet per square foot per minute under a pressure differential of 0.3 in. water (1.57 psf) (0.20 L/sm @ 75 Pa.) when tested in accordance with ASTM E 2357. Assembly shall perform as a liquid drainage plane flashed to discharge condensation or water penetration to the exterior. Assembly shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air and vapor seal materials at such locations, changes in substrate and perimeter conditions.
   1. Assembly shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure.
   2. Assembly shall not displace adjacent materials under full load.
   3. Assembly shall be joined in an airtight and flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations and creep, and anticipated seismic movement.
D. Connections to Adjacent Materials: Provide connections to prevent air leakage at the following locations:
   1. Foundation and walls, including penetrations, ties and anchors.
   2. Walls, windows, curtain walls, storefronts, louvers or doors.
   3. Different wall assemblies, and fixed openings within those assemblies.
   4. Wall and roof connections.
5. Floors over unconditioned space.
6. Walls, floor and roof across construction, control and expansion joints.
7. Walls, floors and roof to utility, pipe and duct penetrations.
8. Seismic and expansion joints.
9. All other leakage pathways in the building envelope.

1.4 SUBMITTALS

A. Submittals: Submit in accordance with Division 1 requirements.

B. Quality Assurance Program: Submit evidence of current accreditation of the subcontractor and certification of the installers under the Air Barrier Association of America’s (ABAA) Quality Assurance Program. Submit accreditation number of subcontractor and certification number of installers.

C. Product Data: Submit manufacturer’s product data, manufacturer’s printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
   1. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
   2. Include statement that materials are compatible with adjacent materials proposed for use.
   3. Submit reports indicating that field peel-adhesion test on all materials to which sealants are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.
   4. Include data indicating compliance with the applicable “Quality Assurance” requirements.

D. Samples: Submit clearly labeled samples, 3 by 4 inch minimum size of each material specified.

E. Shop Drawings: Submit shop drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the air barrier are secured with air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes electric boxes and similar items are sealed.
   1. Include statement that materials are compatible with adjacent materials proposed for use.
   2. Include recommended values for field adhesion test on each substrate.

F. Compatibility: Submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

1.5 QUALITY ASSURANCE

A. Air Barrier Subcontractor Qualifications: Subcontractor shall be currently accredited by the Air Barrier Association of America (ABAA) whose installers are certified in accordance with the ABAA Quality Assurance Program.
   1. Installers shall also be certified by ABAA/BPQI (Building Performance Quality Institute) in accordance with the training requirements outlined in the ULC S705.2-05 Installation
Standard. Installers shall have their photo-identification certification cards in their possession and available on the project site, for inspection upon request.

B. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

C. Preinstallation Conference: Conduct conference at Project site. Include installers of other construction connecting to the air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
   1. Refer to Division 1 Section “Exterior Building Enclosure Air Barrier Requirements.”
   2. Review manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
   3. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

D. Field Quality Assurance: Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Do not cover air barrier until it has been inspected and accepted.

E. Integrated Exterior Mockups: Attend preinstallation conference and provide air barrier system components for integrated exterior mockup as specified in Division 1 section “Quality Requirements.”

F. Air Barrier Manufacturer's Technical Representative Field Review: Air Barrier manufacturer's technical representative shall review the work and provide copies of his observations in the form of a technical report to the Architect and the Owner. The Air Barrier Installer is responsible to notify the manufacturer's technical representative of intended start date and schedule of Air Barrier work.
   1. The Installer and Air Barrier manufacturer's technical representative shall review the substrate surfaces (wall) to receive Air Barrier system prior to beginning installation.
   2. The Air Barrier manufacturer's technical representative shall visit the site to review the work no less than three times (startup, in-progress, and end-of-installation inspection) during the application of the system & submit copies of technical reports to the Architect and Owner within 7 days of the site visit.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages or containers with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
   1. Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the label of an approved agency showing the manufacturer’s name, product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

B. Store materials in their original undamaged packages or containers in a clean, dry, protected location and within temperature range required by air barrier membrane manufacturer. Protect stored materials from direct sunlight.
C. Handle materials in accordance with manufacturer’s recommendations.

1.7 PROJECT CONDITIONS
A. Temperature: Install air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.
B. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.8 WARRANTY
A. Material Warranty: Provide manufacturer’s standard product warranty, for a minimum 3 years from date of Substantial Completion.
B. Installation Warranty: Provide air barrier subcontractor’s 2-year warranty from date of Substantial Completion, including all components of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Spray Polyurethane Foam Air Barrier (“SPF”): Spray-applied proprietary materials as specified.

Subject to compliance with requirements, provide one of the following:
1. BASF; Walltite.
2. Carlisle Spray Foam Insulation; SealTite D7 One Zero.
3. Demilec (USA) LLC.; Heatlok Soy 200 Plus.
4. Henry Company; Permax 2.0X.
5. Icynene Inc.; ProSeal (MD-C-200v3).
6. Johns Manville; CorBond III.
7. NCFI Polyurethanes; InsulBloc.

2.2 AUXILIARY MATERIALS
A. Membrane at Transitions in Substrate and Connections to Adjacent Elements: One of the following as acceptable to the spray polyurethane foam air barrier manufacturer:

1. Carlisle Coatings and Waterproofing; CCW-705.
2. Grace Construction Products; Perm-A-Barrier Flashing.
3. Henry Company; Blueskin SA.
4. Protective Coatings Technology, Inc; Poly-Wall Crack Guard.
5. Tremco, Inc.; ExoAir 110.

B. Transition Membrane between Air Barrier Membrane and Roofing and Other Adjacent Materials: Comply with both air barrier manufacturer’s recommendations and material manufacturer’s recommendations.

C. Spray Foam Stop and Screed: L-shaped stop and screed designed as a SPF termination accessory, fabricated of stable UV-resistant plastic and acceptable to SPF manufacturer. Outer
leg shall be sized to match 2-inch SPF thickness. “Jam-Ex” by Exo-Tec Manufacturing, Inc. or equivalent.

D. Counterflashing for Masonry Through-Wall Flashing: One of the following and as acceptable to the spray polyurethane foam air barrier manufacturer:
1. Carlisle Coatings and Waterproofing; CCW-705 TWF.
2. Grace Construction Products; Perm-A-Barrier Flashing.
3. Henry Company; Blueskin TWF.
5. Tremco, Inc.; ExoAir TWF.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.
5. Verify that sheathing joints are finished flush and sealants used are compatible with air barrier materials proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.
6. Proceed with surface preparation and installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION
A. Remove irregularities in substrates and patch cracks to attain suitable substrate.
1. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
2. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
3. Patch all holes and voids and smooth out any surface misalignments.
4. Patch all masonry cracks, protrusions, small voids, offsets, details, irregularities and small deformities with cementitious patching mortar at least two hours before application.
5. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
6. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with appropriate transition material to provide continuous support for air barrier.

B. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
1. Ensure that penetrating work by other trades is in place and complete.
2. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the spray polyurethane foam.
3. Wipe down metal surfaces to remove release agents or other non-compatible coatings.
4. Ensure veneer anchors are in place.
5. Provide spray foam stops or screeds, secured to substrate, for SPF termination details indicated and as needed at perimeter of SPF installation.

C. Prime substrate for application of sheet membrane transition strips as recommended by manufacturer and as follows:
1. Prime masonry, concrete substrates with conditioning primers.
2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
3. Prime wood, metal, and painted substrates with primer.
4. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.

D. Protection from Spray Applied Materials:
1. Protect adjacent surfaces not designated to receive air barrier to prevent spillage and overspray affecting other construction.
2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
3. Comply with measures specified in Division 1 Section “Indoor Air Quality Requirements.”
4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

3.3 INSTALLATION
A. Transition Strip Installation: Install transition strip materials to provide continuity throughout the building envelope. Install materials in accordance with manufacturer's recommendations and the following:
1. Apply primer for transition strips at rate recommended by manufacturer. Allow primer to dry completely before transition strip application. Apply as many coats as necessary for proper adhesion.
2. Position subsequent sheets of transition strips applied above so that membrane overlaps the membrane sheet below by a minimum of 2 inches, unless greater overlap is recommended by manufacturer. Roll into place with roller.
3. Overlap horizontally adjacent pieces of transition strips a minimum of 2 inches, unless greater overlap is recommended by manufacturer. Roll seams with roller.
4. Seal around all penetrations with a transition strip or other procedure in accordance with manufacturer’s recommendations.
5. Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior
doors, penetrations, and other intersection conditions using transition membranes and in accordance with the manufacturer’s recommendations.

6. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip and air barrier materials to maintain continuity as indicated. Coordinate with installation of flashing materials.

7. At changes in substrate plane, provide transition material recommended by manufacturer to make a smooth transition from one plane to another.

8. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate.

9. At through-wall flashings, provide an additional 6-inch-wide strip of manufacturer’s recommended membrane counterflashing to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with bead of mastic as recommended by manufacturer.

10. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.

11. At expansion and seismic joints provide transition to the joint assemblies.

12. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer when membrane will be exposed to the elements.

13. At end of each working day, seal top edge of self-adhered membrane to substrate with termination mastic if exposed.

14. Do not allow materials to come in contact with chemically incompatible materials.

15. Do not expose transition membrane to sunlight longer than as recommended by the manufacturer.

16. Inspect installation prior to enclosing assembly and repair damaged areas with spray polyurethane foam as recommended by manufacturer.

B. Spray Application of Polyurethane: Install materials in accordance with manufacturer's recommendations, ULC S705.2, evaluation or tested assembly report, and the following:

1. Equipment used to spray polyurethane foam shall comply with ULC S705.2 and the manufacturer’s recommendations for the specific type of application. Record equipment settings on the Daily Work Record as required by the ULC S705.2 installation standard. Each proportioner unit shall supply only one spray gun.

2. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and the ULC S705.2 Installation standard.

3. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than 1/2 inch and not greater than 2 inches. An additional pass of 2 inches shall only be done after the first pass has had time to cool down. At no time shall more than 4 inches be installed in a single day.

4. Install within manufacturer’s tolerances, but not more than minus 1/4 inch or plus 1/2 inch.

5. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.

6. Finished surface of foam insulation to be free of voids and embedded foreign objects.
7. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.

8. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.

9. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.

10. Complete connections to other components and repair any gaps, holes or other damage using material which conforms to ULC S710.1 or ULC S711.1 and installed in accordance with ULC S710.2 or ULC S711.2 as applicable.

C. Coordination: Coordinate and cooperate with Division 7 Section “Thermal Barriers for Plastics” for installation of thermal barrier treatment of sprayed polyurethane foam exposed to the interior of the building.

3.4 FIELD QUALITY CONTROL

A. ABAA Site Inspections: Arrange and pay for site inspections by ABAA to verify conformance with the manufacturer’s instructions, the ULC S705.2 Installation standard, the ABAA Quality Assurance Program, and this section of the project specification.

1. Unless indicated otherwise, provide ABAA Quality Assurance Program audits in accordance with current “Frequency & Cost of Audits” posted on ABAA website. Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed. In the case of any deficiencies, the ABAA-licensed inspector may verbally advise the licensed installer at the time of the inspection.

2. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Owner.

3. In addition to the ABAA site inspector, the air barrier manufacturer’s technical representative will make field reviews during installation and provide technical reports to Contractor, Owner and Architect.

B. Provide access for air barrier manufacturer's technical representative to make inspections. Coordinate and cooperate with those inspections.

C. Testing Agency: Owner will engage a qualified independent testing agency to perform testing indicated: (*AD-02)

1. Water Penetration: Testing agency shall test representative areas of each water and moisture control element of the building envelope, including, but not limited to, flashings, joint sealants, air barriers, copings and edge metals, and storefront/curtainwall elements. Testing for water penetration shall include both testing under dynamic pressure per AAMA 501.1 and static pressure per ASTM E331 and ASTM E1105.

2. Contractor shall coordinate with Owner’s testing agency at the beginning of construction to develop a schedule of building envelope elements requiring field testing. Provide advance notice, of no less than 7 days, to Owner and Owner’s testing agency of when completed building envelope elements will be completed for testing. Maintain building envelope open and accessible to Owner’s testing agency.
3. After testing agency completes testing and inspection and provides written approval, Contractor may proceed with installation of building elements concealing water and moisture control layers. Contractor shall ensure that tested elements are thoroughly vented and dried from any test procedures prior to covering.

4. Repair or remove work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.5 CLEANING AND PROTECTION

A. Protect air barrier assemblies from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Coordinate with installation of materials which cover air barrier, to ensure exposure period does not exceed that recommended by the air barrier manufacturer.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 072727
SECTION 076201 - FLASHING, SHEET METAL AND ROOFING ACCESSORIES (*AD-02)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Metal two-piece reglet and counter flashing.
      2. Metal one-piece counterflashing for saw-cut reglet application.
      3. Gutters and downspouts
      4. Preformed metal copings.
      5. Formed roof edge fascia.
      6. Formed roof edge drip edge.
      7. Miscellaneous sheet metal accessories.
      8. Elastic roof/wall expansion joint systems.
      9. Roof hatches.
     10. Prefabricated roof curbs
     11. Prefabricated equipment supports
     12. Roof pipe curbs.
     13. Concrete splash blocks for downspout applications indicated.

1.3 PERFORMANCE REQUIREMENTS
   A. Manufacture and install copings and roof edge flashings tested according to ANSI/SPRI/FM 4435/ES-1 and capable of resisting the design pressures indicated on Drawings. Provide manufactured pre-engineered roof edge systems; brake metal assemblies fabricated in accordance with NRCA are not acceptable in lieu of manufactured pre-engineered roof edge systems specified.
      1. Roof Edge Fascia System: Conform to ANSI/SPRI/FM 4435/ES-1 Test Method RE-1 for roof edge termination to secure the membrane to a minimum of 100 lb/ft. Conform to ANSI/SPRI/FM 4435/ES-1 Test Method RE-2 pull-off test for fascia to meet design pressure requirement.

1.4 SUBMITTALS
   A. Product data: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
      1. Submit confirmation that roof edge systems conform to ANSI/SPRI/FM 4435/ES-1 performance requirements.
   B. Samples of specified fluorocarbon (“Kynar”) factory finishes on substrate material for coping and gravel stop items. Provide samples of minimum 2-inch square size of full range of manufacturer's standard colors for selection.
   C. Shop drawings showing layout, profiles, methods of joining, and anchorage details, including major counterflashings, gutters and down spouts (coordinated with shingle roofing), conductor
heads, copings, trim/fascia units and expansion joint systems. Note metal materials and gage. Identify work by others; Contractor is responsible for coordinating provision of all components included in accepted shop drawings. Provide layouts at 1:48 scale and details at 1:4 scale.

1. Provide shop drawings of special details, including steps in roof expansion joint systems, and changes in coping width at increase in wall thickness.
2. Provide shop drawings of fabricated equipment supports. Include certified load bearing data, dimensions, and internal thermal insulation.

1.5 QUALITY ASSURANCE
A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
B. Integrated Exterior Mockups: Attend preinstallation conference and provide flashing work for integrated exterior mockup as specified in Division 1 section “Quality Requirements.”

1.6 PROJECT CONDITIONS
A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS
A. Copper: ASTM B 370; temper H00, cold rolled except where temper 060 is required for forming; not less than 16 oz./sq. ft., unless otherwise indicated.
B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
   1. Factory-Painted Aluminum Sheet: ASTM B 209, 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.
   2. Extruded Aluminum: ASTM B 221, alloy 6063-T52, with a minimum thickness of 0.080 inch for primary legs of extrusions that are anodized, unless otherwise indicated.
C. Stainless-Steel Sheet: ASTM A 167, Type 304, soft annealed, with No. 2D finish, except where harder temper is required for forming or performance; minimum 0.0187 inch thick, unless otherwise indicated.
D. Galvanized Steel Sheet: ASTM A 526, G 90, commercial quality, or ASTM A 527, G 90, lock-forming quality, hot-dip galvanized steel sheet with 0.20 percent copper, mill phosphatized where indicated for painting; not less than 0.0396 inch thick, unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES
A. Solder: ASTM B 32, Grade Sn50, used with rosin flux.
   1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer; use a non-corrosive rosin flux over tinned surfaces.
B. Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

C. Mastic Sealant: Polyisobutylene; non-hardening, non-skimming, non-drying, non-migrating sealant.

D. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section “Joint Sealants.”

B. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.

C. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.

D. Downspout Strainers: 20-gage bronze, copper, or nonmagnetic stainless-steel mesh fabricated units, with selvaged edges and non-corrosive fasteners compatible with gutters and downspouts.

E. Splash Blocks: Provide standard precast concrete splash blocks, 3000 psi precast concrete dish-profile units manufactured for purpose. Light weight “patio blocks” are not acceptable. Note: Provide for all roof storm water outfall conditions, condensation lines, and fire suppression system - both Division 7 and Division 23 applications unless noted otherwise.

2.3 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA “Architectural Sheet Metal Manual” (2012- 7th edition) and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded into hems.

1. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

2. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of interlocking hooked flanges, minimum 1-inch deep, filled with mastic sealant (concealed in joints).

3. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, to meet SMACNA standards.

4. Separations: Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation recommended by fabricator.

B. Scuppers: Fabricate through-wall scupper as indicated, associated with conductor heads & down conductors. Incorporate gravel stop as indicated. Fabricate of 16 oz. copper.
2.4 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Castle Metal Products.
   2. Cheney Flashing Company.
   3. Fry Reglet Corporation.
   4. Heckmann Building Products Inc.
   5. OMG EdgeSystems (Formerly W.P. Hickman Company)
   7. Metal-Era, Inc.
   8. Metal-Fab Manufacturing, LLC.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
   1. Copper: 16 oz./sq. ft.
   2. Formed Aluminum: 0.024 inch thick.
   3. Stainless Steel: 0.025 inch thick.
   4. Corners: Factory mitered and soldered (copper) or continuously welded (aluminum).
   5. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   6. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
   7. Multiuse Type, Embedded: For multiuse embedment in masonry mortar joints.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
   1. Copper: 16 oz./sq. ft. Provide for applications at membrane roofs unless noted otherwise.
   2. Formed Aluminum-Zinc Alloy-Coated ("Galvalume") Steel Sheet: 0.028-inch nominal thickness, fluoropolymer coil-coated to match metal roofing panels. Provide for applications at metal roofing unless noted otherwise.
   3. Formed Aluminum: 0.032 inch thick. Provide for applications at membrane roofs unless noted otherwise.
   4. Stainless Steel: 0.025 inch thick.

D. Accessories:
   1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
   2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. One-Piece Counterflashing (Surface- Applied): Provide one-piece counterflashing of formed metal. Form counter-flashing piece with a back-bend top flange/sealant channel, hemmed drip edge and continuous bend to maintain “spring” pressure against base flashing when in place.
Metal profile is shown on drawings. Provide silicone elastomeric sealant as specified in Division 7 Section “Joint Sealants.”

1. Copper: 16 oz./sq. ft. Provide for applications at membrane roofs unless noted otherwise.

2. Formed Aluminum-Zinc Alloy-Coated (“Galvalume”) Steel Sheet: 0.028-inch nominal thickness, fluoropolymer coil-coated to match metal roofing panels. Provide for applications at metal roofing unless noted otherwise.

3. Formed Aluminum: 0.032-inch-thick, fluoropolymer coated to match prefinished aluminum canopy roof, coping or similar conditions.

4. Counterflashing shall be installed with associated roofing work.

F. Copper Finish: Non-patinated, mill.

G. Zinc-Coated Steel Finish: Two-coat fluoropolymer.

1. Color: As selected by Architect from manufacturer's full range.

2.5 ELASTIC EXPANSION JOINTS

A. General: Provide factory-fabricated units of size and profile indicated, complete with prefabricated corner units, intersection units and splicing materials. Provide complete with elastic sheet flashing forming the primary joint membrane, in a supported, “bellows” arrangement designed for attachment to both sides of expansion joints. Insulate underside of bellows with adhesive applied, flexible, closed-cell rubber or plastic not less than 9 mm thick. Provide complete expansion joint system for length of joint, including corners, offsets, steps, and closure pieces.

1. Curb Flange Type: Metal flanged edges, ±50 mm wide, formed to profiles as indicated to fit curbs, and designed for nailing to curb substrate. Provide 16 oz./sq. ft. copper metal flanges.

2. Flat-to-Curb Type: Metal flanged edges, 4-inch flat flange at wall, custom width flange formed to profiles as indicated to fit roof curb & designed for nailing to curb substrate. Provide 16 oz. copper metal flanges.

3. Flat Flange Type: Plain sheet or encapsulated metal flanged edges, for embedment in other construction or nailing to substrates, standard 4-inch minimum flange width.

4. Moisture Barrier: Manufacturer's standard, flexible, continuous, polymeric moisture barrier looped under roof expansion assembly covers at locations indicated. Fill space with blanket-type, mineral-wool insulation.

5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

   a. Afco Products, Inc.
   b. Manville/Roofing Systems Division.
   c. Phoenix Building Products
   d. York Manufacturing, Inc.

2.6 SHEET ALUMINUM FASCIA SYSTEMS AND COPINGS:

A. Fascia for Single-Ply Roofing: Manufactured pre-engineered system consisting of formed 0.040 inch aluminum fascia, and minimum 24-gauge zinc-coated sheet steel water dam; of profile and height indicated; with prefabricated accessories including concealed splice plates, inside and outside corners and special fasteners. Provide prefabricated outside and inside corner, miters welded before finishing. Provide roof edge system tested in accordance with ANSI/SPRI/FM
4435/ES-1 Test Method RE-1 for roof edge termination to secure the membrane to a minimum of 100 psf and tested in accordance with ANSI/SPRI/FM 4435/ES-1 Test Method RE-2 pull-off test for fascia to meet design pressure requirement.

1. Nominal fascia height of 6.0-inches.
3. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. “SecurEdge 200/300 Fascia System”; Carlisle Syntec, Inc.
   b. “EdgeGard + Fascia”; Firestone Building Products.

B. Interlocking Multi-Part Coping System: Manufactured pre-engineered coping system (roofer-fabricated copings not acceptable) consisting of formed 0.050 inch aluminum coping of profile indicated, minimum 20-gauge zinc-coated steel anchor plates, and concealed splice plates. Provide prefabricated inside and outside corners, miters welded before finishing; without exposed fasteners. Provide roof edge system tested in accordance with ANSI/SPRI /FM 4435/ES-1 Test Method RE-3 pull-off test for coping to meet design pressure requirement.

1. Provide coping chair formed with support at mid-width of coping for coping width greater than 16-inches.
2. Provide custom perforated metal vent component of coping system indicated. Coordinate continuous perforated vent with coping anchors at manufacturer’s recommended spacing to maintain ventilation path.
3. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   b. “Perma-Tite ”; Metal-Era (Basis of Design)

C. Provide manufactured formed fascia & manufactured coping assemblies from same manufacturer with same finish.

D. Fluoropolymer Coating: Provide a high-performance fluorocarbon coating conforming AAMA 2605 consisting of a minimum 70% fluoropolymer resin coating in a DFT of 0.9 mil minimum, 30% reflective gloss (ASTM D 523), over 0.15 mil minimum baked-on epoxy primer.

1. Durability: Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish; and without chalking in excess of 8 (ASTM D 659), and fading in excess of 5 NBS units for vertical surfaces. (Values are reduced for exposures at an angle from the vertical position.)
2. Provide colors selected by Architect from manufacturer’s standards or published standard 2-coat, non-metallic colors of PPG “Duranar” or Valspar “Fluropon.” One color is required for project.
3. Provide “Kynar ADS” (air cured fluoropolymer resin coating) coating material to match “Kynar 500” coating for field touch-up use.

E. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested per ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA (2003- 6th edition) “Architectural Sheet Metal Manual.” Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

B. Bed flanges of work in accordance with membrane roofing manufacturer's recommendations as required for waterproof performance.

C. Reglet/Counterflashing Applications: Install receiver/reglet pieces to receive counterflashing. Where shown in masonry, furnish reglets to mason, for installation as work of Section 042000.

1. Built-in: Insert preformed counterflashing piece in installed receiver/reglet and secured by snap-in seal arrangement, so that bottom of flashing makes permanent spring clamping contact with base flashing. Following field bend of receiver cap, place continuous backer rod and elastomeric sealant in masonry joint above reglet/receiver.

2. Install counterflashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

3. Existing Brick: Saw cut joint in brick joints to uniform 3/4-inch depth for step flashing pattern indicated. Insert preformed metal receiver/reglet piece to full depth of saw cut and secure it with lead wedges at 12-inches o.c. Place continuous backer rod and elastomeric sealant in cut joint reglet. Insert the separate counterflashing piece into reglet so that bottom of flashing makes permanent spring clamping contact with base flashing.

4. Surface Applied: Install surface applied reglets to receive counterflashing in manner and by methods indicated. Install counterflashing in reglets by snap-in continuous field bend of receiver cap seal arrangement: fill reglet with mastic or elastomeric sealant, as indicated.

D. Surface-Applied One-Piece Counterflashing: Install surface applied counterflashing in manner & by methods indicated. Install counterflashing securely to substrate with neoprene foam tape if required and batten bar if required (not anticipated for 16 oz./sq. ft. copper), and fill reglet with mastic or elastomeric sealant, as indicated.

E. One-Piece Counterflashing in Saw-cut Joint: Saw cut reglet joint in brick joints to uniform 3/4-inch depth for step flashing pattern indicated. Insert preformed counterflashing to full depth of saw cut and secure with lead wedges at 12-inches o.c., so that bottom of flashing makes permanent spring clamping contact with base flashing. Place continuous backer rod and elastomeric sealant in cut joint reglet.

F. Scuppers: Install fabricated scupper in accordance with membrane roofing manufacturer's detail. Refer to Division 7 Section “PVC Roofing.”

1. Provide appropriate barrier material between copper scupper fabrications and prefinished aluminum conductor head fabrications.
G. Roof Expansion Joint Installation
   1. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.
      a. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required for complete roof expansion joint assembly.
      b. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
      c. Provide for linear thermal expansion of roof expansion joint materials.
      d. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
      e. Provide uniform, neat seams.
      f. Install roof expansion joints to fit substrates and to result in watertight performance.
      g. Torch cutting of roof expansion joints is not permitted.
      h. Do not use graphite pencils to mark aluminum surfaces.
   2. Directional Changes and Other Expansion-Control Joint Systems: Coordinate installation of roof expansion joints with other expansion-control joint systems to result in watertight performance. Install factory-fabricated units at directional changes and at transitions between roof expansion joints and exterior expansion-control joint systems specified in Division 07 to provide continuous, uninterrupted, and watertight joints.
   3. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.
      a. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
   4. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

H. Copings: Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners. Anchor copings to meet performance requirements.
   1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates. Anchor to substrate at manufacturer's required spacing to meet performance requirements.
      a. Coping Width Less Than 16 Inches: For standard 10 foot length coping sections, anchor at standard 40-inch centers. For standard 12 foot length coping sections, anchor at standard 48-inch centers.
      b. Coping Width 16 Inches or Greater: For standard 10 foot length coping sections, anchor at 30-inch centers. For standard 12 foot length coping sections, anchor at standard 36-inch centers.
   2. Provide custom perforated metal vent component as indicated.

I. Roof Edge Flashing (Fascia/Gravelstop): Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.2 FIELD QUALITY CONTROL (*AD-02)

A. Testing Agency: Owner will engage a qualified independent testing agency to perform testing indicated.
B. Water Penetration: Testing agency shall test representative areas of each water and moisture control element of the building envelope, including, but not limited to, flashings, joint sealants, air barriers, copings and edge metals, and storefront/curtainwall elements. Testing for water penetration shall include both testing under dynamic pressure per AAMA 501.1 and static pressure per ASTM E331 and ASTM E1105.

C. Contractor shall coordinate with Owner’s testing agency at the beginning of construction to develop a schedule of building envelope elements requiring field testing. Provide advance notice, of no less than 7 days, to Owner and Owner’s testing agency of when completed building envelope elements will be completed for testing. Maintain building envelope open and accessible to Owner’s testing agency.

D. After testing agency completes testing and inspection and provides written approval, Contractor may proceed with installation of building elements concealing water and moisture control layers. Contractor shall ensure that tested elements are thoroughly vented and dried from any test procedures prior to covering.

E. Repair or remove work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Protection: Protect flashing and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering at time of Substantial Completion.

END OF SECTION 076201
SECTION 077273 MEMBRANE INTEGRITY TEST SYSTEMS (*AD-02)

PART 1 - GENERAL

1.1 COORDINATION:

1. Integrate layout of membrane integrity test system with rooftop structures and equipment and roof penetrations for building utilities and services.
2. Coordinate membrane integrity test system with work of other Sections.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product required for a complete membrane integrity test system.
B. Shop Drawings: Showing the following.
   1. Diagram of proposed system showing complete test area, rooftop structures and equipment, and roof penetrations for building utilities and services. Show location of the EFVM integrity test conductor cable, and EFVM connection boxes.

1.3 INFORMATIONAL SUBMITTALS

A. Qualifications: For manufacturer and installing and testing firm.
B. Field Quality Control Reports: Digital drawings, digital photographic documentation, and written report detailing location and nature of membrane breaches, defects found, and verification of corrective actions taken.

1.4 CLOSEOUT SUBMITTALS

A. Record Drawings: Digital drawings, photographic documentation, and written report detailing installed location of components of membrane integrity test system.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer of membrane integrity test systems with minimum ten-year record of satisfactory manufacturing and support of installed systems comparable to system required as Work of this Section.
B. Installing and Testing Firm Qualifications: Approved or certified by membrane integrity test system manufacturer, with minimum five-year record of satisfactory experience.
PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Membrane integrity test System: Conductor cable, placed on top of membrane, delivering direct current tension to membrane surface, enabling inspection and isolation of points of moisture infiltration through membrane to conductive substrate under membrane.

2.2 MATERIALS

A. Conductor Cable: Nine strands of 0.06-inch diameter highly-conductive stainless-steel wire interwoven with braided polyethylene strands, placed on weather side of membrane:

B. Conductor Wire Assembly: Provide grounding plate for connection to Vector Mapping Grid, suitable for connection to terminals at connection box.

C. Connection Plug: Weatherproof, corrosion-resistant electrical enclosure with permanent terminal connection for connecting diagnostic and testing equipment, NEMA 4X with the following characteristics:

1. Permanent connection for attachment of diagnostic and testing equipment without opening contact box.

2.3 ACCESSORIES

A. Provide corrosion-resistant fasteners and hardware, electrical terminations, sealants, and other items required to provide complete installation.

B. Lap Joint Tape: Provide self adhesive aluminum tape, minimum 2 inch (50 mm) wide.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examination: Verify that substrate complies with roofing manufacturer's and integrity test manufacturer's requirements. Proceed with installation once substrate complies with requirements.

B. Vector Mapping Grid: Install Vector Mapping Grid on membrane substrate immediately under membrane and immediately prior to installation of membrane.

1. Verify that location of Vector Mapping Grid fasteners does not interfere with or cause damage to membrane.

2. Fasten Vector Mapping Grid in accordance with leak detection system manufacturer's requirements.
3. Do not place Vector Mapping Grid where it will be in continuous direct contact with structural components.
4. Provide minimum 2 inch overlap where adjacent sheets meet, including side laps and end laps.
5. Vector Mapping Grid is to be cut as close as possible to the perpendicular strand at both end and side edges

C. Conductor Wire: Install conductor wire on top of membrane at spacing and layout indicated on approved shop drawings.
   1. Secure conductor wire using method recommended by manufacturer.

D. Installation Testing: Verify continuity and functioning of conductor wire upon completion of installation.

3.2 FIELD QUALITY CONTROL

A. Engage Installation and Testing Firm to perform membrane integrity testing. Perform testing in accordance with membrane integrity test system manufacturer's recommendations.
   1. Perform testing following adequate precipitation or wet membrane adequately to enable accurate testing.
   2. Identify locations of membrane leaks; record locations and document with photographs. Submit test reports to Architect.
   3. Confirm completed repair of identified leaks and retest to verify water tightness of membrane.

B. Initial Membrane Test: Perform initial membrane integrity test test upon completion of membrane and integrity test system installation and prior to installation of above-membrane components.

C. Assembly Test: Repeat membrane integrity test following installation of above-membrane components.

D. Final Testing: Repeat membrane integrity test if roof assembly is exposed to traffic or construction operations prior to Substantial Completion.

3.3 PROTECTION

A. Protect tested membrane according to requirements of Division 07 Section “Thermoplastic Polyolefin (Tpo) Roofing.”

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified in other sections by reference to this Section:

1. Exterior joints in the following vertical surfaces and horizontal non-traffic surfaces:
   b. Joints between APC panels and shapes and different materials.
   c. Joints between plant-precast architectural concrete units.
   d. Control and expansion joints in unit masonry.
   e. Joints between different materials listed above.
   f. Perimeter joints between door, window, and louver frames and wall materials.
   g. Control and expansion joints in ceilings and other overhead surfaces.
   h. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Joints between different materials listed above.
   c. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
   d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   f. Joints between dissimilar materials unless detailed otherwise.
   g. Through-penetration joints in non-rated assemblies.
   h. Joints at wall terminations at decks, caps, or obstructions.
   i. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:
   b. Other joints as indicated.

5. Security Sealant joints in horizontal and vertical surfaces as indicated below:
   a. Elastomeric type.
   b. Low-mod gel.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

C. Provide joint sealants for interior STC-rated acoustical applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates, while maintaining indicated partition STC rating.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

E. Qualification Data: For Installer and testing agency.

F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in “Quality Assurance” Article.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Field Test Report Log: For each elastomeric sealant application.

I. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

J. Warranties: Special warranties specified in this Section.

K. Joint-Sealant Schedule: Include the following information:
   1. Specification Section.
   2. Joint-sealant joint location.
   5. Joint-sealant product name.
   7. Joint-sealant primer, when required.
   8. Joint-sealant backer rod type, when required.
  10. Installer.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit minimum of eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Product Testing: Obtain test results for “Product Test Reports” Paragraph in “Submittals” Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
   3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:
      a. Each type of elastomeric sealant and joint substrate indicated.
      b. Each type of non-elastomeric sealant and joint substrate indicated.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected. Architect’s presence at testing is not required.
   4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
         1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Provide written report whether sealant in each type of joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

F. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
   1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period - Silicone: 20 years from date of Substantial Completion.
   2. Warranty Period - Urethane: 5 years from date of Substantial Completion.
   3. Warranty Period – Security Sealant: 5 years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL
A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS
A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
D. Low-Modulus Single-Component Neutral-Curing Silicone Sealant ES-1:
1. Products:
   a. BASF; MasterSeal NP 100.
   b. GE Silicones; SilPruf SCS2000.
   c. Pecora Corporation; 890NST/890FTS (field-tint)
   e. Tremco; Spectrem 3. (or Spectrem 4TS for field-tint)
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrate, O.
   a. Use O Joint Substrates: fluoropolymer finished aluminum, galvanized steel, brick.

E. Medium-Modulus Single-Component Neutral-Curing Silicone Sealant ES-2:
1. Products:
   a. Dow Corning Corporation; 795
   b. GE Silicones; SilPruf NB SCS9000.
   c. Pecora Corporation; 895.
   d. Tremco; Spectrem 2
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrate, O.

F. Single-Component Mildew-Resistant Silicone Sealant ES-3:
   1. Neutral-Curing Products:
      a. Pecora Corporation; 898.
      b. Tremco; Tremsil 600 White.
   2. Acid-Curing Products:
      a. Dow Corning Corporation; 786 Mildew Resistant.
      b. GE Silicones; Sanitary SCS1700.
      c. Tremco; Tremsil 200.
3. Type and Grade: S (single component) and NS (nonsag).
5. Use Related to Exposure: NT (nontraffic).
6. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
a. Use O Joint Substrates: Galvanized steel and ceramic tile.

G. Non-Traffic Multicomponent Nonsag Urethane Sealant ES-4:
   1. Products:
      a. BASF; MasterSeal NP2.
      b. Pecora Corporation; Dynatrol II.
      c. Tremco; Dymeric 240 FC.
      e. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
      f. Tremco; Vulkem 227.
2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25 minimum.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrate indicated, O.
a. Use O Joint Substrates: Galvanized steel and ceramic tile.

H. Multicomponent Pourable Urethane Sealant ES-5:
   1. Products:
      b. Meadows, W. R., Inc.; POURTHANE.
      c. Pacific Polymers, Inc.; Elasto-Thane 227 Type I (Self Leveling).
      d. Polymeric Systems Inc.; PSI-270SL.
      e. Schnee-Morehead, Inc.; Permathane SM 7201.
      f. Tremco; THC-901 or THC-900. (to suit slope)
2. Type and Grade: M (multicomponent) and P (pourable).
4. Use Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrate, O.

2.4 SOLVENT-RELEASE JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealant SRS-1: ASTM C 1311.
   1. Available Products:
      b. Pecora Corporation; BC-158.
      c. Tremco Incorporated; Tremco Butyl Sealant.

2.5 LATEX JOINT SEALANTS

A. Latex Sealant LS-1: Comply with ASTM C 834, Type OP, Grade NF.
B. Products:
   1. BASF; MasterSeal NP 520.
   2. Bostik Findley; Chem-Calk 600.
   5. Tremco; Tremflex 834.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant AS-1: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.
      b. BASF; MasterSeal NP 520.
      c. GE Construction Sealants; RCS20 Acoustical.
      d. Grabber Construction Products; Acoustical Sealant GSC.
      e. Hilti CP506 Smoke and Acoustical Sealant.
      f. Pecora Corporation; AC-20 FTR or AIS-919.
      g. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
2.7 SECURITY SEALANTS:

A. General: All indicated joints and other sealant locations, including precast concrete, masonry, and hollow metal perimeter joints that are within the [detention] [prisoner holding] areas (I-3 Use Group areas, indicated on Drawing A1.1) and exposed to view shall comply with requirements for security sealants. Joints above ceilings, covered by expansion joint covers, or otherwise concealed are excluded. Provide elastomeric security sealants (“tamper-resistant”) for supervised inmate occupied areas within the perimeter security fence; and low-mod gel security sealants (“pick resistant”) for cells and other inmate-occupied areas not subject to continuous supervision, located within the secure perimeter. Low-mod gel (“pick resistant”) sealants are not for use in building joints that require movement such as control and expansion joints; provide “tamper resistant” sealant at these locations. (See below.)

1. Security sealants are referenced in Division 11 and Division 28 Sections as part of the installation of security items directed by the SCSC, who has sole responsibility for provision of secure installation.

2. Provide joint backer material for elastomeric security sealant.

3. Do not use joint backer material for low-mod gel security sealant; install as a “grout” in accordance with manufacturer's recommendations.

4. In cells, provide security sealant (“pick-resistant”) at all perimeter joints of all permanent materials and objects (i.e. plaster security ceilings, floors, concrete bunk bed, security hollow metal frames, air grilles, wall embed plates).

5. In cells provide security sealant (“tamper-resistant”) at all perimeter joints of removable objects (i.e. surface mounted toilet fixtures, inmate emergency intercom, security speaker and any exposed wiring devices such as cover plates of wall switches, receptacles specified in Divisions 22, 23, 26 and 27).

6. Provide security sealant (“tamper resistant”) for all exposed voids between finish materials, and between finish materials and surface mounted devices that inmates could use to hide contraband in inmate-accessible rooms inside the secure perimeter. Provide also at VCT termination at CMU walls where no base is scheduled (only painted base), and at joint between ceiling and wall.

B. Elastomeric Security Sealant (“Tamper-Resistant”): Provide one or two-part non-sag polyurethane or epoxy based elastomeric sealant for Use NT to comply with either ASTM C 920, Type S or M; Grade NS; minimum Class 12.5; and Uses NT, M, G, A, & concrete with durometer hardness of 50 or greater; or ASTM C881-90 Type I, II, IV, & V, grade 3, epoxy adhesive resin; made for abuse resistant applications.

1. Products: Provide one of the following:
   a. “MasterSeal CR 195”; BASF.
   b. “Dynaflex”; Pecora Corp.
   c. “Sikaflex 51 NS”; Sika Corp.
   d. “Prison-Loc 30”, Polytite Construction Products
   e. “Vulkem 617”; Mameco

2. Applications: Provide elastomeric security sealants (“tamper-resistant”) for supervised inmate occupied areas within the secure perimeter.

C. Low-Mod Gel Security Sealant (“Pick Resistant”): Low-modulus security sealant 100% solids, moisture-insensitive, non-sag, epoxy resin product to comply with ASTM C881-90 Type I,
manufactured for assault resistance. “Sikadur 23” manufactured by Sika Corp. is cited as a design standard.

1. Products: Provide one of the following:
   a. “Euco 452-P”; Euclid Chemical Company
   c. “Sikadur 23”; Sika Corp.

2. Applications: Provide low-mod gel security sealants (“pick resistant”) for cells and other inmate-occupied areas not subject to continuous supervision, located within the secure perimeter.

2.8 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bi-cellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile. (work of Division 9 Section “Tiling.”)
      d. Acoustical sealant at gypsum board partitions. (work of Division 9)
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass. (work of Division 8 Section “Glazing.”)
      c. Porcelain enamel.
      d. Glazed surfaces of ceramic tile. (work of Division 9 Section “Tiling.”)
      e. Acoustical sealant at perimeter metal edge moldings of acoustical panel ceilings. (work of Division 9 “Acoustical Panel Ceilings”)

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
   1. Provide sealant for all joints where sealant is not specified in other Sections. Seal all joints between dissimilar materials, unless indicated otherwise.
   2. For interior partitions indicated to be full height, seal all penetrations and joints unless indicated otherwise.
   3. For STC-rated partitions, provide sealant on both sides of partition.
B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

G. Installation of Security Sealant: Install in locations indicated in accordance with manufacturer's written recommendations.
   1. Apply pick-resistant security sealant in all spaces and cracks between similar and dissimilar materials including, but not limited to, metal frames, windows, all fixtures except vitreous china plumbing fixtures, detention furniture, embeds, secure air diffusers, lock columns and receivers.
   2. Apply tamper resistant security sealant in any open joints located in cells, including joints at the intersections of walls to walls, walls to ceilings and walls to floors.

H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

I. Joint-Sealant Application: Vertical and perimeter joints on concealed surfaces of interior unit masonry, concrete, and panel full-height walls and partitions. Refer to other Division 9 Sections for acoustical sealant included as part of assembly installations.

J. Joint-Sealant Application: Vertical and perimeter joints on exposed and concealed surfaces of interior unit masonry, concrete, and panel acoustic STC-rated walls and partitions. Refer to other Division 9 Sections for acoustical sealant included as part of assembly installations.


3.4 FIELD QUALITY CONTROL (*AD-02)

A. Testing Agency: Owner will engage a qualified independent testing agency to perform testing indicated.

B. Water Penetration: Testing agency shall test representative areas of each water and moisture control element of the building envelope, including, but not limited to, flashings, joint sealants, air barriers, copings and edge metals, and storefront/curtainwall elements. Testing for water penetration shall include both testing under dynamic pressure per AAMA 501.1 and static pressure per ASTM E331 and ASTM E1105.

C. Contractor shall coordinate with Owner’s testing agency at the beginning of construction to develop a schedule of building envelope elements requiring field testing. Provide advance notice, of no less than 7 days, to Owner and Owner’s testing agency of when completed building envelope elements will be completed for testing. Maintain building envelope open and accessible to Owner’s testing agency.

D. After testing agency completes testing and inspection and provides written approval, Contractor may proceed with installation of building elements concealing water and moisture control layers. Contractor shall ensure that tested elements are thoroughly vented and dried from any test procedures prior to covering.

E. Repair or remove work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

F. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.

4. Inspect tested joints and report on the following:
   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of
product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

b. Whether sealants filled joint cavities and are free of voids.

c. Whether sealant dimensions and configurations meet specified requirements.

5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

G. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING
A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION
A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE (Type M = multi-component, Type S = single-component)
   2. Joint-Sealant Color: Standard or custom (factory or field-tint) selected by Architect.

   1. Joint Sealant: Type M pourable urethane sealant ES-5.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

C. Joint-Sealant Application: Exterior vertical control and expansion joints in unit masonry.
   2. Joint-Sealant Color: Standard or custom (factory or field-tint) selected by Architect.

D. Joint-Sealant Application: Exterior vertical joints between different materials listed above.
   2. Joint-Sealant Color: Standard or custom (factory or field-tint) selected by Architect.
E. Joint-Sealant Application: Exterior perimeter joints between walls and frames of doors, windows, and louvers.
   1. Joint Sealant: Low or Medium Modulus Type S neutral-curing silicone sealant ES-1 or ES-2.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

F. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
   2. Joint Sealant, Secure Area: Elastomeric security sealant ("pick-resistant").
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

G. Joint-Sealant Application: Interior perimeter joints of exterior openings.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

H. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
   1. Joint Sealant: Type S mildew-resistant neutral or acid-curing silicone sealant ES-3.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

I. Joint-Sealant Application: Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

J. Joint-Sealant Application: Acoustical joints on concealed surfaces of interior unit masonry, concrete, and panel full-height walls and partitions.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

K. Joint-Sealant Application: Acoustical joints on exposed and concealed surfaces of interior unit masonry, concrete, and panel acoustic STC-rated walls and partitions.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

L. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

M. Joint-Sealant Application: Interior control, expansion, and isolation joints in horizontal traffic surfaces of concrete slab flooring.
   1. Joint Sealant: Type M pourable urethane sealant ES-5.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

N. Joint-Sealant Application: Bedding joint applications.
   1. Joint Sealant: Butyl-Rubber-Based Solvent-Release Joint Sealant SRS-1
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200
PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
   1. Structural loads.
   2. Thermal movements.
   3. Dimensional tolerances of building frame and other adjacent construction.
   4. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferred to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
      d. Noise or vibration created by wind and thermal and structural movements.
      e. Loosening or weakening of fasteners, attachments, and other components.
      f. Sealant failure.

B. Structural Loads:
   1. Wind Loads: As indicated on Structural Drawings.
   2. Seismic Loads: As indicated on Structural Drawings.

C. Structural-Test Performance: Provide aluminum-framed systems tested per ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity but not less than 10 seconds.

D. Deflection of Framing Members:
   1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches, and to 1/240 of clear span plus 1/4 inch, for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to smaller of 1/360 of clear span or 1/8 inch.
      a. Operable Units: Minimum 1/16-inch clearance between framing members and operable units.

E. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
F. Heavy Commercial Windows ("Glass Vent"): Provide window units, including required hardware items, complying with requirements of AAMA Grade and Performance Class P-C70 (Projected).

G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

H. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

I. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested per ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but minimum 8 lbf/sq. ft. for storefront and 12 lbf/sq. ft. for curtainwall.

J. Energy Performance, Storefront: Certify and label energy performance as follows:
   1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F
   2. Condensation Resistance: Fixed glazing and framing areas shall have a condensation resistance factor of no less than 56 for framing as determined according to AAMA 1503.

K. Energy Performance, Curtain Wall: Certify and label energy performance as follows:
   1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.47 Btu/sq. ft. x h x deg F
   2. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.39 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
   3. Condensation Resistance: Fixed glazing and framing areas shall have a condensation resistance factor of no less than 56 for framing as determined according to AAMA 1503.
   4. Sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications, technical product data, standard details, and installation recommendations for types of aluminum entrance, storefront, operable sashes, and curtain wall required. Include information on fabrication methods, finishing, door hardware, and accessories.
   1. Submit product data for pre-finished insulated panels.
   2. Submit product data for extruded silicone engineered transition assembly ("ETA").

B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, glazed aluminum curtain walls, accessories, and components from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for aluminum-framed entrance and storefront, and for glazed aluminum curtain wall.

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
   1. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
2. Include decorative formed metal and accessories including interior and exterior mullion covers, exterior window sill, interior filler panels at walls and partitions meeting aluminum-framed systems.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers, including engineered transition assembly (“ETA”). Detail installation of ETA, including corners.

4. For entrances, include hardware schedule and indicate operating hardware types, quantities, and locations. Coordinate with Division 8 Section “Door Hardware.”

5. Include complete details for exterior sunshade assemblies and mounting to curtain wall framing.

6. Shop drawings must be produced and approved by the manufacturer.

D. Color Samples for Color Match Verification: Submit two samples to demonstrate acceptable color match to existing aluminum storefront finish.

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

1. Detail fabrication and assembly of aluminum-framed systems.

2. Indicate anchorage of aluminum-framed systems to surrounding construction to transfer wind loading to structure.

3. Include design calculations.

1.4 QUALITY ASSURANCE:

A. Source Limitations: Obtain aluminum storefront, curtain wall, entrances, operable sashes and accessories, through one source from a single manufacturer.

B. Installer's Qualifications: Firm with not less than five (5) years successful experience in the installations of storefront, curtain wall, and entrances similar in scope to this project, capable of assuming engineering responsibility, and employs installers and supervisors who are trained and approved by manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

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

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

D. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of curtain wall assemblies.

F. Integrated Exterior Mockups: Attend preinstallation conference and provide aluminum storefront and curtain wall work for integrated exterior mockup as specified in Division 1 Section “Quality Requirements.”

1.5 PROJECT CONDITIONS:

A. Field Measurements: Check openings by field measurement before fabrication to ensure proper fitting of work; show field measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in the work. Coordinate fabrication tolerances to ensure proper fit. Coordinate and allow for sealant joints and steel lintels.

1.6 WARRANTY

A. General Warranty: The special warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance, curtain wall, and storefront systems that fail in materials or workmanship within the warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including, but not limited to, excessive deflection.
   2. Failure of system to meet performance requirements.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Failure of operating components to function normally.
   5. Water leakage through fixed glazing and frame areas.

C. Warranty Period
   1. Entrance, Curtain Wall, and Storefront Systems: 2 years from date of Substantial Completion.
   2. Warranty Period on Finish System: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Basis-of-Design Standard: Detailing for aluminum entrances, storefront, and curtain wall is based on the following systems. Contractor shall coordinate all adjustments, if any, required for provided products as approved by the Architect.
   1. Curtain Wall System: Kawneer 1600 System 1”.
   2. Exterior Storefront System: Kawneer 451T.
   5. Operable Sashes: Kawneer GLASSVent.

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
1. Exterior Storefront: 2-x 4.5-inch thermally-broken front-set framing:
   a. EFCO “403 (T).”
   b. Kawneer “451T.”
   c. Oldcastle “3000 Thermal.”
   d. YKK AP “YES 45 TU.”

2. Interior Storefront: 2 x 4.5 inch center-set framing:
   a. EFCO “402.”
   b. Kawneer “451.”
   c. Oldcastle “FG 3000.”
   d. YKK AP “YES 45 FI.”

3. Entrances: Standard 1.75 inch, wide stile:
   a. EFCO “D500.”
   b. Kawneer “500.”
   c. Oldcastle “500.”
   d. YKK AP “50D.”

4. Curtain Wall: 2.5-inch (aluminum pressure plates) (Front glazed and Center glazed as indicated):
   a. EFCO “5600.”
   b. Kawneer “1600 System 1.”
   c. Oldcastle “Reliance Thermal.”
   d. YKK AP “YCW 750.”

5. Operable Sash:
   a. EFCO “WV-410.”
   b. Kawneer “GLASSvent.” (Casement).
   c. Oldcastle “ZS2750.”
   d. YKK AP “YCW 750 CV.”

2.2 MATERIALS:

A. Aluminum Members: Provide alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; meet ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.

B. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.
   1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
   2. Exposed Fasteners: Except where unavoidable for application for hardware, do not use exposed fasteners. For the application of hardware, provide fasteners that match the finish of member or hardware being fastened. Provide Phillips flat-head machine screws for exposed fasteners.

C. Concealed Flashing: Provide 26 gage minimum dead-soft stainless steel, or 0.026" minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
D. Brackets and Reinforcements: Where feasible, provide high-strength aluminum brackets and reinforcements; otherwise provide nonmagnetic stainless steel or ASTM A 386 hot-dip galvanized steel. Provide custom brackets to accommodate non-standard conditions.

E. Masonry Inserts: Fabricated from cast-iron, malleable iron, or ASTM A 386 hot-dip galvanized steel.

F. Glass and Glazing Materials: Comply with requirements of Division 8 Section “Glazing.”

2.3 COMPONENTS:

A. Entrance Doors: Provide manufacturer's 1-3/4-inch- thick glazed doors with minimum 0.125-inch- thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.

B. Projected Windows (“Glass Vents”): Fabricate flush-type, thermally broken aluminum windows designed for integration with storefront framing. Provide performance grade and hardware indicated. Window screens are not required. Match storefront finish. Provide structurally glazed “zero sight line” sash with minimum exposure snap-on cover element to protect insulating glass unit edge.

1. Projected Window Hardware: Provide the following operating equipment and hardware:
   a. Hinges: Stainless steel 4-bar friction hinges with adjustable friction slide shoe (2 per vent).
   b. Limit Arms: Concealed limit arms to restrict sash opening to maximum of 8” without special (custodial) “key.”
   c. Sash Lock: Cam action sweep lock handle and keeper. (Quantity required for AAMA C-70.) Provide cast white bronze exposed hardware.
   d. Operator: Underscreen pivot-shoe-type, gear-type rotary operator.

C. Insect Screens: Provide screens on inside of window and provide for each operable exterior sash or ventilator. Provide aluminum tubular frame that comply with SMA 1004, “Specifications for Aluminum Tubular Frame Screens for Windows,” Architectural C-24 class and 18 x 16 mesh aluminum mesh in color selected by Architect. Furnish a standard screen wicket for hardware access on each screen. Finish screen frames to match aluminum windows unless directed otherwise. Splines shall be extruded vinyl, removable to permit re-screening.

D. Storefront Framing System: Provide center-set resilient flush-glazed storefront framing system with provisions for glass replacement. Shop-fabricate and preassemble frame components where possible.

1. Single Thermal-Break Construction: Fabricate with single integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact.

2. Enhanced (High Performance) Sill Flashing System: Provide thermally-broken extruded aluminum sill flashing with 2-inch tall back leg and bottom profile with outboard trough and weep holes to direct water to exterior. Provide full-frame-depth end dams mechanically attached to sill flashing extrusion and sealed with silicone. Provide silicone sill flashing splice sleeves and sealant as required at end dams and penetrations for anchorage. Provide finish to match framing.
E. Curtain Wall Framing System – 2.5" Width: Provide nominal 2.5" wide glazed aluminum curtain wall system for 1-inch glazing consisting of structural extruded tube sections with conventional center tongue, glazing pressure plate, and mullion caps for nominal 6.00" total section depth.
   1. Provide conventional “pressure wall” system with glazing pressure plates and snap-on mullion caps for application areas indicated.
      a. Provide nominal 1/2-inch depth mullion caps unless indicated otherwise.
      b. Provide nominal 4-inch depth mullion caps for horizontal applications indicated.

F. Associated Decorative Formed Metal and Accessories: Provide matching aluminum shop-fabrications and manufactured extruded aluminum accessories indicated.
   1. Provide manufacturer’s extruded aluminum exterior sill assemblies of depth and extrusion thickness required for application. Coordinate with storefront and curtain wall sill member to not obstruct weeps and internal drainage, and to maintain flashing of sill condition.
   2. Provide exterior mullion covers utilizing extrusions to greatest extent practical and .080-inch aluminum thickness. Include clip and concealed splicing members required.
   3. Form interior filler panels for closing ends of partition systems and for other applications indicated. Form from minimum .050-inch aluminum, producing a panel of same thickness as partitions or mullions unless otherwise indicated. Incorporate reveals, trim, and concealed anchorages for attaching to adjacent surfaces.
   4. Provide terminations to flush butt-joint terminations with concealed fasteners for trim affix to aluminum framing members.
   5. Provide returned ends at trim and closure sections which terminate with uniform width joint and sealant or gasket system as indicated. Do not mechanically fasten such panels to aluminum storefront and curtain wall members.
   6. Provide surface-applied decorative muntins (simulated divided lites) to maintain uniform site-line, and in pattern as indicated for storefront and curtain wall. Provide nominal 7/8-inch wide profile selected by Architect from manufacturer's full range. Provide muntin grid with perimeter frame mechanically attached to aluminum entrance, storefront and curtain wall framing for simulated divided light applications indicated. Adhesive-applied grids not acceptable.
      a. Provide one aluminum muntin at indicated glazing areas located at exposed surface of exterior lite.

2.4 ENGINEERED TRANSITION ASSEMBLIES (ETA)
A. Engineered Transition Assembly: Air barrier perimeter transition for aluminum entrances, storefront, and curtain wall systems. Assembly comprised of the following components:
   1. Silicone Rubber Sheet: Extruded, translucent cured silicone.
      a. Air Infiltration, ASTM E 283: Less than 0.01 cfm when tested with proposed sealant.
      b. Hardness, ASTM D 2240: 40 minimum.
      c. Tensile Strength, ASTM D 412: 800 psi minimum.
      d. Elongation, ASTM D 412: 400% minimum (340% for premolded corners).
      e. Tear Strength, ASTM D 624, Die B: 90 ppi minimum.
      f. Corners: Pre-molded or job-formed and lapped. Mitered abutting corners are not acceptable.
      g. Surface: Textured or ribbed on sealant side(s) to maximize adhesion and shear strength at sealant.
2. Silicone Sealants: ASTM C 920, single-component, neutral-curing silicone; Type S, Grade NS, approved by silicone rubber sheet manufacturer for use with silicone rubber sheet and with substrates.

3. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. Dow Corning; “Silicone Transition Strip” and “758 Silicone Weatherbarrier.”
   b. Elbex; “Elbex HS.”
   c. Momentive Performance (GE); “UltraSpan” US1101 and GE “SilPruf.”
   d. Pecora; “XL-Span” and “AVB Silicone.”
   e. Tremco; “Proglaze” ETA and “Spectrem 1 Silicone.”

2.5 INSULATED SPANDREL PANELS

A. Insulated Spandrel Panels (Glazing Type G-3): Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.
   1. Overall Panel Thickness: 1 inch.
   2. Exterior Skin: Aluminum.
      a. Thickness: Manufacturer's standard for finish and texture indicated.
      b. Finish: Matching framing system.
      c. Texture: Smooth.
   3. Interior Skin: Aluminum.
      a. Thickness: Manufacturer's standard for finish and texture indicated.
      b. Finish: Matching curtain-wall framing.
      c. Texture: Smooth.
      d. Backing Sheet: 1/8-inch-thick, tempered hardboard.
   4. Thermal Insulation Core: Manufacturer's standard rigid, closed-cell, polyisocyanurate board.
   5. Surface-Burning Characteristics: For exposed interior surfaces of panels, when tested according to ASTM E 84 as follows:
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.

2.6 FINISHES:

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION
3.1 INSTALLATION:

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing curtain wall system. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section “Joint Sealants” to produce weathertight installation.
   1. Install enhanced (high performance) sill flashing extrusion with sealed end dams for storefront framing. Provide silicone splice material and sealant at extrusion joints and penetrations. Do not obstruct weep holes.
   2. Install continuous flashing with end dams and sill member for curtain wall in accordance with manufacturer’s instructions to maintain drainage path. Coordinate the installation of perimeter sealant at sill framing member with installation of snap-on covers to maintain open weep holes.

E. Coordinate installation of aluminum framing with air barrier to maintain continuity of air- and vapor barrier between adjacent opaque wall area and aluminum framing. Incorporate extruded silicone engineered transition assembly (“ETA”) as indicated.
   1. Curtain Wall: Incorporate extruded silicone engineered transition assembly (“ETA”) as indicated. Engage transition material in curtain wall glazing pocket as indicated.
   2. Storefront: Incorporate membrane transition material specified in Section “Sprayed Polyurethane Foam Air Barrier” as indicated.

F. Install framing components plumb and true in alignment with established lines and grades.

G. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.
   1. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

3.2 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
   1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
   2. Alignment:
      a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
      b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.
3.3 **FIELD QUALITY CONTROL (*AD-02)**

A. **Testing Agency**: Owner will engage a qualified independent testing agency to perform testing indicated.

B. **Water Penetration**: Testing agency shall test representative areas of each water and moisture control element of the building envelope, including, but not limited to, flashings, joint sealants, air barriers, copings and edge metals, and storefront/curtainwall elements. Testing for water penetration shall include both testing under dynamic pressure per AAMA 501.1 and static pressure per ASTM E331 and ASTM E1105.

C. Contractor shall coordinate with Owner’s testing agency at the beginning of construction to develop a schedule of building envelope elements requiring field testing. Provide advance notice, of no less than 7 days, to Owner and Owner’s testing agency of when completed building envelope elements will be completed for testing. Maintain building envelope open and accessible to Owner’s testing agency.

D. After testing agency completes testing and inspection and provides written approval, Contractor may proceed with installation of building elements concealing water and moisture control layers. Contractor shall ensure that tested elements are thoroughly vented and dried from any test procedures prior to covering.

E. Repair or remove work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 **PROTECTION**

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure installed storefront, entrance and curtain wall system work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084000