SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

Part 1 - General

1.1 Related Documents

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

1.2 Summary

A. Section Includes:

1. Formed Products:
    a. Formed roof drainage sheet metal fabrications.
    b. Formed low-slope roof sheet metal fabrications.
    c. Formed steep-slope roof sheet metal fabrications.
    d. Formed equipment support flashing.
    e. Formed expansion-joint cover flashings.
    f. Miscellaneous sheet metal accessories:
    g. Precast concrete splash blocks.

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section “Roof Replacement Preparation” for removal procedures for existing materials.
3. Division 07 Section "Asphalt Shingle Roofing" for installing sheet metal flashing and trim integral with roofing.
4. Division 07 Section Thermoplastic Polyolefin (TPO) Single-Ply Roofing" for installing sheet metal flashing and trim integral with membrane roofing.
5. Division 07 Section "Metal Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
6. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
7. Division 07 Section “Roofing Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 References

A. American Society for Testing and Materials (ASTM):

1. A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware
2. A 653 - Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip process.
3. A 755 - Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
4. A 924 - Steel Sheet, Zinc Coated, (galvanized) by the Hot-Dip process.
5. B 32B - Solder Metal.
6. B 749 - Lead and Lead Alloy Strip, Sheet, and Plate Products.
7. C 920 - Elastomeric Joint Sealants.
8. D 4586 - Asphalt Roof Cement, Asbestos-Free.

B. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

C. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA): Architectural Sheet Metal Manual.

D. National Association of Architectural Metal Manufacturers (NAAMM): Metal Finishes Manual for Architectural and Metal Products

1.4 Performance Requirements

A. General: Sheet metal flashing and trim assemblies as indicated to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Edge Design: Fabricate and install roof edge flashing that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist roof edge design pressure (P) calculated according to ANSI/SPRI-ES-1.

1. Wind Speed: 90 mph.
2. Horizontal Design Pressure: 20 psf.
3. Vertical Design Pressure: 23 psf.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

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

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.5 Action Submittals

A. Product List: Submit list of proposed Products and manufacturers, including all items

specified in Part 2 – Products or otherwise required by the Work.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

C. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

1.6 Informational Submittals

A. Qualification Data: For qualified fabricator, including ANSI/SPRI-ES-1 certification.

B. Warranty: Sample of special warranty.

1.7 Closeout Submittals

A. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

B. Warranty: Executed copies of special warranty.

1.8 QUALITY ASSURANCE

A. General: Work of this Section to physically protect membrane roofing, base flashings, and expansion joints from damage that would permit water leakage to building interior.

B. Fabricator Qualifications: Shop that 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, with three years minimum experience.
   1. Certified by an approved testing and inspecting agency to fabricate roof edge trim to meet specified design pressure (P) calculated according to ANSI/SPRI-ES-1.

C. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical roof eave, including built-in gutter, fascia. fascia trim apron flashing, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment**,** and accessories.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Pre-installation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
   2. Review methods and procedures related to sheet metal flashing and trim.
   3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
   5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.9 Delivery, Storage, and Handling

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation

and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

D. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.10 Coordination

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and noncorrosive installation.

B. Coordinate installation of flanged metal components, including gravel guards, pitch pans, and accessories to ensure strip-in on same day they are installed.

C. Schedule work to avoid storage on, and traffic over finished work.

1.11 Warranty

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

Part 2 - Products

2.1 Sheet Metals

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

B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality.
2. Aluminum-Zinc Alloy-Coated (Galvalume) Steel Sheet: ASTM A 792, Class AZ50 coating designation, Grade 40; structural quality.
3. Surface: Smooth, flat.

C. Prepainted Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality.
2. Aluminum-Zinc Alloy-Coated (Galvalume) Steel Sheet: ASTM A 792, Class AZ50 coating designation, Grade 40; structural quality.
3. Surface: Smooth, flat.
4. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   b. Minimum Exposure Tests:
      1) Humidity Resistance: 2000 hours.
      2) Salt-Spray Resistance: 2000 hours.
5. Color: As selected by Architect from manufacturer's full range.
6. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 Underlayment Materials

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, provide one of the following:
   a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
   b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.

c. Henry Company; Blueskin PE200 HT.

B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 Miscellaneous Materials

A. General: Provide materials and types of fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Metallic-Coated and Prepainted Metallic-Coated Steel Sheet: ASTM F 2329 or Series 300 stainless steel.

3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

4. Rust-resistant and compatible with materials to be joined.

5. Length: As required for thickness of material to penetrate substrate 1/2-inch minimum.

C. Mechanical Fasteners for Sheet Metal to Substrate Anchorage:

1. Masonry: One-step, screw-type drive anchor (nailin); heat-treated, stress relieved, stainless steel pin; zinc jacketed; sized for intended application; minimum 1-1/4-inch length x 1/4-inch diameter; Hammer-Screw® manufactured by Powers Fasteners, Inc.
2. Wood Blocking: Hexagonal head screws, stainless steel, with neoprene rubber washers; jacket color to match pre-painted sheet metal.
3. Concrete: Same as masonry, or other power actuated fasteners, suitable for application.

D. Roofing Nails: Stainless steel (for fastening into ACQ treated lumber); with annular rings, size as required to suit application; minimum 11-gage with 3/8-inch diameter head.

E. Mechanical Fasteners for Sheet Metal to Metal Fabrications (Support Framing) Anchorage: Appropriate for purpose intended, size as required to suit application and achieve positive anchorage to substrate material.

F. Solder:

1. For Metallic-Coated (galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

G. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

H. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane and/or silicone polymer sealant; low modulus, as specified in Division 07 Section “Sealants (for Roofing)”; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

J. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

K. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

L. Splash Blocks: Precast concrete of size and profile indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment; suitable for downspouts discharging at grade level **[or onto roof surface]**.

2.4 Fabrication, General

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

1. Obtain field measurements for accurate fit before shop fabrication.

C. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

D. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

E. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

F. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with elastomeric sealant concealed within joints.

1. Fabricate all components with allowance for expansion at joints. Provide enlarged or oval holes at all piercing fasteners.

G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

H. Form all sheet metal components (except corners) in longest practical length up to 10-feet maximum; true to shape, square, accurate in size, and free from distortion or defects detrimental to appearance or performance.

I. Fabricate corners on all sheet metal components (gravel guards, copings, cap flashings, etc.) to form one piece with minimum 18-inch and maximum 36-inch long legs.

J. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

1. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

K. Soldered Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

L. Unsoldered Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

M. Hem exposed edges of metal 1/2-inch; miter and seam corners.

N. Fabricate vertical faces with bottom edge formed outward 3/4-inch at 30 degrees and hemmed to form drip.

1. Where vertical height exceeds 8-inches, fabricate with stiffing grooves in accordance with SMACNA, unless specifically approved otherwise.

O. Form all sheet metal material to provide watertight joints:

1. Wall Copings:

a. Where wall thickness is less than 8-inches: Cover and backer plates may be used.

2. Vertical Surfaces (copings, cap flashings, gravel guards, etc.): Flat lock or cover and backer plate seams.

P. Miter all sheet metal corners and solder, weld, or fasten and seal all joints watertight:

1. Metallic-Coated Steel Sheet: Solder joints watertight.

2. Prepainted Metallic-Coated Steel Sheet: Apply minimum 1/4-inch bead of sealant between connecting metal flanges and drill and fasten with rivets at 2-inches o.c.

3. Install sealant so it will not be visible on outside of joints.

Q. Fabricate elements complete with required connection pieces.

R. Fabricate all components with horizontal (flat) surfaces with built-in slope for drainage toward roof unless indicated otherwise.

S. Do not use graphite pencils to mark metal surfaces.

2.5 Roof Drainage Sheet Metal Fabrications

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Gutter Style: SMACNA designation K.
    a. Size: Designed to meet roof drainage area, rainfall intensity criteria, and downspout size and spacing.
    b. Supports: Minimum 1/8-inch x 1-1/`2 inch] Brackets and 0.1046 inch (12 gage) spacers at maximum 36-inches oc, staggered.
    c. Join sections with riveted and sealed joints.
2. Expansion Joints: Lap type.
    a. Spacing: Minimum twenty (20) feet, maximum fifty (50) feet between expansion joints.
3. Gutters with Girth 16- to 20-Inches: Fabricate from the following materials:
    a. Prepainted Metallic-Coated Steel: 0.028 inch (22-gage) thick.

B. Downspouts: Fabricate **rectangular** downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Size: Designed to accept roof drainage area, rainfall intensity criteria, and downspout spacing.
2. Length: Minimum twenty (20) feet or required height, maximum fifty feet between expansion joints.
3. Joints: Sections with riveted and sealed or soldered joints.
4. Supports: 12 Gage straps at maximum 8-feet oc. All strap edges rolled or smooth.
5. Fabricate from the following materials:
    a. Prepainted Metallic-Coated Steel: 0.022 inch (24-gage**)** thick.

C. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4-inches beyond cant or tapered strip into field of roof. [Fasten gravel guard angles to base of scupper.] Fabricate from the following materials:

1. Metallic-Coated (Galvanized or Galvalume) Steel: 0.028 inch 22-gage

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes[, exterior flange trim,] [and] [built-in overflows]. Fabricate from the following materials:

1. Prepainted Metallic-Coated Steel: 0.028 inch (22-gage) thick.

2. Metallic-Coated (Galvanized or Galvalume) Steel: 0.028 inch (22-gage) thick.

E. Fabricate gutter and downspout accessories and **seal** watertight.

2.6 Low-Slope Roof Sheet Metal Fabrications

A. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide, joint cover plates.
1. Joint Style: Butt, with 6-inch- wide exposed cover plates.
2. Fabricate roof edge flashing from the following material:
a. Prepainted Metallic-Coated Steel: 0.022 inch (24-gage) thick.
3. Fabricate roof edge cleats from the following material:
a. Metallic-Coated (Galvanized or Galvalume) Steel: 0.028 inch (22-gage) thick.

B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and[drill elongated holes for fasteners on] interior leg. Miter corners, seal, and solder or weld watertight.

1. Coping Profile: As indicated on drawings.

2. Joint Style: Butt, with 12-inch- wide concealed backup plate.

3. Fabricate copings from the following materials:

a. Prepainted, Metallic-Coated Steel: 0.022 inch (24-gage) thick.

C. Counterflashing: Fabricate from the following materials:

1. Metallic-Coated (Galvanized or Galvalume) Steel: 0.022 inch (24-gage thick.

2. Prepainted Metallic-Coated Steel: 0.022 inch (24-gage) thick.

D. Flashing Receivers: Fabricate from the following materials:

1. Metallic-Coated (Galvanized or Galvalume) Steel: [0.022 inch (24-gage)] <Insert thickness> thick.

2. Prepainted Metallic-Coated Steel: 0.022 inch (24-gage)] thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:
1. Metallic Coated (Galvanized or Galvalume) Steel: 0.028 inch (22-gage) thick.

F. Roof-Drain and Soil Pipe Flashing: Fabricate from the following material:
1. Lead: 4.0 lb/sq. ft. hard tempered.

2.7 Steep-Slope Roof Sheet Metal Fabrications

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:

1. Metallic Coated (Galvanized or Galvalume) Steel: 0.022 inch (24-gage) thickness.

B. Drip Edges: Fabricate from the following materials:

1. Prepainted Metallic-Coated Steel: 0.018 inch (26-gage)] thick.

C. Eave, Rake[, Ridge, and Hip] Flashing: Fabricate from the following materials:

1. Prepainted Metallic-Coated Steel: 0.018 inch (26-gage)] thick.

D. Counterflashing: Fabricate from the following materials:

1. Prepainted Metallic-Coated Steel: 0.018 inch (26-gage)] thick.

E. Flashing Receivers: Fabricate from the following materials:

1. Prepainted Metallic-Coated Steel: 0.018 inch (26-gage)] thick.

F. Roof-Penetration Flashing: Fabricate from the following material:

1. Metallic-Coated (Galvanized or Galvalume) Steel: 0.028 inch (22-gage) thick.

2.8 Finishes

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

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

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

D. Exposed to View (Unfinished) Galvanized Steel Components: Paint to match prepainted metallic-coated steel prior to installation:

1. Clean: Comply with SSPC-1 - Solvent Wipe.

2. Primer: Apply specified or finish paint manufacturer's recommended primer in accordance with manufacturer's instructions.

3. Finish Coat: Apply powder coating or approved urethane enamel in accordance with manufacturer's instructions.

Part 3 - Execution

3.1 Examination

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

3. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

4. Verify membrane termination and base flashings are in place, sealed, and secure.

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

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as recommended by SMACNA and as indicated on

Drawings.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. Field measure site conditions prior to fabricating work.

B. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Provide continuous cleats fastened not more than 12-inches on center. Anchor cleats with a minimum two fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
   a. Minimum Dry Film Thickness: 15-mils.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10-feet**. Provide joints within 18- to 36-inches of all corners or intersections. Where lapped expansion provisions cannot be used or

would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with elastomeric sealant concealed within joints.

E. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws; metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance:

1. Metallic-Coated or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.

F. Seal joints as shown and as required with elastomeric sealant for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Roofing Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder prepainted metallic-coated steel sheet.

2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

H. Rivets: Rivet joints where indicated, and where necessary for strength.

I. Protect all membrane penetrations as indicated and as recommended in SMACNA and NRCA manuals.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets and straps spaced not more than 36 inches apart, staggered. Provide end closures and seal watertight with sealant.

1. Fasten gutter spacers to front and back of gutter.

2. Loosely lock straps to front gutter bead and anchor to roof deck.

3. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls.

Locate hangers at top and bottom and at approximately 60 inches o.c. in between.

2. Provide elbows at base of downspout to direct water away from building.

3. Connect downspouts to underground drainage system where available.

4. Set splash blocks under downspouts not connected to underground drainage system.

D. Downspout Boots: Align with existing storm water system inlet pipes or downspout locations. Secure tabs with fasteners appropriate for wall surface materials.

E. Splash Blocks: Install where downspouts discharge onto low-slope roofs or onto grade.

1. Roof Discharge: Set on traffic pads compatible with roofing membrane.

2. Grade Discharge: Set on a bed of compacted fill.

F. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and solder **or seal with elastomeric sealant** to scupper.

2. Loosely lock front edge of scupper with conductor head.

3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

G. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1-inch below scupper discharge.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install starter and edge strips, and cleats before starting installation.

2. Strip in all sheet metal flanges the same day they are installed.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces specified in Part 1 and as indicated.

1. Backer Plates: Secure with fasteners suitable for substrate, 6-inches o.c. each face.

2. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at staggered 3-inch centers.

3. Apply 1/4-inch bead of sealant between each layer of metal at each edge.

4. Cover Plates: Hook front or exposed face of cover plate over drip edge.

5. Do not use mastic between sheet metal components.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in ANSI-SPRI ES-1.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4-inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4-inches over base flashing. Lap counterflashing joints a minimum of 4-inches and bed with elastomeric sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof.

1. Install lead flashings at all soil pipe penetrations. Turn lead flashing down inside piping, being careful not to block vent piping with flashing

2. Install lead flashings at all roof drains.

3. Pitch pans are not desired. Install only where specifically indicated, or approved by Special Consultant. Provide flanged umbrellas at all pitch pans.

G. Protect all membrane penetrations as indicated and as recommended in SMACNA and NRCA manuals.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

1. Install receivers on vertical surfaces to receive counterflashings.

a. Install surface mounted reglets true to lines and levels.
1) Seal top of reglets with sealant.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated

beyond successful repair by finish touchup or similar minor repair procedures.

3.9 SCHEDULE - MATERIALS

A. Exposed to View Components:

1. Prepainted metallic-coated steel sheet.

2. Wrap gutter brackets, downspout straps and other heavy gage materials with prepainted metallic-coated steel sheet or powder coat to match.

B. Concealed from View Components, (Counterflashings, etc.):

1. Metallic-coated steel sheet.

*****END OF SECTION 07 62 00*****

SECTION 07 71 23 – MANUFACTURED GUTTERS AND DOWNSPOUTS

1.01: General

PART 1 GENERAL

1.01 SUMMARY

A. Section includes pre-finished aluminum gutters and downspouts.

1. Tie into area drains as indicated on the drawings. Refer to Landscape Plan for downspout termination requirements.

2. Tie into concrete splash blocks as indicated on the drawings. Refer to Landscape Plan for splash block requirements.

B. Conform to applicable code for size and method of rainwater discharge.

1.02 REFERENCES

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. SMACNA- Architectural Sheet Metal Manual.

1.03 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

C. Product Data: Submit data on manufactured components, materials, and finishes.

D. Samples: Submit two samples, 6 inch long illustrating component design, finish, color, and configuration.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with manufacturer's instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials during storage capable of causing discoloration, staining, or damage.

1.06 WARRANTY

A. Furnish 2 year watertightness warranty for gutters and downspouts.

B. Provide a two-year workmanship warranty.

C. Provide 20 year finish warranty for pre-finished metal.

PART 2 PRODUCTS

2.01 GUTTERS AND DOWNSPOUTS

A. Manufacturers:
1. Perimeter Systems, Division of Southern Aluminum Finishing Company, Inc, Profile No. DSC, 6 inch Colonial Fascia, manufactured of .040" aluminum, SAFinish finish. Color as selected by Architect from manufacturer's standard colors.

a. Downspouts: Furnish and install manufacturer's standard downspout Profile No. DS, 4" x 4" manufactured of aluminum 0.40" thick. Finish and color to match gutters.

2.02 COMPONENTS

A. Drip Edge: Manufacturers standard drip edge, matching profile as shown on drawings; 0.032 inch aluminum shop pre-coated with high performance organic coating; color as selected by Architect.

2.03 ACCESSORIES

A. Anchors and Supports: Profiled to suit gutters and downspouts.
1. Anchoring Devices: Type recommended by fabricator.
2. Gutter Supports: Inside strap, support bracket and retainer.
3. Downspout Supports: Manufacturer's Style No.3.

B. Fasteners: Same material and finish as gutters and downspouts.

2.04 FABRICATION

A. Gutter liner: 10'-0" lengths, tapered and notched to provide a 1" telescoping lap joint. Gutters shall be prepunched at 12" o.c. to provide for thermal movement and provided with punched slots for associated brackets.

B. Fascia: Snap-over fascia shall be press formed in 10'-0" lengths with true and repeated shapes. Fascia joints shall receive 6" concealed splice plates with finish to match fascia.

C. Provide manufacturer's standard support brackets, keeper brackets, and interior straps for installation at 30" o.c. Brackets shall be 1/8" x 1" aluminum, designed to provide a resistance lock for the snap-over fascia.

D. Provide manufacturer's standard elastomeric expansion joint assembly at 40' intervals.

E. Provide manufacturer's standard welded miter corners.

F. Provide end caps and terminations at all end terminations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify surfaces are ready to receive gutters and downspouts.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install gutters and downspouts in accordance with manufacturer's instructions

B. Slope gutters as required to properly drain water.

C. Install downspouts at maximum 30'-0" o.c., coordinate locations with landscape.

D. Install splashblock under downspout except where noted otherwise on the drawings.

*****End of Section 07 71 23*****

SECTION 07 72 73 – ROOF HATCHES

PART 1 GENERAL

1.01 SUMMARY

Metal roof hatches with integral curbs.

1.02 SYSTEM DESCRIPTION

The roof hatches shall have a clear opening as shown on the drawings, and shall consist of an insulated cover and frame. Material shall be G-90 galvanized steel and have a factory applied coat of primer (.090 Aluminum H-14 3003, mill finish on aluminum models). Corners shall be fully welded and ground smooth. A gasket between cover and frame shall create a weather tight seal.

1.03 DELIVERY, STORAGE AND HANDLING

A. Examine units upon arrival at jobsite. Notify the carrier and manufacturer of any damage immediately.

B. Store units under roof, if possible until installation; or, if stored outside, store under a tarp or suitable cover.

1.04 WARRANTY

The unit carries a limited warranty of 5 years against defective material and workmanship, covering parts only, no labor or freight. Defective parts, if deemed so by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant which warrants same.

1.05 MAINTENANCE

A. Under normal usage, the hatches shall require no preventive maintenance.

B. No "Spare Parts" shall be required.

PART 2 PRODUCTS

2.01 MANUFACTURER

Acceptable Manufacturer: Precision Ladders, LLC, P. O. Box 2279, Morristown, TN 37816-2279; Toll Free Tel: 800-225-7814; Tel: 423-586-2265; Email: info@PrecisionLadders.com; Web: www.PrecisionLadders.com

2.02 MATERIALS

A. CURB

1. Formed from 14 gauge galvanized steel of lock forming quality per ASTM A-525 with G90 coating (.090 Aluminum H-14 3003 on aluminum models).
2. Sheathed with 1" of rigid fiber board insulation.
3. Height of 12" unless indicated otherwise on drawings.
4. 4" integral flange for securing to roof.
5. Hinges connecting curb to door shall be 1/8", 2 piece formed steel with 3/8" pivot pin.
6. Extruded rubber gasket within a 20 gauge extruded aluminum track shall be securely attached to the frame to make the unit weather tight.

B. COVER

1. Formed from 14 gauge galvanized steel of lockforming quality per ASTM A-525 with G90 coating (.090 Aluminum H-14 3003 on aluminum models).
2. Liner shall be 22 gauge galvanized steel with G90 coating (.040 Aluminum H-14 3003 on aluminum models).
3. Insulation between cover and liner to be 1" thick U.L. plain fiberglass 0.75# density.
4. Lid shall be reinforced as required with 11 ga. steel channel (.090 Aluminum H-14 3003 on aluminum models).
5. A one point cab lock is to be provided with a built-in inside handle on units with a length of 4' 6" or less. On units of greater length, a 2 point slam lock will be used.
6. Exterior of cover shall be devoid of hardware with the exception of the outside handle.
7. Outside handle shall be vinyl coated, steel T-handle.
8. Automatic hold-open device shall be formed from 3/16" steel flat bar and 1/2" diameter steel round stock with a vinyl grip.
9. Padlock provisions provided on both interior and exterior of unit.
10. Extruded rubber gasket shall be securely attached to the liner, thus providing a weather-tight seal.

C. PRESSURE CONTROL

Opening/closing assistance/resistance shall be provided with spring-loaded pressure intensifiers consisting of a telescoping tube; the top (outer) tube shall be 1 5/16", bottom (inner) tube shall be 1 1/2". Tubes shall be cadmium plated and chromate-sealed.

D. HARDWARE

Corrosion resistant hardware and fasteners is standard. Optional Stainless Steel hardware is available.

E. MANUFACTURED UNITS

The roof hatch is a Model PH-G(for galvanized steel) or PH-A (for aluminum) followed by the opening size in feet and inches. For example: PH-G 2’6” x 3’0”

F. OPTIONAL ACCESSORIES

1. Precision Safety Access Handrail, mounted to outside corner of hatch curb, to provide a hand hold assist when entering or exiting the hatch.
2. Precision Extend-A-Rail, to be mounted to hatch access ladder, to provide a hand hold assist when entering or exiting the hatch.
3. Precision Aluminum Guard Rail System with self-closing gate, mounted to exterior of hatch, to protect the roof opening.

G. FABRICATION

The hatch is completely fabricated ready for installation before shipment to the site.

H. FINISH

Red oxide primer with Mill finish.

I. SOURCE QUALITY CONTROL

1. All products inspected at factory.
2. All products tested in factory for proper operation before shipment.

PART 3 EXECUTION

3.01 EXAMINATION

Examine rough opening in roof for opening size and squareness.

3.02 INSTALLATION

Install per the manufacturer's installation instructions.

3.03 FIELD QUALITY CONTROL

The manufacturer has representatives in all areas of the United States and Canada. For the name of the closest representative, call (800)225-7814.

*****End of Section 07 72 73*****

SECTION 07250 – CEMENTITIOUS SPRAY-ON FIREPROOFING

PART 1: GENERAL

1.01: General Requirements

A. Conform to the general provisions of the Contract, General and Supplementary Conditions to the contract, Division One of this Specification, the Drawings and this Specification Section.

B. Should conflict arise between the Drawings and the provisions of the Specifications, the Specifications shall govern.

C. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services for all sprayed fireproofing as shown on drawings and as specified, in accordance with provisions of the Contract Documents, and completely coordinated with work of all other trades.

D. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to, or necessary for, a sound, secure and complete installation.

E. Provide sprayed fireproofing systems which, when applied to and combined with structural systems used in work, produce complete fire resistant assemblies that:

1. Are equal to or exceed requirements specified.
2. Are tested and approved by Underwriter's Laboratories, Inc.
3. Are approved by authorities having jurisdiction.

1.02: Scope of Work (includes but is not necessarily limited to the following):

A. General:

1. Refer to the drawings for the extent of work to be done.
2. Inspect existing conditions and the work of other trades for proper conditions before beginning the work of this section.
3. Coordinate the work of this section with the work of other trades.
4. Protect people, property, and the work of this section and other trades.
5. Clean up work site and dispose of waste and debris on a daily basis.

B. Scope: Provide all material, tools, labor and equipment necessary for the installation of sprayed on cementitious fireproofing to protect the structural framing and floor members as called for in the Drawings and as directed by these specifications.

1.03: Related Work Specified Elsewhere (includes but is not limited to the following):

A. Section 05120, Structural Steel

B. Section 05210, Steel Joists

C. Section 05311, Steel Floor Decking

D. Section 05312, Steel Roof Decking

1.04: Definitions

A. Concealed sprayed-on fire-resistive material refers to applications where sprayed-on materials are applied to surfaces that are concealed from view behind other construction when Work is completed.

B. Exposed sprayed-on fire-resistive material refers to applications where sprayed-on materials are applied to surfaces that are exposed to view when Work is completed.

1.05: Regulatory Codes and Agencies.

A. Refer to Division 1.

1.06: Performance Requirements

A. Fire Resistance Ratings: As indicated by reference to fire resistive designs listed in UL "Fire Resistance Directory," or in comparable publication of another testing and inspecting agency acceptable to authorities having jurisdiction, for fire resistive assemblies where sprayed-on fire-resistive material serves as direct-applied protection, tested per ASTM E 119.

B. Surface Burning Characteristics: As indicated for each sprayed-on fire-resistive product required, tested per ASTM E 84 and listed in UL Building Materials Directory, current edition.

1.07: References

A. Publications listed herein are part of this specification to the extent referenced. The criteria established within these specifications shall take precedence over the standards referenced herein.

B. American Society for Testing and Materials (ASTM):

1. ASTM E 84, Surface Burning Characteristics of Building Materials.
2. ASTM E 119, Fire Tests of Building Construction and Materials.
3. ASTM E 136, (Noncombustibility) Behavior of Materials in a Vertical Tube Furnace at seven hundred fifty (750) degrees Centigrade.
4. ASTM E 605, Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members.
5. ASTM E 736, Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
6. ASTM E 759, Effect of Deflection of Sprayed Fire-Resistive Materials Applied to Structural Members.
7. ASTM E 760, Effect of Impact on the Bonding of Sprayed Fire-Resistive Materials Applied to Structural Members.
8. ASTM E 761, Compressive Strength of Sprayed Fire- Resistive Materials Applied to Structural Members.
9. ASTM E 859, Air Erosion of Sprayed Fire-Resistive materials Applied to Structural Members.
10. ASTM E 937, Corrosion of Steel by Sprayed Fire-Resistive Materials Applied to Structural Members.

1.08: Submittals

A. Make all submittals in accordance with Section 01300, Submittals.

B. Product Data:

1. Submit manufacturer's published literature for specified products and accessories as applicable, including manufacturer's specifications, physical characteristics and performance data.

2. Submit product data for each sprayed-on fire-resistive product.

3. Submit, as a supplement, manufacturer's instructions and directions for application if not included in manufacturer's published literature.

C. Test Reports:

1. Submit test reports for sprayed-on fire-resistive materials from a qualified independent testing agency employed and paid by Contractor or manufacturer. Provide reports indicating that physical properties of proposed fire-resistive products, including patching materials, comply with specified requirements based on comprehensive testing of current product formulations according to following requirements:

a. Testing is performed on sprayed-on fire-resistive materials randomly selected from bags bearing the applicable classification marking of UL or another inspecting and testing agency acceptable to authorities having jurisdiction.

b. Testing is performed on specimens of sprayed-on fire-resistive materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical in every respect to installed fire-resistive materials including application of sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.

c. Testing agency does testing on laboratory specimens that it witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.

2. Submit test reports for primers and other coatings, if any, applied to structural steel from a qualified independent testing agency employed and paid by Contractor indicating that primers and coatings proposed for application in shop or field are compatible with sprayed-on fire-resistive materials.

3. Results from tests and inspections performed by Owner-employed independent testing agency shall be reported promptly to Architect and Contractor.

1.09: Quality Control

A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by the sprayed-on fire-resistive material manufacturer as having necessary experience, staff, and training to install manufacturer's products.

B. Single Source Responsibility: Obtain sprayed-on fire-resistive materials from a single manufacturer for each different product required.

C. Special Inspections: Owner will employ and pay a qualified independent testing agency to provide inspections during construction on spray-applied fire-resistive materials.

D. Provide fire-resistive products containing no detectable asbestos.

1.10: Workmanship

A. Level of skill: In the acceptance or rejection of installed product, no allowance will be made for a lack of skill.

B. Indication of a lack of skill from the worker shall be sufficient grounds for the Architect to reject the applied coating and to require its complete removal and complete re-application at no additional cost to the Owner.

1.11: Delivery, Handling, and Storage

A. Delivery:

1. Take all precautions to deliver materials to the site without defects, damage or deterioration.

2. Deliver all materials in the original unopened packages, containers, or bundles with manufacturer original label intact and legible. Do not remove labels.

3. Do not deliver to the site more than one week prior to installation. Coordinate with the General Contractor for proper delivery time.

4. Do not deliver to the building until the building is enclosed and dry.

B. Handling

1. Take all precautions to handle all materials to prevent damage.

2. Do not apply any damaged materials.

3. Until final acceptance is received, replace any and all damaged work at no cost to the owner.

C. Storage:

1. Store all firestopping materials as necessary to protect from sunlight, moisture, dirt, mud, temperature change, open flames and contaminants which may damage the material’s fire resistance qualities.

2. Store all firestopping materials flat and a minimum of three inches (3') off of the ground, fully supported at a minimum of three locations (within 6" of each end and in the middle) and more where required to prevent bending and deformation in any direction.

3. Verify that each label is intact and clearly states thermal resistance and conductance and manufacturer's name.

4. Keep all materials dry by storing inside the enclosed heated building described in the delivery subparagraphs of this section.

5. Where products and/or materials have been approved for outside storage, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation.

6. Do not store in or near patient, staff, pedestrian or vehicular traffic areas.

1.12: Environmental Conditions

A. Apply waterborne products only when ambient temperatures are above 40 ° F. for 24 hours before and after application. Start of application constitutes acceptance of conditions and responsibility for performance.

B. General Contractor shall provide ventilation to allow proper drying of the spray-applied fire resistive material during and subsequent to its application.

C. Building must be enclosed and dry.

D. General Contractor shall provide ventilation to allow proper drying of the spray-applied fire resistive material during and subsequent to its application.

E. In enclosed areas, ventilation shall not be less than 4 complete air changes per hour.

PART 2: PRODUCTS

2.01: Materials

A. Concealed Sprayed-On Fire-Resistive Materials

1. Provide manufacturer's standard products complying with requirements indicated for material composition and physical properties representative of installed products.

2. Formulation: Factory-compounded mixture of inorganic binders and lightweight synthetic aggregates, conveyed to nozzle as a slurry and applied to form a dust-free, nonfriable plaster fire-resistive material.

B. Miscellaneous Materials

1. Potable water shall be used for the application of spray-applied fire resistive materials.

2. Spray-applied fire resistive materials shall be free of all forms of asbestos, including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Material manufacturer shall provide certification upon request.

3. Materials shall be applied to conform to the drawings, specifications and following test criteria:

a. Compression: 500 psf minimum per ASTM E 761.

b. Bond Strength: 200 psf minimum per ASTM E 736.

c. Bond Impact: No cracking, spalling or delamination per ASTM E 760.

d. Deflection: No cracking, spalling or delamination per ASTM E 759.

e. Air Erosion: Maximum weight loss of 0.005 grams per square foot per ASTM E 859.

f. Corrosion: No contribution to corrosion of steel per ASTM E 937.

g. Dry Density: Average density, 15 percent; individual density, 14 percent; values as required for fire resistance ratings per ASTM E 605-93.

C. Approved Products / Manufacturers: Basis of Design

1. Cafco 300 Blaze Shield, Isolatek International Corp.

2. Substitutions accepted per Division 01

D. Cementitious mixture sprayed fireproofing shall contain sodium proprionate or another approved fungus inhibitor, mixed with fireproofing mixture before application.

PART 3: EXECUTION

3.01: Inspection

A. Inspect the work of other trades for proper conditions prior to commencing the work of this section.

B. In the event of any discrepancies or unsuitable conditions, stop work. Prepare a written report listing any conditions detrimental to the work of this section and immediately transmit to the Architect. Do not proceed with work relating to detrimental conditions until those conditions have been resolved, or specifically directed by the Architect.

1. Examine surfaces to receive sprayed-on fire-resistive materials.

2. Verify that surfaces are free of oil, grease, paints/primers, loose mill scale, dirt, and other foreign substances that may impair proper adhesion of the fire-resistive material to the substrate.

3. Do not begin application of fire-resistive materials until Contractor, applicator, and fire-resistive materials inspector have examined surfaces to receive fire-resistive materials and determined that surfaces are acceptable to receive the fire-resistive material.

3.02: Coordination

A. Coordinate all work involving material, labor and equipment of other trades penetrating or attaching to the work of this section so that each trade's work can be installed, erected or fabricated as required and that the work space is maintained and left clean and safe.

3.03: Preparation

A. All surfaces to receive fire protection shall be free of oil, grease, loose mill scale, dirt, paints/primers (other than those listed and tested) or other foreign materials, which would impair satisfactory bonding to the surface. Manufacturer shall be contacted for procedures on handling primed/painted steel.

B. Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of spray-applied fire resistive materials.

C. The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of sprayed-on fire protection is complete in an area.

D. The spray-applied fire resistive material shall only be applied to steel deck which has been fabricated and erected in accordance with the criteria set forth by the Steel Deck Institute.

3.04: Application

A. Comply with fire-resistive material manufacturer's instructions for mixing materials, for application procedures, and for types of equipment used to convey and spray on fire-resistive materials; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Spatter coat steel deck surface prior to application of cementitious material.

C. Patching: Use same materials as originally sprayed or special patching material designated by fire-resistive material manufacturer, either as acceptable to governing authorities.

D. Equipment, mixing and application shall be in accordance with the manufacturer's written application instructions.

E. The application of spray-applied fire resistive material shall not commence until certification has been received by the General Contractor that surfaces to receive sprayed fire protection have been inspected by the applicator and are acceptable to receive sprayed fire protection.

F. All unsuitable substrates must be identified and made known to the General Contractor and corrected prior to the application of the spray-applied fire resistive material.

G. Fire protection shall not be applied to steel floor decks prior to the completion of concrete work on that deck.

H. The application of spray-applied fire resistive material to the underside of roof deck shall not commence until the roof is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and construction roof traffic has ceased.

I. Provide masking, drop cloths or other suitable coverings to prevent overspray from coming in contact with surfaces not intended to be sprayed.

J. Bonding materials (adhesives, catch coats, metal lath, mesh, stud pins, etc.) shall be applied as per the appropriate UL fire resistance design and manufacturer's written recommendations.

K. Topcoat material, if any, shall be the type recommended and approved by the manufacturer of each spray-applied fire resistive material required for the applications indicated.

3.05: Field Quality Control

A. An independent testing agency employed and paid by Owner will perform field quality control testing to verify thickness and density of spray-applied fire-resistive materials according to provisions of locally prevailing building code.

B. Repair or replace fire-resistive materials within areas where test results indicate fire-resistive design does not comply with requirements at no cost to Owner.

3.06: Inspection and Testing

A. The spray-applied fire resistive material shall be tested for thickness and density in accordance with one of the following procedures:

1. ASTM E605 - Standard Test Method for Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members.

2. AWCI - Inspection Procedure for Field-Applied Sprayed Fire-Resistive Materials, Technical Manual 12-A; an annotated guide.

3. UBC Standard No. 7-6 - Thickness and Density Determination for Spray-Applied Fire Protection.

3.07: Repairing and Cleaning

A. All patching of and repair to sprayed fire protection due to damage by other trades shall be performed under this section and paid for by the trade responsible for the damage.

B. After the completion of the work in this section, equipment shall be removed and all surfaces not to be sprayed shall be cleaned to the extent previously agreed to by applicator and General Contractor.

C. Remove overspray and fallout of materials from surfaces of other work and clean exposed surfaces to remove evidence of soiling.

3.08: General Clean-Up

A. At the end of each day's work and at final completion, the site shall be free of all waste materials and equipment used by the Contractor. Remove all waste materials and debris and dispose of in a legal and safe manner.

B. The Contractor shall be responsible for maintaining a clean work place and shall pay for all costs, at no additional expense to the Owner, should outside labor and equipment be used to clean up the work site.

C. Prevent waste materials from entering and accumulating in the storm drainage system and on adjacent property.

*****End of Section 07 81 16*****

SECTION 07 84 00 – FIRESTOPPING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 22 Plumbing Sections specifying piping penetrations.

B. Division 23 HVAC specifying duct penetrations

C. Division 26 Electrical Sections specifying cable and conduit penetrations

1.02 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated and the passage of smoke and other gases.

B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E814, but not less than equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T-ratings, in addition to F-ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor area. **T-rated assemblies are required at penetrations thru fire-rated horizontal assemblies.** ***EXCEPTION: Floor penetrations contained and located within the cavity of a wall do not require a T rating.***

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E119, but not less than that equaling or exceeding the fire resistance rating of the construction in which the joint occurs.

E. For firestopping exposed to view, traffic, moisture and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E84.

1.03 SUBMITTALS

A. Product data for each type of product specified.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

B. Shop drawings detailing materials, installation methods and relationships to adjoining construction for each through-penetration firestop system and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.

2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.

C. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

D. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners and other information specified.

1.04 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey or another agency, performing testing and follow-up inspection services for firestop systems, that is acceptable to authorities having jurisdiction.

2. Through-penetration firestop systems are identical to those tested per ASTM E814 under conditions where positive furnace pressure differential of at least 0.01-inch of water (2.5 Pa) is maintained at a distance of 0.78-inch (20 mm) below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:

a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory", by Warnock Hersey or by another qualified testing and inspecting agency.

3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E119 under conditions where the positive furnace pressure differential is at least 0.01-inch of water (2.5 Pa), as measured 0.78-inch (20 mm) from

the face exposed to furnace fire. Provide systems complying with the following requirements:

a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.

C. Installer Qualifications: Engage an experienced Installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.

E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light MIcroscopy".

F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 - Section "Project Meetings".

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacturer; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time and mixing instructions for multicomponent materials.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

1.06 PROJECT CONDITIONS

A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation or other causes.

B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.07 SEQUENCING AND SCHEDULING

A. Do not cover up those firestopping installations that will become concealed behind other construction until the owner's representative and authorities have jurisdiction, if required, have examined each installation.

PART 2 PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Manufacturers: Provide firestopping products from the following:

1. Hilti
2. Specified Technologies, Inc.
3. Tremco
4. Grace Construction Products (Flamesafe)

B. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

C. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials including the following:
    a. Semirefractory fiber (mineral wool) insulation, 4 pcf, and 8 pcf density as required.
    b. Ceramic fiber.
    c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    d. Fire-rated formboard.
    e. Joint fillers for joint sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

D. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.02 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of development optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

D. Verify sleeves in openings are steel. Remove any plastic sleeves and replace with steel sleeves. Sleeves shall be secured to the masonry walls.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in Part I, with ASTM C1193 and with the sealant manufacturer's installation instruction and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beds of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.05 FIELD QUALITY CONTROL

A. All penetration firestop systems shall be examined by an appointed code official general contractor and/or inspecting agency employed and paid by Owner. All firestop penetrations shall be examined for complete firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.06 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 firestopping immediately and install new materials to produce firestopping complying with specified requirements.

3.07 LOCATIONS

A. Penetrations through all fire-resistance-rated walls, partitions, and floors including both empty openings and openings containing cables, pipes, ducts, conduits and other penetrating items.

B. Sealant joints in fire-resistance-rated construction.

3.08 FIRESTOP SCHEDULE **(NOTE: Install all firestopping materials in accordance with UL Design numbers.)**

I. WALLS - GYPSUM WALLBOARD AND WOOD STUD CONSTRUCTION

A. Single Metal Pipe/Conduit or Tubing:

1. Pipe Sizes:

a. Steel Pipe - Nom. 12 in. diameter. (or smaller), schedule 10 (or heavier) steel pipe.
b. Iron Pipe – Nom. 12 in. diameter or smaller cast iron pipe.
c. Conduit - Nom. 6 in. (or smaller) electrical metallic tubing or steel conduit.
d. Copper Tubing - Nom. 6 in. (or smaller) type L (or heavier) copper pipe.
e. Copper Pipe - Nom 6 in. (or smaller) Regular (or heavier) copper pipe.

2. Rating - F, 1 Hour and 2 Hour.

3 UL Number - WL 1085.

4. Manufacturer/Product - Hilti Construction Chemicals, Inc./FS One Sealant.

5. Annular space around penetration – 0” – 1/4” maximum.

6. Fill annular space completely with sealant specified. Additional fill material to be installed such that a 1/2” bead of firestop sealant at pipe/gypsum board interface.

7. Follow UL design for all required materials and installation requirements.

B. Multiple Penetrations:

1. Cables, through penetrations.

   a. Steel or aluminum cable tray (maximum 18" x 6").
   b. Cables: Aggregate cross area of cables in cable tray to be maximum 30% of the cross-sectional area of the cable tray.

      1) 7/C No. 12 AWG with PVC insulation and PVC jacket.
      2) 100 pair No. 24 AWG cable with PVC insulation and jacket.
      3) 1/C, 750 KC mil (or smaller) with PVC insulation and jacket.

   c. Nominal 3" diameter PVC schedule 40 vented piping system.
   d. Steel pipe nominal 6" diameter or smaller, schedule 40 or heavier steel pipe.
   e. Conduit, nominal 4" diameter or smaller EMT or 6" diameter steel conduit.
   f. Copper pipe, nominal 4" diameter or smaller regular or heavier copper pipe.
   g. Copper tube, nominal 4" diameter or smaller Type L or heavier copper tube.
   h. Cable Bundles

      1) 7/C No. 12 AWG with PVC insulation and PVC jacket.
      2) 25 pair No. 24 AWG cable with PVC insulation and jacket.
      3) Type R GU/59 coaxial cable with PVC outer jacket.
      4) 24 fiber optic cable with PVC sub unit and outer jacket.

2. Rating: F, 1 Hour and 2 Hour.

3. UL Number: WL 8013.

4. Manufacturer/Product: Hilti FS – Fire Block, FS – One sealant.

5. Firestop System: Construct firestop in accordance with UL Design Number.

6. Follow UL design for all required materials and installation requirements.

C. Cables (SINGLE OR MULTIPLE)

1. Cable Sizes

   a. max. 7/C No. 12 AWG cables with PVC insulation and jacket.
   b. max. 25 pair 24 AWG phone cables with PVC insulation and jacket.
   c. RG 59/U coaxial cable with PE insulation and PVC jacket.
   d. max. 2/C (+ GND) No. 14 AWG metal clad cables.
   e. max. 2/C No. 8 AWG metal-clad cables.
   f. Maximum 5/8" diameter fiber optic cables.

2. Rating - F, 1 hour and 2 hour.

3. UL Number - WL 3065.

4. Manufacturer/Product - Hilti Construction Chemicals, Inc./FS-One.

5. Pipe Sleeve - 4" diameter, schedule 5 or thinner. Cables to fill max 45% of area of opening. Set sleeve flush with wall.

6. Annular Space - Minimum 1/4", maximum 3/4"

7. Fill annular space with a minimum 5/8" depth of FS-One firestop sealant on each side of opening for one hour rating and 1 ¼" for two hour rating.

8. Follow UL design for all required materials and installation requirements.

D. Plastic Pipe

1. Pipe Sizes:

   a. Maximum 6" diameter PVC.
   b. Maximum 6" diameter CPVC.
   c. Maximum 6" diameter ABS.
   d. Maximum 6" diameter FRPP.

2. Rating – F and T, 1 hour and 2 hour.

3. UL Number - WL2078.

4. Manufacturer/Product - Hilti Construction Chemicals, Inc./Hilti CP 642 or CP643 firestop collar and FS-One firestop sealant.

5. Install firestop collar to both sides of wall using Hilti 1/4" toggle bolt.

6. Annular Space - Minimum 0", Maximum 1/4"

7. Fill annular space with a minimum 1/4" depth of FS-One firestop sealant on both sides of wall.

8. Follow UL design for all required materials and installation requirements.

E. Insulated Metal Pipes

1. Pipe Sizes

   a. Steel pipe- Nom 10 inch diameter (or smaller) schedule 10 (or heavier).
   b. Copper tubing- Nom4 in. dia. (or smaller) Type L (or heavier).
   c. Copper pipe- Nom 4 in. dia. (or smaller) regular (or heavier) copper pipe.

2. Rating- F, 1 hour and 2 hour. T, ¾ hour and 1 ¾ hour

3. UL Number- WL 5025

4. Manufacturer/Product: HILTI Retaining collar with FS-One firestop sealant.

5. Annular space: 1 1/8"

6. Insulation: Nom 2 in. thick 3.5 pct glass fiber.

7. Follow UL design for all required materials and installation requirements.

II FRAMED FLOORS-FLOOR CEILING ASSEMBLIES (NOTE: ALL PIPING SHALL BE RUN WITHIN A WALL OR CHASE)

A. Single Metal Pipe/Conduit or Tubing

1. Pipe Sizes

a. Steel pipe- Nom 6 inch diameter (or smaller) schedule 40 (or heavier).
b. Steel Conduit-Nom. 6 inch diameter or smaller.
c. EMT- Nom 4 inch diameter or smaller.

2. Rating: F, 1 Hour and 2 Hour.

3. UL Number - FC 1059.

4. Manufacturer/Product: Hilti Construction Chemicals, Inc.FS-One Intumescent Firestop Sealant.

5. Annular space around penetration-Min. 1/4", Max 3/4".

6. Fill annular space completely with sealant specified. Minimum depth of sealant at floor 3/4". Minimum depth of sealant at ceiling 5/8". Maximum diameter of opening 7-5/8".

7. Follow UL design for all required materials and installation requirements.

B. Single Copper Pipe with Insulation

1. Pipe Size

a. Max. Nom. 2 inch diameter steel pipe schedule 10 (or heavier)
b. Max. Nom 2 inch diameter copper pipe.

2. Rating: F, 1 Hour, T 1 Hour.

3. UL Number- FC 5036.

4. Manufacturer/Product: Hilti Construction Chemicals, Inc. FS-One Intumescent Firestop Sealant.

5. Annular space around penetration: Min 1/2", Max 1".

6. Pipe insulation: Max 1 1/2" thick glass fiber pipe insulation.

7. Fill annular space completely with sealant specified. Min depth of sealant at floor 3/4". Min depth of sealant at ceiling 5/8". Max diameter of of opening 6 5/8".

8. Follow UL design for all required materials and installation requirements.

C. Plastic Pipe

1. Pipe Sizes:

    a. Max. Nom. 4 inch diameter schedule 40 PVC plastic pipe(cellular or solid cores)
    b. Max. Nom 4 inch diameter schedule 40 ABS plastic pipe (cellular or solid).
    c. Max. Nom 4 inch diameter schedule 40 FRPP plastic pipe.
    d. Max. Nom 4 inch diameter SDR 17 CPVC plastic pipe.

2. Rating- F, 1 Hour and 2 Hour, T , 1 Hour and 2 Hour.

3. UL Number: FC 2025

4. Gypsum wall assembly: 1 Hour or 2 Hour.

5. Manufacturer/Product: Hilti Construction Chemicals, Inc. CP 643 Firestop collar and FS-One Intumescent Firestop Sealant.

6. Annular space around penetration- Min 0", Max 1/4".

7. Follow UL design number for installation.

8. Follow UL design for all required materials and installation requirements.

D. Plastic Pipe Stack with Branch Line Through 1 Hour Wood Floor

1. UL Number: FC 2050

2. Follow UL design for all required materials and installation requirements.

E. Plastic Pipe Drain Fittings with Bathtub Waste/Overflow Fittings

1. UL Number FC 2189.

2. Follow UL design for all required materials and installation requirements.

*****End of Section 07 84 00*****

SECTION 07 92 00 – JOINT SEALANTS

PART 1: GENERAL

1.01: General Requirements

A. Conform to the general provisions of the Contract, General and Supplementary Conditions of the contract, Division One of this Specification, the Drawings and this Specification Section.

B. Should conflict arise between the Drawings and the provisions of the Specifications, the Specifications shall govern.

C. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for, or incidental to, the furnishing and installation, complete, of all sealants, both exterior and interior, where the word caulk, caulking, or sealant are shown on the Drawings or specified, in accordance with the provisions of the Contract Documents, and completely coordinated with the Work of all other trades.

D. Although such Work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to, or necessary for, a sound, secure, and complete installation.

1.02: Scope of Work (includes but is not necessarily limited to the following):

A. General:

1. Refer to the drawings for the extent of work to be done.
2. Inspect existing conditions and the work of other trades for proper conditions before the work of this section begins.
3. Coordinate the work of this section with the work of other trades.
4. Protect people, property, and the work of this section and other trades.
5. Clean up work site and dispose of waste and debris on a daily basis.

B. Scope: Provide all materials and accessories, labor, tools, and equipment for the installation of caulking and sealants as shown and described in this section. The following list constitutes a nominal schedule of sealant Work required under this Section. (Note: not all conditions may occur in this project.) Provide and install all sealants, as scheduled.

1. Flashing reglets and retainers.
2. Exterior wall joints.
3. Concrete control joints, exterior and interior, and between concrete and other materials.
4. Interior sound-sealed, smoke-sealed, fire resistive, and air-sealed joints.
5. Flooring joints.
6. Isolation joints between structure and other elements.
7. Paving and sidewalk joints and joints between paving or sidewalks and building.
8. Joints at penetrations of walls, floors, and decks by piping and other services and equipment, including penetrations of fire-rated walls.

9. Exterior and interior perimeters of all door and window frames, louvers, grilles, and all other openings that occur in exterior walls.
10. Bedding for door thresholds.
11. Caulking of plumbing fixtures to floor and wall (silicone).
12. Other joints where caulking, sealant, or compressible sealant is required as indicated.

C. Provide guarantee that caulking and sealing work will be free of defects for a period of three (3) years from date of Final Acceptance. Remove any defective Work or materials and replace with new Work and materials, and repair any other Work damaged as a result of defective sealing work or material, at no additional expense to the Owner. Failure of watertightnesss shall constitute defect. Guarantee shall be jointly by the applicator and the Contractor.

1.03: Related Work Specified Elsewhere

A. Section 03 30 00, Cast-in-Place Concrete
B. Section 05 30 00, Metal Decking
C. Section 05 50 00, Metal Fabrications
D. Section 06 20 00, Finish Carpentry and Millwork
E. Section 06 41 16, Plastic Laminate-Clad Cabinets
F. Section 06 41 00, Architectural Wood Casework
G. Section 07 20 00, Thermal Insulation
H. Section 09 22 16, Non-Structural Metal Framing
I. Section 09 29 00, Gypsum Wallboard and Sheathing
J. Section 04 22 00, Concrete Unit Masonry

1.04: Regulatory Codes and Agencies

A. Refer to Division 1

1.05: Industry Standards

A. Sealant materials shall comply with the following, as applicable:
1. ASTM C-603 and ASTM C-1193
2. Federal Specifications TT-S-001543A, TT-S-00227E, and TT-S-00230C

B. Backer materials shall comply with
1. ASTM C-509
2. Federal Specifications HH-F341a, Type I, Class A and B.

C. Sealants to be used for openings in fire rated assemblies:
1. UL or recognized equivalent testing lab

1.06: Submittals

A. Comply with all requirements of Division 1

B. Product Data:

1. Submit manufacturer's published literature for specified products and accessories as applicable, including manufacturer's specifications, physical characteristics and performance data.

2. Submit, as a supplement, manufacturer's instructions and directions for application if not included in manufacturer's published literature.

3. Submit Manufacturer's full range of colors for the Architect's selection. Submit 6-in. long cured sample of each selected color.

4. Submit 6-in. long samples of each type of sealant, backing rod, and bond breaker tape.

5. Submit written guarantee after installation is complete.

1.07: Quality Control

A. Obtain all materials of each type from a single source unless prior approval is received from the Architect.

1.08: Delivery, Storage, and Handling

A. Deliver sealants and accessories in original sealed containers with Manufacturer's name and trade mark and product label clearly marked.

B. Provide protection against weather, damage, or loss.

1.09: Protection

A. Protect people from injury and adjacent property, structures and the work of other trades from damage.

B. The Contractor or Subcontractor shall repair or replace, as directed by the Architect, all work or property damaged by the Contractor or Subcontractor at no additional cost to the owner.

C. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 that the repaired installations are indistinguishable from original work.

1.10: Administrative

A. Coordination: Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.

B. Pre-installation Conference: Conduct conference at Project Site.

PART 2: PRODUCTS

2.01: Manufacturers and Products

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include the following:

1. Polyurethane
    a. Tremco, Inc.
    b. A. C. Horn
    c. Sonneborn Building Products Division.

2. Silicone
    a. DAP Products, Inc.
    b. Pecora Corp.
    c. Tremco, Inc.
    d. Dow Corning Corp.

3. Compressible Sealant
    a. Poly-Tite and Sandell

4. Acrylic Sealants
    a. Sonneborn Building Products Division.
    b. Dow Corning Corp.
    c. Pecora Corp.
    d. Tremco, Inc.

5. Polysulfide
    a. Morton-Thiokol
    b. Pecora Corp.
    c. Sonneborn Building Products Division.

6. Fire Rated Systems
    a. 3M Fire Barrier Sealant CP 25WB
    b. USG Firecode Smoke-Sound Sealant

7. Epoxy
    a. Aboseal

B. Provide the Following Types of Sealant:

1. One or two component polyurethane or polysulfides. (Exterior and interior use). Verify suitability of conditions for one-component caulking if used.
2. One or two component silicone. (Exterior use and interior wet area use).
3. One or two component acrylic. (Interior use).
4. Compressible sealant. (where indicated).

C. Joint Cleaner: Type recommended by Sealant Manufacturer.

D. Joint Primer-Sealer: Type recommended by Sealant Manufacturer.

E. Bond Breaker: Polyethylene or other material recommended by Sealant Manufacturer Self-adhesive tape, where possible.

F. Sealant Backer Rod: Rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, or other flexible, non-absorbent and non-bituminous material recommended by Sealant Manufacturer, to control joint depth for sealant placement. Break bond of sealant at bottom of joint. Provide proper shape of sealant bead and minimize possibility of sealant extrusion when joint is compressed.

G. For penetrations of fire rated walls or floors, comply with 3M System CAJ2001, CAJ2002, CAJ1175 or approved equal as appropriate for size of opening and piping/conduit passing through opening. For these systems, strictly comply with all provisions of tested system.

PART 3: EXECUTION

3.01: Examination and Preparation

A. Examine substrates and conditions, with installer present, to determine if conditions affecting performance of insulation are satisfactory.

B. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

C. Clean substrates of substances harmful to work of this section.

3.02: Environmental Conditions:

A. Perform sealant Work only when ambient temperature is 40^{o} F., or higher. Apply in accordance with Manufacturer's instructions.

B. Before application, thoroughly clean all joints. Apply to joints that are free of frost, moisture, or material that will inhibit bond. Apply to cementitious materials only when thoroughly cured and dry.

3.03: Installation

A. Seal building and any joints or areas which will permit penetration of air and/or moisture leakage in accordance with manufacturer's instructions, unless sealing work is specifically required under other Sections. Make all joints watertight.

B. Seal all cracks and expansion joints in slab-on-grade with epoxy.

C. Apply primer, where required, to joint surfaces. Take extreme care to limit application to surfaces to receive caulking. Mask off adjacent surfaces.

D. Make depth of sealing compounds not more than one-half the width of the joint, but in no case less than 1/4 inch. Subcaulk joints that are deep or joints where a suitable backstop has not been provided to the proper depth, using backing rod and bond breaker.

E. Install correctly sized backer in joints to receive sealant. Apply bond breaker where bond must be avoided.

F. Apply with proper tool, using sufficient pressure to fill all voids and joints solid. Upon completion, leave caulking with smooth even finish.

G. Provide colors matching materials being sealed, unless otherwise indicated. Where compound is not exposed to view in finished Work, provide Manufacturer's color that has best overall performance.

H. Provide non-sagging sealant for use in joints in vertical surfaces. Sealants for horizontal surfaces joints may be self-leveling.

I. Before use of any sealant, investigate its compatibility with joint surfaces, joint fillers, and other materials in joint system. Provide only materials known to be fully compatible with actual installation conditions.

J. Obtain sealing compounds only from Manufacturers who will, when required, provide services of Manufacturers' field service representatives at project site for the purposes of advising and instructing installers in the proper procedures and precautions for use of materials. Provide such services, when required, at no expense to the Owner.

K. Size compressible sealant so that width of material is twice the joint width.

3.04: Joint Sealant Schedule

Substrate Application	Joint Sealant Function	Product Technology
Cast-In-Place Concrete	Seal between exterior vertical and horizontal non-traffic joints.	Silicone, Urethane
Precast Concrete	Seal between exterior vertical and horizontal non-traffic joints.	Silicone, Urethane
Unit Masonry	Seal between exterior vertical control and expansion joints, horizontal pressure-relieving joints, and joints between flashing materials / unit masonry.	Silicone, Urethane
Stone Assemblies	Seal between exterior joints in dimension stone cladding.	Silicone, Urethane
Glass Unit Masonry	Seal between glass units and perimeter of glass block system.	Silicone
EIFS – Exterior Insulation and Finish Systems	Seal exterior expansion and control joints in exterior insulation and finish systems.	Silicone, Urethane
Flashing and Sheet Metal	Seal joints and overlap conditions.	Silicone, Urethane
Doors and Frames	Seal exterior perimeter joints at frames of doors and surrounding substrates.	Silicone, Urethane
Entrances, Storefronts and Curtainwall	Seal aluminum, glass and glazing accessory components and joinery.	Silicone
Windows and Louvers	Seal exterior perimeter joints at frames of window and louvers and surrounding substrates.	Silicone, Urethane

Substrate Application	Joint Sealant Function	Product Technology
Metal Panels	Seal between exterior joints between metal panels.	Silicone
Glazing	Structural attachment of aluminum and glass systems, shop glazed curtainwall / window systems.	Silicone
Traffic and Non-Traffic Horizontal Conditions	Seal exterior and interior horizontal non-traffic and traffic isolation and contraction joints in cast-in-place concrete slabs, ceramic tile, dimension stone, dimension stone tile, brick, brick pavers, stone paving units.	Silicone, Urethane
Interior Wall and Door / Window Elevator Frame Conditions	Seal joints between interior wall surfaces and frames of interior doors, windows and elevator entrances, including conditions where sealant will be painted.	Latex, Urethane
Interior Wall / Partition and Floor / Ceiling Conditions	Seal control and expansion joints in ceilings and other overhead surfaces.	Silicone, Urethane

3.05: Clean Up

A. At the end of each day's work and at final completion, the site shall be free of all waste materials and equipment used by the Contractor. Remove all waste materials and debris and dispose of in a legal and safe manner.

B. The Contractor shall be responsible for maintaining a clean work place and shall pay for all costs, at no additional expense to the Owner, should outside labor and equipment be used to clean up the work site.

C. Prevent waste materials from entering and accumulating in the storm drainage system and on adjacent property.

*****End of Section 07 92 00*****