

DIVISION 7

Moisture Protection



SECTION 07131 – SPRAY APPLIED WATERPROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract from the front of the Specification book, including General Conditions and Supplementary General Conditions, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Spray Applied waterproofing for below grade vertical waterproofing.
- B. Related Sections include the following:
 - 1. Division 3, Section 03300 "Cast-In-Place Concrete."

1.3 PERFORMANCE REQUIREMENTS

- A. Provide waterproofing that prevents the passage of water.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, penetrations, inside and outside corners, and other termination conditions.
- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- D. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.
- E. Sample Warranty: Copy of special waterproofing manufacturer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is licensed by waterproofing manufacturer to install manufacturer's products. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation. The individual shall have experience with multiple previous installations and competent to respond to concerns raised.
- B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.
- C. Provide surfaces that are broom clean, dry, sound and free of voids, bugholes, rockpockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing membrane system.

- D. Using suitable abrasive methods, remove residue of form release, curing compound, chemical retarders and other surface treatments, laitance, mortar smear, sawcutting residue, mill scale, rust, loose material and other contaminants from concrete, masonry and ferrous metal surfaces to receive the work of this Section.

1.8 WARRANTY

- A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.
 - 1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
 - 2. Warranty Period: Submit maximum available warranty period for comparison and selection of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide the following waterproofing system applied to foundation walls in below grade situation product:
 - 1. Sierra Concepts, LLC: House Guard Waterproofing System.
 - 2. Tremco: Tremproof 260.
 - 3. Carlisle: CCW Barricoat liquid applied system.
 - 4. CETCO: StrataSeal SG
 - 5. Henry: AquaBloc WB liquid applied system.

2.2 SHEET DRAINAGE PANELS

- A. Insulation Drainage Board:
 - 1. House Guard System and Carlisle System: Dow; Styrofoam Perimate
 - a. Thickness: 1"
 - b. Compressive Pressure: At 1200 psf/ sq.ft. 4% compression.
 - c. Drainage Ability: 3 gal./min/foot
 - d. Thermal Resistance: R-5.
 - 2. Tremco System: TREMDrain DPI Board
 - a. Thickness: 3/4"
 - b. Drainage ability: 74 gal./hr/foot
 - c. Thermal Resistance: R-3.

3. CETCO System: Aduadrain 15XP & Aquadrain 100BD
 - a. Thickness: 7/16" & 1" respectively
 - b. Drainage ability: 20 gpm/ft. & 97 gpm/ft. respectively
4. Carlisle and Henry System: Owens Corning insulation System.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with membrane waterproofing.
 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Substrate Patching: provide as recommended by manufacturer.
- C. Tremco Accessories:
 1. Joint backing: Closed-cell, polyethylene rod as recommended by membrane manufacturer.
 2. Joint Treatment products:
 - a. Dymeric 240-240FC; Tremco Inc.
 - b. Vulkem 227; Tremco Inc.
 - c. THC 900-901; Tremco Inc.
- D. Trowel Grade Mastic:
 1. CETCO Acceptable products:
 - a. M-2000 Liquid Flashing trowel-grade mastic.
 - b. StrataSeal TG
 - c. StrataSeal RG
 - d. CAT-7 Catalyst
 2. Carlisle Acceptable products:
 - a. Follow manufacturer's recommendations.
 3. Henry Acceptable products:
 - a. Follow manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification
 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

4. Verify conformance with manufacturer's requirements;

3.2 SURFACE PREPARATION

- A. Clean, prepare and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates as recommended by manufacturer. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- F. With CETCO product at inside Corner Transitions: Install a 3/4" (19 mm) fillet of M-2000 Liquid Flashing at all horizontal and vertical inside corners. Then install M-2000 90-mil thick extending out from corner cant minimum 6" (150mm) on both sides.
- G. All exposed metal surfaces (pipes, sleeves, drains, vents, etc.) shall be clean. Remove oil, paint, rust, scales, or any other foreign matter before applying waterproofing.
- H. With CETCO product at penetrations: Seal around all applicable penetrations with minimum 90-Mil (2.3 mm) thick coat of M-2000 Liquid Flashing extending onto penetration and extending out a minimum 6" (150 mm) radius around the penetration.
- I. Corners: Prepare as recommend by manufacturer.
- J. With Carlisle products, follow manufacturers recommendations when treating all angle changes and penetrations.
- K. With Henry products, follow manufacturers recommendations when treating all angle changes and penetrations.

3.3 SPRAY APPLIED APPLICATION

- A. Install according to waterproofing manufacturer's written instructions and recommendations.
 - 1. Installed Thickness: 60 to 70 mils.
- B. Repair tears, voids, and lapped seams in waterproofing not complying with requirements.
- C. Install protection/insulation board over cured membrane in accord with manufacturer's instructions.

3.4 PROTECTION AND CLEANING

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Promptly remove primer or membrane system material from adjacent surfaces with MEK, Toluene or Xylene; leave work area in broom clean condition.

END OF SECTION 07131

SECTION 07140 – DECK WATERPROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Provide a complete polyurethane waterproofing membrane system including all applicable sealants and elastomeric flashings needed to prevent water penetration at decks. Refer to drawings for locations.
- B. Related work:
 - 1. Division 3, Section 03300 "Cast-In-Place Concrete."

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01330.
- B. Product data:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Shop Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades;
 - 4. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 5. Written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of architects and owners for verification.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Applicator qualifications:
 - 1. Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
 - 2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.
- C. Convene a pre-installation job-site conference three weeks prior to commencing work of this Section:
 - 1. Secure attendance by Architect, Contractor, applicator, and authorized representatives of the membrane system manufacturer and interfacing trades.
 - 2. Examine Drawings and Specifications affecting work of this Section, verify all conditions, review installation procedures, and coordinate scheduling with interfacing portions of the Work.
- D. Materials: Obtain waterproofing and drainage materials from a single manufacturer to assure material compatibility.
- E. Materials: Obtain waterproofing and drainage materials from a single manufacturer to assure material compatibility

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.
- B. Maintain the products in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- C. Comply with pertinent provisions of Section 01660.

1.6 SUBSTRATE CONDITIONS

A. General:

1. Provide applicator with surfaces that are broom clean, dry, sound and free of voids, bugholes, rockpockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing membrane system.
2. Using suitable abrasive methods, remove residue of form release, curing compound, chemical retarders and other surface treatments, laitance, mortar smear, sawcutting residue, mill scale, rust, loose material and other contaminants from concrete, masonry and ferrous metal surfaces to receive the work of this Section.

B. Concrete: Where work of this Section will be applied to concrete, provide surfaces that are smooth with finish equal to one that is light steel troweled followed by a fine hair broom.

C. Plywood: Where work of this Section will be applied to plywood, provide exterior grade plywood, 5/8" thick minimum, with A-side up, fastened with ring-shank nails.

D. Decks:

1. Slope deck surfaces to open edge or drains that have flanges at membrane level which are flush with deck surfaces.
2. Rigidly install pipe, vents and other surface protrusions, properly flash them, and cover to prevent entry of membrane materials.

E. Metal flashings: Where metal flashings are substrate to waterproofing membrane, set the flashings in continuous bedding bead of urethane sealant; install sealant S-bead between metal laps and mechanically fasten to substrate along leading edges at every 4" on center, staggered linearly, to lay flat without fishmouths.

F. Joints: Configuration shall be consistent with this Section and with all other requirements of the Contract Documents.

1.7 WARRANTY

- A. Deliver to the Architect signed copies of the following written warranties against defective materials and workmanship for a period of two years following date of completion. Warrant that installed waterproofing membrane system shall be free of defects including adhesive failure, cohesive failure, and waterproofing failure resulting from substrate cracking up to 1/16 inch.
 - 1. Manufacturer's standard warranty covering materials, minimum 5 years
 - 2. Applicator's standard warranty covering workmanship, minimum 2 years.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide one of the fluid applied elastomeric waterproofing membrane systems :
 - 1. Acceptable products:
 - a. Tremco Inc.: TREMproof 250 GC.
 - b. CETCO: LDC 60H.
 - c. Henry: AquaBloc WB, rubberized asphalt emulsion.
 - 2. Coal-tar free polyurethane designed for concealed building components subject to hydrostatic head;
 - 3. Complying with ASTM C836-89a.

2.2 ACCESSORIES

- A. Primer: As recommended by waterproofing membrane system manufacturer;
- B. Joint backing: Closed-cell, polyethylene rod as recommended by membrane manufacturer;
- C. Elastomeric sheet flashing: 1/16 inch thick by 12 inch wide uncured neoprene sheeting;
- D. Joint Treatment:
 - 1. Tremco Acceptable products:
 - a. Dymeric 240/240FC; Tremco Inc.
 - b. Vulkem 227; Tremco Inc.
 - c. TREMproof 201T; Tremco Inc.
 - d. or prior approved equal

- E. Trowel Grade Mastic:
 - 1. CETCO Acceptable products:
 - a. M-2000 Liquid Flashing trowel-grade mastic.

- F. Prefabricated Composite Drainage: Required when deck above is pavers.
 - 1. Tremco Acceptable products:
 - a. Acceptable product(s): Provide TREMDrain S 1/4" composed of a filter fabric laminated to free-draining high-density dimpled polystyrene drainage core.
 - 2. CETCO Acceptable products:
 - a. Aquadrain 10X.
 - 3. Henry Acceptable products:
 - a. Henry DB 200.

- G. Protection board: Required when deck above is installed with sleepers.
 - 1. Tremco Acceptable products:
 - a. Tremco 40 mil High Density Polyethylene with a double side tape on the outside edge.
 - 2. CETCO Acceptable products:
 - a. Aquadrain 30H.
 - 3. Henry Acceptable products:
 - a. 1/8 or 1/4 inch asphaltic protection board.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the membrane system manufacturer as compatible, subject to review of the Architect.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with manufacturer's product data, including product application and installation instructions, as well as, manufacturer's shipping and storage recommendations.

3.2 SURFACE CONDITIONS

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

- B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
 - 1. Verify conformance with manufacturer's requirements;
 - 2. Report unsatisfactory conditions in writing to the Architect;
 - 3. Do not proceed until unsatisfactory conditions are corrected.
- C. Concrete to receive waterproofing shall be of sound structural grade with a smooth finish, free of debris, oil, grease, laitance, dirt, release agent, curing compounds (except pure sodium silicate type), or other foreign matter which will impair the adhesion of the waterproofing. Structural concrete shall be cured a minimum of 14 days prior to membrane installation. Lightweight structural concrete requires a minimum of 21 days cure time prior to membrane installation.

3.3 PREPARATION

- A. Surface preparation and detailing procedures to be in accord with waterproof membrane system manufacturer's instructions and recommendations except where more stringent requirements are indicated.
- B. Clean all deck surfaces to receive membrane system in accord with manufacturer's instructions; vacuum clean or blow clean with oil-free compressed air all surfaces to receive sealants, detailing materials or membranes immediately prior to installation.
- C. Rout, clean, prepare and detail surface cracks in accord with manufacturer's instructions; install backer rod where required.
- D. Clean metal surfaces to bright metal by wire brushing or mechanical etching; scuff-sand lead flashing and plastic surfaces.
- E. Prime surfaces in accord with manufacturer's instructions.
- F. Install 1/4" diameter backer rod into corner of all horizontal-to-vertical junctures subject to movement and cover with 1" detail cant of approved sealant; install 1" detail cants at projections, curbs and other horizontal-to-vertical junctures.
- G. Install detail coats, joint and crack treatments, and liquid flashings in accord with manufacturer's instructions.
- H. Allow detail applications to cure in accord with manufacturer's instructions prior to general application of membrane.

3.4 APPLICATION

- A. General: Install waterproofing system in accord with manufacturer's recommendations and instructions as applies to the Work except where more stringent requirements are indicated.
 - 1. Waterproofing membrane shall have a minimum of 60 mil dry-film thickness.
 - 2. Grid deck surfaces to assure proper coverage rates and verify membrane wet-film mil thickness with gauges as work progresses.
 - 3. Retain empty product containers during course of work to aid in determining whether completed membrane complies with required average dry-film thickness.
- B. All non-moving cracks and joints over 1/8" (3 mm) in width shall be routed out to 1/4" (6 mm) minimum in width and depth, and then cleaned. Fill cleaned joint flush with polyurethane sealant. Allow sealant to cure before applying membrane waterproofing.
- C. With CETCO product at inside Corner Transitions: Install a 3/4" (19 mm) fillet of M-2000 Liquid Flashing at all horizontal and vertical inside corners. Then install M-2000 90-mil thick extending out from corner cant minimum 6" (150mm) on both sides.
- D. Verify proper dry condition of substrate using method recommended by membrane system manufacturer; perform adhesion checks prior to general application of membrane system using field adhesion test method recommended by manufacturer.
- E. Mask off adjoining surfaces not to receive membrane system.
- F. Wipe clean all detail coats with white rags wetted with Xylene solvent; do not saturate detail coat.
- G. Apply membrane uniformly and allow cure in accord with manufacturer's instructions.
- H. Feather terminating edge when entire area cannot be completed in one day; clean area 6" wide along terminating edge of membrane with Xylene solvent on clean white rags prior to startup on next working day; use interlaminary primer per manufacturer's instructions as needed; overlap existing work by 6" with new work.
- I. Install protection board or drainage board over cured membrane in accord with manufacturer's instructions.

3.5 PROTECTION AND CLEAN-UP

- A. Promptly remove primer or membrane system material from adjacent surfaces with MEK, Toluene or Xylene; leave work area in broom clean condition.
- B. Prohibit traffic over completed work and protect against work overhead until protection course is installed; protect from damage until protected beneath overlaying work.

END OF SECTION

SECTION 07148 – GREEN ROOF/PLAZA WATERPROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Provide a complete 215-mil (5.5mm) thick, reinforced hot rubberized asphalt waterproofing membrane system including all applicable sealants, elastomeric flashings, detailing, reinforcing flashings at corners, joints, penetrations, curbs and drains; separation protection sheet, drainage composite layer, root shield product, moisture retention mat, growing medium, plants and prefabricated green roof drainage.
- B. Related work:
 - 1. Division 3, Section 03300 "Cast-In-Place Concrete."

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product data:
 - 1. Materials list of items proposed under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Submit manufacturer's product data complete with general and specific installation instructions, recommendations and limitations.
 - 4. Shop Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
 - 5. Submit material certification(s) signed by manufacturer certifying materials comply with specific performance characteristics and physical requirements. Certification must be evident that all materials are supplied by a single source manufacturer.
 - 6. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

7. Submit at time of bid, manufacturer's written document that installer is certified as a current Approved Applicator with manufacturer.
8. Submit soil samples and vegetation samples for approval prior to construction. Submittal shall include certification from green roof soil supplier and green roof vegetation supplier that soil medium and vegetation are suitable for use on the project.
9. Submit sample copy of manufacturer's waterproofing warranty identifying the terms and conditions.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Applicator qualifications:
 1. Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
 2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation. The individual shall have experience with multiple previous installations and competent to respond to concerns raised.
- C. Convene a pre-installation job-site conference three weeks prior to commencing work of this Section:
 1. Secure attendance by Architect, Contractor, applicator, and authorized representatives of the membrane system manufacturer and interfacing trades.
 2. Examine Drawings and Specifications affecting work of this Section, verify all conditions, review installation procedures, and coordinate scheduling with interfacing portions of the Work.
- D. Construct a minimum 10-ft x 10-ft mock-up of waterproofing membrane incorporating all of the components including: concrete deck, primer, hot applied rubberized asphalt, reinforcement fabric, and protection layer. Successful mock-up may remain as part of work.
- E. Maintain copy of manufacturer's installation instructions and MSDS for all products on job-site as well as allow access to the job-site by Owner's Independent Inspector, and Manufacturer Agent.

- F. Owner shall make arrangements and payments for an independent inspection service to monitor installation compliance with the project documents and Manufacturer's published literature, installation instructions, and site specific details. Independent inspection firm shall be a company participating with the Manufacturer's Certified Inspection Program. Inspection service shall produce reports and digital photographs documenting each inspection. Reports shall be made available in a timely manner to the Installer, General Contractor, Manufacturer, Architect and Owner.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.
- B. Maintain the products in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- C. Storage of materials must be in an appropriate location and manner as to protect from any construction damage, as well as damage from weather, prolonged sunlight, excessive temperature and sources of ignition. Remove of any damaged material from job-site and dispose of in accordance with applicable regulations. Do not double stack pallets during shipping or storage. Allow adequate ventilation.
- D. Handling of materials to be in accordance with manufacturers instructions. Melting equipment shall consist of double jacketed, oil bath melter with mechanical agitator. Avoid overheating of hot applied rubberized asphalt.
- E. Comply with pertinent provisions of Section 01600.

1.6 PROJECT CONDITIONS

- A. All federal, state and local regulations, codes, and safety standards must be adhered to at all times.
- B. Do not apply waterproofing system if temperature is less than 0°F (-18°C). Application of hot applied rubberized asphalt shall not be performed during rain, snow or inclement weather; or on frost or wet covered surfaces.

- C. The work area must be adequately ventilated. Warn personnel against breathing of vapors and contact of material with skin and eyes. Limit access to required personnel during the installation process. Do not use flammable products near spark or an open flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs. Wear appropriate protective clothing and respiration protection gear at all times.
- D. Protect adjoining surfaces not to be waterproofed against damage or soiling, including plants, vegetation and animals which may be affected by the waterproofing operations.
- E. Provide adequate protection for membrane after installation. Do not allow any foot or vehicular traffic on unprotected membrane. Do not allow any material or waste products to contaminate membrane. Contact Manufacturer to determine performance impedance, if any, caused by contamination of the membrane.

1.7 SUBSTRATE CONDITIONS

- A. General:
 - 1. Provide applicator with surfaces that are broom clean, dry, sound and free of voids, bugholes, rock pockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing membrane system.
 - 2. Using suitable abrasive methods, remove residue of form release, curing compound, chemical retarders and other surface treatments, laitance, mortar smear, saw cut residue, mill scale, rust, loose material and other contaminants from concrete, masonry and ferrous metal surfaces to receive the work of this Section.
- B. Concrete: Where work of this Section will be applied to concrete, provide surfaces that are smooth with finish equal to one that is light steel trowel followed by a fine hair broom.
- C. Green Roof:
 - 1. Deck surfaces to drains that have flanges at membrane level which are flush with deck surfaces.
 - 2. Rigidly install pipe, vents and other surface protrusions, properly flash them, and cover to prevent entry of membrane materials.

- D. Metal flashings: Where metal flashings are substrate to waterproofing membrane, set the flashings in continuous bedding bead of urethane sealant; install sealant S-bead between metal laps and mechanically fasten to substrate along leading edges at every 4" on center, staggered linearly, to lay flat without fishmouths.
- E. Joints: Configuration shall be consistent with this Section and with all other requirements of the Contract Documents.

1.8 WARRANTY

- A. Deliver to the Owner signed copies of the manufacturer's written warranties validated by Manufacturer confirming acceptance of installation, including independent inspection reports, in accordance with all applicable instructions.
 - 1. Manufacturer's agreed upon warranty.
 - 2. Applicator's standard warranty covering workmanship.
 - 3. Warranty period: 15 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Acceptable Manufacturer's:
 - 1. Tremco
 - 2. CETCO
 - 3. Henry Company
- B. All components must be single source from membrane manufacturer to ensure system compatibility.

2.2 PRIMER

- A. Tremco Product:
 - 1. TREMprime QD Low Odor Primer
- B. CETCO Product, (select product(s) per project requirements) :
 - 1. Strataprime WB, water based concrete surface conditioner.
 - 2. Strataprime SB – solvent based concrete surface conditioner.
- C. Henry Product:
 - 1. 930-18 Primer polymer modified primer.

2.3 HOT RUBBERIZED ASPHALT WATERPROOFING MEMBRANES

- A. Tremco Product:
 - 1. Tremproof/Permaquik 6100 HRA a hot rubberized asphalt waterproofing membrane
- B. CETCO Product:
 - 1. Strataseal HR, hot rubberized asphalt waterproofing membrane
- C. Henry Product:
 - 1. 790-11, hot rubberized asphalt waterproofing membranE.

2.4 REINFORCING FABRIC

- A. Tremco Product:
 - 1. Tremco Reemay Spun Bonded Polyester Style 2014, reinforcing fabric
- B. CETCO Product(select product(s) per project requirements) :
 - 1. Stratabond 100 – 1.5-oz non-woven, spunbonded polyester fabric.
 - 2. N-Flash – 60-mil uncured neoprene rubber sheet.
 - 3. FLASH SA – 70-mil self-adhered rubberized asphalt reinforced with a fiberglass mat with a sand surface.
- C. Henry Product:
 - 1. Polyester Fabric reinforcing sheet.

2.5 ROOT BARRIER/PROTECTION BOARD

- A. Tremco Product:
 - 1. Tremco Root-Barrier is installed above the applied Tremproof/Permaquik 6100 HRA waterproofing membrane.
 - 2. Consists of a 40 mil High Density Polyethylene with a double side tape on the outside edge.
 - 3. Overlap the edges by a minimum of 4" (10.2cm)
 - 4. Termination should be consistent with Tremco recommendations
- B. CETCO Product (select product(s) per project requirements):
 - 1. RAP 200 – 90-mil rubberized asphalt protection course reinforced with synthetic fibers with a sand surface.
 - 2. RAP 250FR – 140-mil fire resistant rubberized asphalt protection course reinforced with fiberglass with a granulated surface.
 - 3. RAP 350FR – 160-mil fire resistant rubberized asphalt protection course reinforced with fiberglass with a granulated surface.
 - 4. Root Barrier: Root Barrier 100 a 10-mil thick polyethylene sheet with overlap seams seamed with Volclay Seamtape.

- C. Henry Products, provide one of the following systems:
 - 1. G100s/s w/ Roof Bloc 20 Intensive Root Barrier.
 - 2. DBR 50/100 System.

2.6 FLASHING

- A. CETCO Products (select product(s) per project requirements):
 - 1. N-Flash – 60-mil uncured neoprene rubber sheet. N-FLASH flashing applications require the use of bonding adhesive, splicing cement, and lap sealant.
 - 2. Flash TS – 150-mil torch weld rubberized asphalt reinforced with a fiberglass mat with a sand surface.
 - 3. Flash TG - 160-mil torch weld rubberized asphalt reinforced with a fiberglass mat with a granulated surface.
 - 4. Flash SA – 70-mil self-adhering rubberized asphalt reinforced with a fiberglass mat with a sand surface.
- B. Henry Products (select product(s) per project requirements):
 - 1. NP180s/s Base Sheet flashing not to be exposed.
 - 2. Neoflash Uncured Neoprene Flashing w/ Neoprene Adhesive for expansion joints and exposed flashing.

2.7 DRAINAGE MAT/ WATER RETENTION

- A. Tremco Product:
 - 1. Drainage/Water retention element is three-dimensional, molded panels of recycled material. It should be comprised of a high compressive strength core, an attached top fabric restricting to restrict soil and root growth, bottom fabric to protect membrane, and a perforated, water reservoir core.
 - 2. Under planted areas: TREMDrain GR 1/2"
 - 3. Under paver areas: TREMDrain 1000.
- B. CETCO Product:
 - 1. Under planted areas: Aquadrain 18H turned upside down to create water reservoirs.
 - 2. Under paver areas: Aquadrain 18H.
- C. Henry Product:
 - 1. Under extensive planted areas: Henry DBR 50.
 - 2. Under intensive planted areas: Henry DBR.
 - 3. Under paver areas: Henry DB 650.

2.8 GROWING MEDIUM LAYER

- A. Growing medium depth range for extensive system is 1 1/2" to 6" and for intensive system and is 6" to 24" for intensive system depending on planting design.
- B. Growing material composed of a minimum of 75% mineral soil.
- C. Install growing medium directly onto Roof Drainage. Spread growing medium to proper design thickness throughout the entire Green Roof.
- D. Intensive planting needs to be determined before growing medium layer can be properly designed.

2.9 PLANTING

- A. Refer to Landscape specification for extensive and intensive planting mix.

2.10 PAVERS

- A. Provide pedestals and sand bedding specified elsewhere.
- B. Pavers specified elsewhere.
 - 1. Not permitted with Henry product. Submit alternative.

PART 3 - EXECUTION

3.1 GENERAL

- A. Refer to Manufacturer's Installation Instruction for application of complete membrane system.
- B. The Installer, with the Owner's Independent Inspector, shall examine all surfaces and other conditions under which this section of work is to be performed and notify the contractor in writing of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected and are acceptable for compliance with Manufacturer's warranty requirements. General conditions acceptable for the installation are list below. For conditions not covered in this Section contact the Manufacturer for application guidance.

3.2 ENVIRONMENTAL CONDITIONS

- A. Waterproofing system is not to be applied on wet or frozen substrates.

3.3 SAFETY

- A. Keep waterproofing materials away from open flames or sparks during storage and material application.
- B. HRA should not be heated above 400°F.
- C. Kettle must be operated by workmen thoroughly familiar with its safe operation as recommended by the kettle manufacturer.
- D. Protective clothing, respiratory equipment and eye protection shall be provided and worn by all workmen applying components of HRA system.
- E. Read container labels and Material Safety Data Sheets for health and safety precautions prior to use.

3.4 CONCRETE CONDITIONS

- A. HRA must not be applied over any type of lightweight concrete without prior written approval.
- B. Metal pan decks must be vented as approved by manufacturer.
- C. The structural concrete should have minimum of 4,000 psi compressive strength at 28 days.
- D. The structural concrete should be cured by water or alternately by a dissipating curing compound. Manufacturer shall approve curing compounds in writing prior to bid.
- E. The structural concrete shall have a smooth, light steel trowel finish followed by a fine hair broom or equivalent finish to maintain a minimum coverage rate of 1-3/4 pounds per square foot. A steel float finish will provide too smooth of a surface for proper adhesion of the waterproofing materials, therefore concrete surfaces that have a steel float finish must be mechanically treated prior to the application of the waterproof material.

- F. The concrete surface shall be smooth, free of excessive roughness, voids, protrusions, spalled areas, laitance, honeycombs, float marks or exposed aggregate. Such conditions require more material to achieve an acceptable membrane installation.
- G. The structural concrete deck should be pitched to drains a minimum of 1/8" per foot.
- H. The structural concrete slab shall be cured a minimum of 28 days prior to membrane installation.
- I. Remove all dirt, debris, oil, grease, cement laitance or other foreign matter which will impair the adhesion and performance of the waterproofing membrane.
- J. Any existing membrane residuals shall be rendered to the satisfaction of manufacturer.
- K. Protect adjacent work areas and finished surfaces from damage or contamination during installation operations.
- L. Expansion joints should be sealed with applicable expansion joint material. Detail waterproofing membrane to expansion joint per manufacturer's standard details.

3.5 VERIFYING CONDITIONS

- A. A job site meeting of the general contractor, waterproofing applicator, the owner and manufacturer representative, shall be held to verify all conditions. All prints, drawings, and specifications affecting the work of the section shall be examined. No work shall be undertaken until unacceptable conditions are corrected.
- B. Moisture content of concrete shall be tested immediately before application by the rubber mat test or other approved method.
- C. A test application of the rendered surface condition shall verify that adhesion of the HRA Membrane is acceptable to manufacturer.

3.6 SURFACE CLEANING

- A. All structural concrete surfaces to be waterproofed shall be free of laitance, loose mortar, oil and other contaminants which interfere with proper membrane adhesion.

3.7 PREPARATORY WORK

- A. Apply primer per manufacturer's guidelines to all surfaces to receive hot applied rubberized asphalt membrane. At the changes in plane such as at parapet walls, concrete columns, etc. prime vertical surface to the height specified in the drawings by the architectural engineer. Allow primer to dry prior to installing the membrane. The surface of the concrete will look discolored, but not blackened. Do not allow the primer to pool or become contaminated. Note: Membrane will not adhere properly to wet primer. Install a flashing.
- B. All corner joints shall be treated as recommended by manufacturer.
- C. All shrinkage cracks (less than 1/16 inch) shall be treated as recommended by manufacturer.
- D. All moving structural cracks shall be shall be treated as recommended by manufacturer.
- E. All construction joints and cold joints shall be treated as recommended by manufacturer.
- F. Expansion joints shall be treated as recommended by manufacturer.

3.8 STANDARD MEMBRANE INSTALLATIONS

- A. Preparatory work using must be allowed to fully cure.
- B. HRA Membrane Preparation
 - 1. The membrane is heated in a double jacketed, oil bath type tank with mechanical agitation designed for hot applied rubberized asphalt membrane. Do not use single wall, direct fire equipment to heat rubberized asphalt membrane.
 - 2. Follow manufacturer's instructions for membrane preparations.
- C. Apply base layer of HRA, a continuous monolithic coat, to the surface at a uniform rate sufficient to fully adhere to entire area to be waterproofed. The rate will vary with surface condition; however, a minimum application of 90 mils (.59 lbs per square foot (2.9 Kg/m²)) is required.
- D. Install reinforcing fabric following manufacturer's instructions.

- E. Apply top layer of HRA, a continuous monolithic coat, at the uniform rate of a 125 mils (.83 lbs per square foot (4.05 Kg/m²)) for a total film thickness of 215 mils over entire area to be waterproofed. Allow system to cure for a minimum of 4 hours.
- F. Flood test horizontal area with a minimum 2 inch of water for 48 hours. Plug all drains and provide barriers necessary to contain water. Allow for any overflow to protect the building in the event of rain. Water test must be witnessed, documented and approved by Independent Inspector.
 - 1. Alternative: Electronic testing of deck.
- G. Repair damage, as required, with an application of HRA and reinforcing fabric. Repeat flood test until all leaks are repaired and waterproofing passes test after 48 hours.
- H. Install approved protection board as required upon successful completion of water test.

3.9 ROOT BARRIER PROTECTION

- A. Install root barrier over cured HRA membrane
- B. Overlap the edges a minimum of 4" (10.2cm) and heat weld or tape all seams.
- C. Turn up root barrier at all vertical surfaces and terminate per manufacturer's recommendations to completely protect waterproofing system.

3.10 DRAINAGE/WATER RETENTION

- A. Install approved drainage/water retention mat with open side of the dimple toward the soil under landscaped areas and dimples down under paver areas.
- B. Connect each drainage mat by overlapping the flange

3.11 ROOT BARRIER

- A. Under landscaped areas install root barrier following manufacturer's instructions.

3.12 GROWING MEDIUM

- A. Supply and Install soil mixes to the specified depths.

3.13 PLANTING AND PAVERS

- A. All drains should be fitted with inspection/maintenance boxes accessible at top soil level.
- B. Landscaping to be provided as specified and indicated elsewhere. Monitor Landscape contractor's installation of landscape soil and vegetation over the installed waterproofing assembly to watch for potential damage. Any damage to waterproofing assembly by landscape operations shall be corrected immediately with repair expense covered by Landscape contractor.
- C. Pavers shall be specific brand, type, size, color, thickness, and surface texture as specified elsewhere. Place concrete pavers, where indicated by project design, accurately aligned and leveled with upper surface of pavers in plane with adjacent units. Cut pavers to fit irregularly shaped areas and around protrusions. Install concrete pavers to manufacturer's instructions on approved pedestals or leveling bed per project design.

3.14 JOB COMPLETION

- A. Clean-Up
 - 1. In areas where adjacent finished surfaces are soiled by work of this Section, consult Manufacturer of surfaces for cleaning advice and conform to their recommendations and instructions.
 - 2. Remove all debris, tools, equipment and remaining product on-site. Dispose of debris and damaged product following all applicable regulations.
- B. Inspection
 - 1. The Installer with the Owner's Independent Inspector shall examine all completed work.

END SECTION

SECTION 07170 – BURIED WATERPROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions, and Division 1 General requirements, apply to the work of this section.

1.2 WORK SUMMARY

- A. The work of this section includes, but is not limited to the furnishing and installing the following materials, per project specifications and drawings, or as directed by bentonite waterproofing manufacturer:
 - 1. Bentonite sheet waterproofing membrane.
 - 2. Work includes all applicable sealants, waterstops and waterproofing flashings needed to ensure a complete waterproof system for buried concrete and masonry components at locations indicated.

1.3 RELATED SECTIONS

- A. Other specification Sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Division 2: Subsurface and Geotechnical Investigations
 - 2. Division 2: Earthwork, Excavation and Fill, Shoring,
 - 3. Division 2: Geocomposite Foundation Drainage
 - 4. Division 3: Concrete.

1.4 SYSTEM DESCRIPTION

- A. Provide bentonite waterproofing and prefabricated drainage composite system to prevent the passage of liquid water and install without defects, damage or failure. Waterproofing shall be two high strength geotextiles interlocked encapsulating minimum 1.10 lbs. per square foot (5.37 kg/sqm) granular sodium bentonite with an integrated polyethylene liner.

1.5 SUBMITTALS

- A. General: Prepare and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections.

- B. Product Data: Submit manufacturer's product data, with complete general and specific installation instructions, recommendations, and limitations.
- C. Product Samples: Submit representative samples of the selected product for approval:
- D. Material Certificates: Submit certificate(s) signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements. Submit certification that waterproofing system and components, drainage and protection materials are supplied by a single-source manufacturer.
- E. NSF Standard 61 Certification: Submit Official NSF Listing for standard bentonite geotextile waterproofing membrane confirming that product conforms to the requirements of NSF Standard 61 – Drinking Water System Components – Health Effects.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installing company should have at least three (3) years experience in work of the type required by this section, who can comply with manufacturer's warranty requirements, and who is an Approved Applicator as determined by waterproofing/drainage system manufacturer.
- B. Manufacturer Qualifications: Bentonite geotextile waterproofing and all accessory products shall be provided by a single manufacturer with a minimum of 30 years experience in the direct production and sales of bentonite waterproofing systems. Manufacturer shall be capable of providing field service representation during construction, approving an acceptable installer, recommending appropriate installation methods, and conducting a final inspection of the bentonite waterproofing and prefabricated drainage system applied.
- C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field installation to establish procedures to maintain required working conditions and to coordinate this work with related and adjacent work. Verify that final waterproofing and waterstop details comply with waterproofing manufacturer's current installation requirements and recommendations. Pre-con meeting attendees should include representatives for the owner, architect, inspection firm, general contractor, waterproofing contractor, concrete contractor, excavating/backfill contractor, and mechanical and electrical contractors if work penetrates the waterproofing.

- D. Materials: Obtain bentonite waterproofing with integrated polyethylene liner and prefabricated drainage materials from a single manufacturer to assure material compatibility.
- E. Independent Inspection: Owner shall make all arrangements and payments for an independent inspection service to monitor waterproofing material installation compliance with the project contract documents and manufacturer's published literature and site specific details. Independent Inspection Firm shall be an approved company participating with the waterproofing manufacturer's Certified Inspection Program. Inspection service shall produce reports and digital photographs documenting each inspection. Reports shall be made available to the Contractor, waterproofing installer, waterproofing material manufacturer, and Architect. Inspections should include substrate examination, beginning of waterproofing installation, periodic intervals, and final inspection prior to concrete or backfill placement against the waterproofing.
- F. Water Sample Test: Project site water sample supplied to manufacturer by waterproofing contractor to determine type of bentonite system (standard sodium bentonite or contaminate resistant (CR) sodium bentonite) to be utilized on the project. Manufacturer shall conduct test free of charge. Contractor is responsible for collection and shipment of one liter of actual site water. Water should be shipped in uncontaminated, sealed plastic container to manufacturer for review.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and Handling: Deliver materials in factory sealed and labeled packaging. Sequence deliveries to avoid delays, while minimizing on-site storage. Handle and store following manufacturer's instructions, recommendations and material safety data sheets. Protect from construction operation related damage and prolonged weather exposure. Remove damaged material from site and dispose of in accordance with applicable regulations.
- B. Storage: Do not double-stack pallets during shipping or storage. During storage protect waterproofing materials from moisture, excessive temperatures and sources of ignition. Provide cover, top and all sides, for materials stored on-site, allowing for adequate ventilation.

1.8 PROJECT CONDITIONS

- A. Substrate Condition: Proceed with work only when substrate construction and preparation work is complete and in condition to receive waterproofing system. Substrates to be free of standing water, dirt and debris, loose material, voids and protrusions or deformations which may inhibit application or performance of waterproofing.
1. Where work of this Section will be installed on earth, provide subgrades that are stable, smoothed and compacted to minimum 95 percent modified proctor density.
 2. Where work of this Section will encounter groundwater, provide waterproofing manufacturer with sufficient groundwater samples taken from Project at logged locations for manufacturers laboratory analysis.
 3. Manufacturer shall provide written report confirming laboratory testing with regard to suitability of waterproofing system for installation in Project conditions.
- B. Weather Conditions: Perform work only when existing and forecasted weather conditions are within the guidelines established by the manufacturer of the waterproofing materials. Do not apply waterproofing materials into standing water or over ice and snow. Though exposure to precipitation and ground water seepage typically will not adversely affect the product, the General Contractor shall maintain site conditions to remove standing water from precipitation or ground water seepage in a timely manner. Should bentonite be subjected to prehydration as a result of prolonged immersion, inspection of the material and written acceptance from manufacturer representative is required prior to concrete or backfill placement.

1.9 WARRANTY

- A. Waterproofing Warranty: Upon completion and acceptance of the work required by this section, the waterproofing materials manufacturer will provide a written one (1) year warranty, covering both materials and labor, to the project owner. Warranty requires the following: (1) System waterproofing products and drainage composite products shall have been provided by a single manufacturer; (2) Installation inspected by certified Independent Inspection Firm per Section 1.06E; (3) In Section 3 work, the manufacturer's waterstop product must be installed in all applicable horizontal and vertical cold pour concrete construction joints and around applicable penetrations. Manufacturer's warranty shall be independent from any other warranties made by the Contractor under requirements of the Contract Documents and may run concurrent with the other warranties.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Provide one of the following systems where indicated on the drawings:
1. CETCO; Voltex DS bentonite interlocked-geotextile waterproofing with integrated polyethylene liner and applicable accessories as manufactured by Colloid Environmental Technologies Company (CETCO), 1500 West Shure Drive, Arlington Heights, Illinois 60004-1440, USA. Phone: (847)392-5800; Fax: (847)506-6195; Web-site: <http://www.cetco.com>.
 2. Tremco; Paramount Paraseal Membranes a complete dual-waterproofing, resealable, composite sheet membrane system composed of high-density polyethylene with a sodium-bentonite face designed for buried concrete or masonry construction having the following attributes.
- B. Obtain primary waterproofing materials of each type required from a single manufacturer to greatest extent possible. Provide accessory materials that are approved by membrane manufacturer.
- C. No substitutions are permitted.
- D. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the membrane system manufacturer as compatible, subject to review of the Architect.

2.2 MATERIALS

- A. Sodium Bentonite: Specially selected Wyoming granular sodium bentonite with 90% passing through a 20-mesh sieve and less than 10% passing through a 200-mesh sieve. Sodium bentonite shall have a 2 gram free swell minimum volume of 16 cc and a maximum fluid loss of 18ml in de-ionized water.
- B. NSF Certified: Standard bentonite geotextile waterproofing membrane with integrated polyethylene liner shall be certified by NSF International to conform to the requirements of NSF Standard 61 – Drinking Water System Components – Health Effects.
- C. Provide base sheet of minimum 6 mil polyethylene sheet for use as hydration barrier below slabs.
- D. VOLTEX BENTONITE GEOTEXTILE WATERPROOFING
 - 1. Volclay Voltex DS[®]: 4' x 14.5' (1.2 x 4.4m) roll of interlocked geotextiles encapsulating a minimum of 1.10 lbs. per square foot (5.37 kg/sqm) of granular sodium bentonite. Composite shall consist of one woven and one non-woven polypropylene geotextile, interlocked using a needle-punching process that produces several interlocks per square inch (6.45 sq. cm) over the entire surface area of product with an integrated polyethylene liner on one side.
 - 2. If soils determine necessary provide Volclay Voltex DSCR[®]: 4' x 14.5' (1.2 x 4.4m) roll of interlocked geotextiles encapsulating a minimum of 1.10 lbs. per square foot (5.37 kg/sqm) of contaminant resistant granular sodium bentonite. Composite shall consist of one woven and one non-woven polypropylene geotextile, interlocked using a needle-punching process that produces several interlocks per square inch (6.45 sq. cm) over the entire surface area of product with an integrated polyethylene liner on one side.
- E. TREMCO BENTONITE WATERPROOFING
 - 1. For applications in areas where saline, alkaline, acid or otherwise contaminated groundwater conditions exist, provide "Paramount Saltwater Paraseal," which is Paraseal Membrane specially designed.
- F. CETCO ACCESSORY WATERPROOFING PRODUCTS: All accessory waterproofing materials shall be provided by the bentonite waterproofing manufacturer or shall have manufacturer's written approval for substitution.
 - 1. Volclay Bentoseal[®]: Trowel grade sodium bentonite compound used as a detailing mastic around penetrations, corner transitions and grade terminations.

2. Volclay Hydrobar Tubes: 2" (50 mm) diameter x 2' (60 cm) long, water soluble tube container filled with granular sodium bentonite
3. Volclay Waterstoppage®: 50 lbs. (22.7 kg) bag of granular Volclay sodium bentonite.
4. Volclay SeamTape®: 2" (50 mm) wide butyl rubber sealant tape.
5. Termination Bar: Min. 1" (25 mm) wide aluminum bar with pre-punched holes on 12" (300 mm) centering for fastening.
6. Volclay TB-Boot®: performed EPDM tie-back cover or field fabricated 26 gauge galvanized sheet metal tie-back covers.

G. TREMCO ACCESSORY WATERPROOFING PRODUCTS: All accessory waterproofing materials shall be provided by the bentonite waterproofing manufacturer or shall have manufacturer's written approval for substitution.

1. For installation at horizontal-to-vertical junctures, provide "Paramount Paragranular" loose bentonite granules in weatherproof 50 lb. bags and capable of swelling to occupy a minimum volume of 17 ml when 2 grams are dispersed into deionized water.
2. For detailing vertical junctures and penetrations, provide "Paramount Paramastic" non-hydrated expandable mastic of trowelable consistency containing not less than 55 percent high swelling Wyoming sodium bentonite.
3. Provide the following fasteners as needed:
 - a. Case-hardened steel nail with fluted shank having a minimum 1" length and a minimum 1" diameter cap for use on green concrete and masonry substrates.
 - b. Powder shot steel pin having a minimum 3/4" diameter washer for use on hardened concrete and grouted masonry substrates.
 - c. Steel staples approved by membrane manufacturer for use according to Project conditions.
4. "Paramount Permanent Seam Tape" reinforced, rubberized-asphaltic waterproofing seam tape 4" wide by 60 mils thick for sealing membrane overlaps wherever flood-testing is required and elsewhere as required by Project conditions or designs.
5. "Paramount Para JT Tape" non-reinforced, adhesive tape of partially cross-linked polymeric elastomers 2" wide by 1/8" thick for molding form-fit seals around difficult contours and for taping seams within overlaps.
6. Provide "Paramount Paraterm Bar" extruded aluminum bar with upper flange to receive sealant for terminations at grade line and on parapet walls.
7. Provide "Vulkem 116 Sealant" one-part or Vulkem 227 two-part, gun-grade polyurethane sealant for completing termination seals and other sealing recommended by manufacturer.

8. Provide "Vulkem 201 or Vulkem 222 Elastomeric Flashing" polyurethane, liquid-applied, elastomeric waterproofing flashing.
9. Provide "Paramount Parastick'N'Dry" pressure sensitive, double-sided tape laminate of bentonite sandwiched between a netting and non-woven fabric for wrapping through-concrete imbeds and other detailing.
10. Provide "Paramount Superstop" flexible, reinforced, bentonite-laminate waterstop strips 1/2" by 1" by 20' -0" with pressure-sensitive adhesive backing for sealing static cold joints in concrete.
11. Provide "Paramount Paraprimer" versatile adhesive bonding agent primer formulated for use with tapes and pressure-sensitive waterproofing accessories.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with contract documents and manufacturer's product data, including product application and installation instructions.

3.1 SUBSTRATE INSPECTION AND CONDITIONS

- A. The installer, with the Owner's Independent Inspector present, shall examine conditions of substrates and other conditions under which this section work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected and are acceptable for compliance with manufacturer's warranty requirements. General substrate conditions acceptable for the waterproofing installation are listed below. For conditions not covered in this Section, contact the waterproofing manufacturer for guidance.
- B. SOIL SUBSTRATES: Site conditions allowing, standard bentonite sheet applications do not require a mud-working slab. Grade substrates should consist of well-leveled soils without voids and debris, and compacted to a minimum of 85% Modified Proctor density. If substrate consists of large aggregate, place a high-strength geotextile layer over the aggregate and then provide several inches of compacted soil or sand for uniform support and containment of waterproofing sheets.

- C. CONCRETE: Reinforced structural slabs should be a minimum of 6" (150 mm) thick when placed on a working mud slab. Reinforced concrete slab(s) on compacted grade shall be a minimum of 4" (100 mm) thick. Install bentonite sheets under all elevator pits. Cast-in-place concrete to receive waterproofing shall be of sound structural grade with a smooth finish, free of debris, oil, grease, laitance, dirt, dust, or other foreign matter which will impair the performance of the waterproofing and drainage system and which do not comply with manufacturer's warranty requirements. Bentonite sheet can be installed on green structural concrete as soon as the forms are removed. There is no product limitation regarding a minimum concrete curing time requirement for bentonite sheet to be installed over structural concrete. Do not apply bentonite sheet waterproofing over lightweight insulating concrete.
1. Form fins, ridges, and other protrusions should be level and smooth with monolithic concrete surface. Honeycombing, aggregate pockets, tie-rod holes and other voids should be completely filled with non-shrink cementitious grout and level with monolithic concrete surface.
 2. Related work to be completed under Division 3. waterstop shall be installed in all applicable vertical and horizontal concrete construction cold pour joints and around applicable penetrations and structural members. Refer to waterstop product manual for further installation procedures and guidelines.

3.2 SURFACE PREPARATION

- A. Remove dirt, debris, oil, grease, cement laitance, or other foreign matter which will impair or negatively affect the performance of the waterproofing and drainage system.
- B. Protect adjacent work areas and finish surfaces from damage or contamination from waterproofing products during installation operations.

3.3 GENERAL INSTALLATION GUIDELINES

- A. Install bentonite sheet with the woven geotextile side facing the concrete (polyethylene liner side away from concrete) to be waterproofed in both horizontal and vertical applications. Overlap bentonite sheet edges a minimum 4" (100 mm) or greater as defined herein.

3.4 UNDER SLAB INSTALLATION

- A. Reinforced structural foundation slabs should be a minimum of 6" (150 mm) thick when placed on a working mud slab. Reinforced concrete slab(s) on compacted grade shall be a minimum of 4" (100 mm) thick. Install bentonite sheet under all elevator pits.
- B. Install underslab bentonite sheet membrane extending to base of shoring wall (poly side down; woven geotextile side up) fully overlapping the 12" (300 mm) horizontal tail of the bentonite sheet corner transition sheet. Secure corner edge of membrane with washer-head fasteners or pneumatic staples 12" (300 mm) on center.
- C. Place bentonite sheet directly on properly prepared substrate (poly side down; woven geotextile side up facing installer) with adjoining edges overlapped a minimum of 4" (100 mm). Stagger sheet end seams a minimum of 24" (60 cm). Mechanically fasten or staple bentonite sheet as required to prevent movement from construction operations or concrete placement. When the slab is poured in sections, extend bentonite sheet a minimum 12" (300 mm) beyond the slab edge to enable proper overlapping.
- D. Detail all slab penetrations, grade beams, and pile caps, install 1/4" (6 mm) thick layer of waterstoppage extending a 6" (150 mm) radius. Cut bentonite sheet to fit snugly around penetrations and pile caps. Around base of penetrations trowel 3/4" (18 mm) thick fillet of seal and extend the seal up the penetration 1-1/2" (38 mm) and onto the bentonite sheet. Around base of pile caps and grade beams trowel 3/4" (18 mm) thick fillet of seal and extend the seal up the cap and onto bentonite sheet a minimum 2" (50 mm).
- E. Inspect finished bentonite sheet installation and repair any damaged material prior to concrete slab placement.
- F. Related work to be completed under Division 3. Waterstop shall be installed in all slab joints, around applicable slab penetrations and structural members. Refer to waterstop product manual for further installation procedures and guidelines.

3.5 SLAB / FOOTING EDGE TRANSITION COURSE

- A. Provide a minimum of 6" (150 mm) overlap between underslab and vertical wall waterproofing. Secure overlap with washer-head fasteners a minimum of 24" (600 mm) on center and apply seal to the overlap edge.
- B. At the slab/footing form edge, secure bentonite sheet horizontally oriented (poly side down; woven geotextile facing installer) to the top inside edge of the exterior slab/footing form with the sheet conforming to the interior form sides and then extending out onto the horizontal slab substrate a minimum 12" (300 mm). Overlap edges of adjacent bentonite sheet a minimum 4" (100 mm) and secure to prevent sheet movement during construction or concrete placement.

3.6 BACKFILLED CAST-IN-PLACE CONCRETE WALLS

- A. Place transition bar along the wall/footing intersection with ends "butted" tightly together to form a continuous installation.
- B. Trowel 3/4" (18 mm) thick, continuous seal fillet at all inside wall corner transitions. Trowel seal form-tie pockets/patches and any slightly irregular honeycomb areas.
- C. Starting at the base of the wall, install bentonite sheet horizontally (woven geotextile against the wall; poly side facing installer) covering the transition bar and extending onto the footing a minimum of 6" (150 mm). For hydrostatic conditions, cover the entire footing and overlap waterproofing membrane from underslab work a minimum of 6" (150 mm). Attach bentonite sheet using washer-headed mechanical fasteners centered 24" (60 cm) around the sheet edge. Overlap all adjacent sheet edges a minimum 4" (100 mm). Stagger all vertical overlap seams a minimum of 12" (300 mm).
- D. After the bottom horizontal course, bentonite sheet can be installed either vertically or horizontally oriented. Continue bentonite sheet installation up wall to finished grade elevation, staggering all sheet roll ends of adjacent courses a minimum 12" (300 mm). Do not allow horizontal bentonite sheet overlap joints to run at same elevation as the concrete pour lift joints. Overlap all adjacent bentonite sheet edges a minimum 4" (100 mm).

- E. Cut bentonite sheet to fit snugly around penetrations. Detail around all penetrations with 3/4" (18 mm) cant of seal. Completely fill any space between the penetration and bentonite sheet edge. Extend seal 1/4" (6 mm) thick over substrate a minimum radius of 1-1/2" (38 mm) and onto penetration.
- F. Where applicable terminate bentonite sheet at grade with metal termination bar fastened 12" (300 mm) on center. Cover top edge of bentonite sheet with 1/2" (12 mm) thick, 2" (50 mm) wide layer of seal.
- G. Inspect finished bentonite sheet installation and repair any damaged material prior to backfill placement. Assure that bentonite sheet is not displaced during backfill placement or soil compaction.

3.7 CLEAN UP

- A. Clean areas where adjacent finished surfaces are soiled by work of this Section. Remove all tools, equipment and remaining product on-site. Dispose of section work debris and damaged product following all applicable regulations.

END OF SECTION 07170

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Extruded polystyrene board.
 - 2. Glass fiber blanket/batt.
 - 3. Blown in Dens-Pak Cellulose Insulation.
- B. Related Sections:
 - 1. Gypsum drywall assemblies: Division 9.
 - 2. Mechanical system insulation: Division 15.
 - 3. Insulation in headers: Division 6.

1.3 REFERENCES

- A. ASTM C 578-92 -- Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 1992.
- B. ASTM C-739 -- Standard Specification for Loose Fill Insulation.
- C. ASTM C-518 -- Standard Specification for Thermal Resistance.
- D. ASTM E-970 -- Standard Specification for Critical Radiant Flux.
- E. ASTM E-84 -- Standard Specification for Flame Spread.
- F. ASTM E 136-93a -- Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degree C; 1993.
- G. ASTM E-119.

1.4 DEFINITIONS

- A. Thermal Resistance (R-value): The temperature difference in degrees F between the two surfaces of a material of given thickness, required to make 1 Btu of energy flow through 1 square foot of the material in 1 hour.

1.5 SUBMITTALS

- A. Product Data: Submit for each product specified in this section.
- B. Manufacturer's Instructions: Obtain and submit manufacturer's instructions for installation of products in specific applications indicated for this project. If preprinted instructions do not clearly establish installation procedures applicable to project conditions, submit manufacturer's instructions prepared specifically for this project.
 - 1. Include instructions for examination, preparation, and protection of adjacent work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Foamed Plastic Insulation: Minimize period between product delivery and actual installation. Protect against exposure to flame, sparks, or excessive heat. Minimize exposure to sunlight.

1.7 QUALIFICATIONS

- A. Dens-Pak cellulose blown-in installation should be made only by factory-certified contractors using approved equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide manufacturer's standard preformed insulation units, sized for proper fit in indicated applications.
- B. Extruded Polystyrene Board Insulation: Manufactured by extrusion process with integral high density skin:
 - 1. Type X (ASTM C 578): 15.0 psi compressive strength.
 - 2. Total R-value or thickness: Indicated on drawings.
 - 3. Manufacturers: Provide products complying with requirements of the contract documents and made by one of the following:
 - a. Dow U.S.A.
- C. Glass Fiber Insulation-Blanket/Batt:
 - 1. Unfaced blanket/batt: Type I (ASTM C 665), passing ASTM E 136 combustion test requirements.
 - 2. Total R-value or thickness: Indicated on drawings.

3. Provide products complying with requirements of the contract documents and made by one of the following:
 - a. CertainTeed Corporation.
 - b. Manville Roofing Systems, a Division of Schuller International, Inc.
 - c. Owens-Corning Fiberglas Corporation.

- D. Cellulose Dens-Pak Insulation:
 1. Manufacturer: Nu-Wool Company, Inc.
 2. Nu-Wool Cellulose Insulation, Wall seal for walls.
 3. Total R-value: Indicated on drawings.
 4. Provide thickness as indicated by manufacturer to achieve R-value. Where R-Value is not indicated fill cavity fully.

- E. Open Cell Spray Foam:
 1. Manufacturer: Demilec, Inc.
 2. Product: Selection 500.
 3. Total R-value: Indicated on drawings.
 4. Provide thickness as indicated by manufacturer to achieve R-value. Where R-Value is not indicated fill cavity fully.

- F. Spray applied cellulose sound control material:
 1. Manufacturer and product:
 - a. International Cellulose Corporation; K-13 Spray-On System.
 2. Thickness: 1".
 3. Color; Not critical, lowest cost option.

- G. Fire Safing:
 1. Thermafiber Safing Insulation mineral wool type insulation.
 - a. UL and OPL labeled product.
 - b. Comply ASTM C 665 and ASTM C 612-00.

- H. Vapor Retarder: Not required.

- I. Vent Chute:
 1. Provide the following product or equal product as determined by Architect:
 - a. "Polyvent"; Plastifoam, Rockville, CT.

2.2 ACCESSORIES

- A. Provide accessories as necessary to properly install specified products.
 - 1. Adhesive: Insulation manufacturer's recommended adhesive, complying with fire performance requirements.
 - 2. Staples.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditions conform to requirements of contract documents.
- B. Verify that related work to be performed within indicated spaces before installation of insulation has been completed.
- C. Verify that substrates are in satisfactory condition to receive insulation.
- D. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation indicates acceptance of conditions.

3.2 PREPARATION

- A. Clean substrates of any substances which might damage materials to be installed.
- B. Remove harmful projections capable of puncturing vapor retarder.

3.3 INSTALLATION

- A. Do not install insulation which is damaged, wet, soiled, or which has been covered at any time with ice or snow.
- B. Comply with insulation manufacturer's recommendations and installation sequence. Provide permanent placement and support of insulation.
- C. Install materials in a manner which will maximize continuity of thermal envelope. Use a single layer of insulation wherever possible to achieve indicated requirements, unless otherwise indicated.
- D. Insulation Boards:
 - 1. Cut insulation neatly as required to fit tightly around obstructions.
 - 2. Install boards as indicated. Butt board edges and ends tightly. Form solid joints where insulation boards meet protrusions and between adjacent boards. Stagger joints.

3. Foamed plastic insulation: Coordinate installation as necessary with work specified elsewhere to ensure that insulation is concealed promptly after installation.
 4. Extruded polystyrene insulation:
 - a. Foundation installation: Provide installation capable of sustaining subsequent construction work without damage or displacement.
 - (1) Adhesive: Use insulation manufacturer's recommended adhesive to attach insulation boards to foundation. Maximize contact between board surface and substrate.
- E. Insulation Blankets/Batts:
1. Install properly sized blankets/batts conforming to indicated spacings of framing members.
 2. Cut insulation neatly as required to fit tightly around obstructions.
 3. Application: Wood-framed construction:
 - a. Unfaced insulation: Friction-fit insulation between framing members.
- F. Dens-Pak Cellulose Insulation:
1. Cellulose insulation: Blow insulation using pneumatic equipment, into indicated spaces or areas after all mechanical, plumbing and electrical and other utility installations have been completed. Provide insulation manufacturer's recommended density to achieve total R-value required.
 - a. Horizontal installation: Level loose insulation to consistent thickness. Insulation may be allowed to settle slightly to provide homogeneous density. Excessive compaction is not acceptable.
 - b. Vertical installation: Install following manufacturer's instructions. Nu-Wool WALLSEAL insulation is pneumatically sprayed with a controlled water fog for adhesion into open wall cavities. Drywall may be installed 24 hours after application. Total drying time is approximately 30 days.
 - c. Installation procedures and techniques are as recommended by manufacturer using machines approved for blown in insulation.
- G. Open Cell Spray Foam Insulation:
1. Install strictly following manufacturer's instructions.
- H. Spray Applied Cellulose Insulation:
1. Install strictly following manufacturer's instructions.

3.4 PROTECTION

- A. Protect installed materials from damage until permanent concealing work is completed.
- B. Where concealing work is not performed immediately after installation work of this section is completed, erect suitable temporary coverings or enclosures to prevent damage.

END OF SECTION 07210

SECTION 07410 – METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
- B. Standing-seam metal roof panels.
- C. Related Sections include the following:
 - 1. Division 5 Section "Cold-Formed Metal Framing" for metal framing.
 - 2. Division 6 Section "Rough Carpentry" for wood framing and sheathing.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for flashing not part of roofing and other sheet metal work.
 - 4. Division 7 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide manufactured wall panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.
- B. Air Infiltration: Provide manufactured wall panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E 1680 at a static-air-pressure difference of 4.0 lbf/sq. ft..
- C. Water Penetration: Provide manufactured wall panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. and not more than 12.0 lb/sq. ft..
- D. Wind-Uplift Resistance: Provide wall panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.

- E. Structural Performance: Provide manufactured wall panel assemblies capable of safely supporting design loads indicated under in-service conditions with vertical deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 1592 by a qualified independent testing and inspecting agency.
 - 1. Maximum Deflection: 1/140 of the span.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.
- B. Shop Drawings: Show layouts of panels on walls, details of edge conditions, joints, panel profiles, supports, anchorages, trim, flashings, underlayment, closures, snow guards, and special details. Distinguish between factory- and field-assembled work.
- C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for wall panels with factory-applied finishes.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Product Test Reports: Indicate compliance of manufactured wall panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed metal wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

- B. Handling: Exercise care in unloading, storing, and erecting wall panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish opening dimensions and proceed with fabricating wall panels without field measurements or allow for trimming panel units. Coordinate wall construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- C. Finish Warranty Period: 20 years from date of Substantial Completion.
- D. Special Weathertight Warranty: Submit a written warranty executed by manufacturer agreeing to repair or replace metal wall panel assembly that fails to remain weathertight within the specified warranty period.
- E. Weathertight Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer: The manufacturer offering metal panels to be incorporated into the Work is the following:
 - 1. Metal Standing Seam Panels:
 - a. Petersen Aluminum Corp., PAC-CLAD.
 - 2. Other manufacturers substitutions will be considered when its equality to specified product when submitted following procedure in General Requirements.

2.2 METALS AND FINISHES

- A. Standing Seam Roof System: ASTM E 1592, cold-rolled sheet.
- B. Finishes: Kynar 500, Refer to color scheme for selected colors.

2.3 ROOF PANEL ASSEMBLIES

- A. Standing-Seam Wall Panels: Manufacturer's standard factory-formed, standing-seam wall panel assembly designed for concealed mechanical attachment of panels to roof sheathing. Provide one of the following products:
 - 1. PAC-CLAD; Redi-Roof Panel, 18", 1 3/8" stiffener beads, .032 aluminum.
 - 2. Color to be selected from manufacturer's standard colors during the submittal process.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and accessories required for a complete roof panel assembly and as recommended by panel manufacturer, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
 - 1. Clips: Provide panel clips designed to meet negative-load requirements.
 - 2. If required provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
 - 3. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.

4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
- C. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including flashings, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
1. All factory or field fabricated pieces to be .032 Aluminum.
 2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
 3. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel wall and remain weathertight. Provide sealant recommended by panel manufacturer.
- D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- E. Underlayment: WR Grace; Vycor Ultra.

2.5 FABRICATION

- A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel.
1. Panel Supports and Anchorage: Examine framing to verify that purlins, angles, channels, and other secondary structural panel support members and anchorage have been installed according to written instructions of panel manufacturer.
 2. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate metal panel with rain drainage work; flashing; trim; and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.3 PANEL INSTALLATION

- A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cutting exterior panels by torch is not permitted.
 - 2. Install panels with concealed fasteners, unless otherwise indicated.
 - 3. Install panels over solid substrate with minimum 3:12 slope. Install 1 ply of felt from lower edge up, with at least 3-inch side laps and 4-inch end laps.
- B. Accessories: Install components required for a complete wall panel assembly including trim, copings, fasciae, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items.
 - 1. Install accessories with concealed fasteners, unless otherwise indicated.
- C. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.
 - 1. Install weatherseal under ridge cap. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
 - 2. Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.

3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

- E. Standing-Seam Panel Assembly: Fasten panels to supports with concealed clip according to panel manufacturer's written instructions.
 - 1. Install clips at each support with self-drilling/self-tapping fasteners.
 - 2. At end laps of panels, install tape calk between panels.
 - 3. Install factory-calked cleats at standing-seam joints. Apply snap-on batten to panels to provide a weathertight joint.
- F. Installation Tolerances: Shim and align panel units 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.

3.4 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 07410

SECTION 07460 – FIBER CEMENT BOARD SIDING & TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiber Cement Board clapboard siding.
 - 2. Fiber Cement Board trim.
 - 3. Air Infiltration Barrier
- B. Coordinate this section with interfacing and adjoining work for proper sequence of installation
- C. Related Sections
 - 1. Section 06100 – Rough Carpentry
 - 2. Section 07900 – Sealants
 - 3. Section 09900 – Paint

1.3 SUBMITTALS

- A. Submit three 6 inch x 6 inch pieces of fiber-cement claddings in texture and widths shown and specified herein.
- B. Submit specifications, installation data and product data.

1.4 PRODUCT HANDLING

- A. Stack fiber-cement claddings on edge or lay flat on a smooth, level surface. Protect edges and corners from chipping. Store sheet under cover and keep dry prior to installing.

1.5 PROJECT CONDITIONS

- A. Substrates:
 - 1. Do not apply trim over wet or moist substrates.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A company with installation experience of units the same or similar to those included in this section, and authorized or licensed by manufacturer.

1.7 WARRANTY

A. Special Project Warranty: Submit a written warranty signed by the manufacturer and installer, guaranteeing to correct failures in product and workmanship which may occur during the warranty period, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure shall be defined as any interruption of watertight condition.

1. Warranty period: 2 years; starting from the date of substantial completion.

B. Manufacturer's Product Warranty: Submit manufacturer's standard written warranty signed by the manufacturer, guaranteeing to replace siding materials which have failed in performance.

1. Warranty period: 50 years; starting from the date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Fiber cement siding and trim to be manufactured by one of the following provided they are in compliance with the drawings:

1. James Hardie Siding Products
2. Cemplank. Inc.

2.2 MATERIAL

A. Non-asbestos fiber-cement siding to comply with ASTM Standard Specification C1186 Grade II, Type A.

B. Siding

1. Shall meet the International Building Code. Non asbestos fiber-cement siding to be non-combustible when tested in accordance with ASTM test method E136.
2. Clapboards: James Hardie Siding Products; Hardiplank Lap Siding, Smooth, 4" Exposure.

3. Vertical Siding: James Hardie Siding Products; Hardie Panel Vertical Siding, Smooth, 4'x8' and 4'x10'.

C. Trim:

1. Refer to the drawings for the sizes and types of trim.
2. 5/4 Trim: HardiTrim XLD Technology, Smooth.
3. 1x Trim: HardiTrim HLD, Smooth.
4. HardieTrim Planks or 7/16"x2 1/2" HardiTrim for vertical siding battens.
5. Soffits: HardiSoffit, Non-vented, Smooth.
6. Top floor deck ceiling: Beaded Porch Panel. Primed and field painted with two coats.

D. Finish:

1. Provide ColorPlus Technology System.
2. Field apply final coat of paint under section 09900.
3. Colors to be selected from manufacturer's standard colors during the submittal process.

E. Exterior Brackets:

1. Fypon, BKT10X12X4.
2. install with long dimension horizontal.
3. Provide adhesive as recommended by manufacturer.

F. Exterior Window Crowns:

1. AZEK, Ram Crown, AZM-6934.
2. Provide adhesive as recommended by manufacturer or blind nail on top.
3. Paint to match casing behind using paint as recommended by manufacturer.

G. Vinyl Privacy Lattice:

1. Genova Products; Choice Lattice, Privacy w/ U-Channels & H-Channels.
2. Permalatt Products, Inc; Vinyl Lattice, 1" Diagonal w/ U-Channels & H-Channels.
3. Color to be selected from standard colors during construction.
4. Provide accessories for a complete installation.

H. Accessories:

1. Provide all manufacturer's matching accessories, such as nails, caulk and patching material for holes.

2.3 FASTENERS

A. Nails: As recommended by the manufacturer.

2.4 AIR INFILTRATION BARRIER

A. Tyvek Commercial Wrap air infiltration barrier. No substitutes.

1. Maximum roll widths available.

2.5 DRYER VENT WALL CAP

A. Mid-America; Master Exhaust Vent, Square Trim Ring.

1. Color to be selected from manufacturer's standard colors during the submittal process.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Correct conditions detrimental to timely and proper completion of work.

3.2 INSTALLATION – AIR INFILTRATION BARRIER

A. Install underlayment strictly adhering to the manufacturer's installation instructions and following the details on the drawings. Install after window installation. Install underlayment where shown on the drawings.

B. Install weatherboard fashion; lap horizontal joints 4 inches, minimum; lap vertical joints 6 inches, minimum. Tape all joints.

3.3 INSTALLATION – SIDING

A. Install siding and trim strictly following the manufacturer's installation instructions. Install siding with maximum lengths possible for wall surface area to be covered. Short lengths with a joint in short sections of the walls, such as between windows, shall not be acceptable.

B. All cut ends to be located against a trim or casing piece.

C. If a pneumatic nailing device is to be used a Hitachi adjustable nailing device shall be used. The cutting device for all siding and trim shall be a sliding chop saw type in order to provide a proper cut edge.

3.4 INSTALLATION – TRIM

- A. Install flashing around all wall openings.
- B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- C. Place fasteners no closer than 1 inch from end. Fasten maximum 16 inch on center.
- D. Maintain clearance between trim and adjacent finished grade.
- E. Trim inside corner with single board.
- F. Install single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten fiber-cement board to fiber-cement board.
- G. Seal gaps with high quality, paintable caulk.
- H. Shim frieze board and window/door casing as required to align with adjacent trim.
- I. Install fiber cement fascia over structural sub fascia.
- J. Provide patching material for nail holes in trim.

3.5 FINISHING

- A. Caulk all joints against trim edges.
- B. Field apply final coat of paint after installation and caulking is complete.
- C. Protect siding from other trades.

3.6 CLEANING

- A. Remove scraps and debris from the site on a regular and frequent basis. Do not allow to accumulate.

END OF SECTION 07460

SECTION 07531 - MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Membrane roofing and roofing accessories.

1.3 RELATED SECTIONS

- A. Section 07600 – Flashing and Sheet Metal.
- B. Division 15000 - Plumbing Specialties: Roof drains and vents.
- C. Division 15000: Prefabricated curb for mechanical equipment.

1.4 REFERENCES

- A. ANSI/ASTM D412 - Rubber Properties in Tension.
- B. ANSI/ASTM D746 - Brittleness Temperature of Plastics and Elastomeric by Impact.
- C. ASTM D624 - Rubber Property - Tear Resistance.
- D. ASTM D822 - Practice for Operating Light and Water-Exposure Apparatus (Carbon-Arc) Type for Testing Paint, Varnish, Lacquer, and Related Products.
- E. ASTM D1004 - Initial Tear Resistance of Plastic Film and Sheeting.
- F. ASTM D2240 - Rubber Property - Durometer Hardness.
- G. ASTM C272 - Water Vapor Transmission of Materials.
- H. Factory Mutual Engineering & Research Corporation (FM) - Roof Assembly Classifications.
- I. National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual.

- J. Underwriters Laboratories (UL) - Fire Hazard Classifications.
- K. ASTM D4667 - Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane

1.5 SYSTEM DESCRIPTION

- A. Elastomeric Sheet Membrane Conventional Roofing System: Single ply membrane system with recovery board and flashing.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate fascia, flashing, intersection of new and existing joint and termination detail conditions, conditions of interface with other materials. Includes details for new equipment flashing conditions.
- C. Determine roof uplift pressure in accordance with current FM LPDA 1-28. Submit determination calculation sheet with submittal for approval.
- D. Product Data: Provide characteristics on membrane materials, flashing materials, insulation, recovery board, vapor retarders and walkway.
- E. Manufacturer's Installation Instructions: Indicate special precautions required for seaming the membrane.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with three years documented experience.
- B. Applicator: Company specializing in performing the work of this section with 3 years experience and approved by system manufacturer.
- C. Work of this section to conform to NRCA Roofing and Waterproofing Manual manufacturer's instructions.

1.8 REGULATORY REQUIREMENTS

- A. Conform to applicable local current building code for roof assembly fire hazard requirements.
- B. Underwriters Laboratories, Inc. (UL): Class A Fire Hazard Classification.

- C. Factory Mutual Engineering & Research Corporation (FM): Roof Assembly Classification wind uplift requirements in accordance with FM LPDS 1-28.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this section, under provisions of General Conditions.
- B. Review installation procedures and coordination required with related Work.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of General Conditions.
- B. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- C. Store products in weather protected environment, clear of ground and moisture.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply roofing membrane during inclement weather ambient temperatures below 45 degrees F or above 90 degrees F.
- B. Do not apply roofing membrane to damp or frozen deck surface.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.12 COORDINATION

- A. Coordinate the work with the installation of associated metal flashings, as the work of this section proceeds.

1.13 WARRANTY

- A. Provide 15 year warranty under provisions of General Conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - MEMBRANE MATERIAL

- A. All materials of the roofing system shall be manufactured by one manufacturer source.
- B. Membrane Roofing system manufactured by one of the following manufacturers:
 - 1. Firestone Building Products Co.
 - 2. Carlisle Syntec Incorporated
 - 3. Versico Inc.
- C. Other equal systems by other manufacturers may be submitted for approval. PVC roofing shall not be considered as an equal.

2.2 MEMBRANE AND ASSOCIATED MATERIALS

- A. White Membrane, provide one of the following:
 - 1. Color: White
 - 2. Firestone: UltraPly
 - 3. Carlisle: Sure-White.
 - 4. Carlisle: Sure-Weld.
 - 5. Versico: VersiWeld.
- B. Seaming Materials: Provide what is recommended by manufacturer.

2.3 ADHESIVE MATERIALS

- A. Surface Conditioner: As recommended by membrane manufacturer.
- B. Membrane Adhesives: As recommended by membrane manufacturer.
- C. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

2.4 RECOVERY BOARD

- A. Recovery Board:
 - 1. Firestone: ½" FiberTop "E"
 - 2. Carlisle; 1/2" HP Recovery Board.
 - 3. Versico: 1/2" panel as approved by manufacturer.

2.5 INSULATION

- A. Insulation: Closed cell polyisocyanurate foam with the following characteristics:

Board Density:	Nominal 2 lb/cu ft
Board Size:	48 x 96 inch
Board Thickness:	8 inches
Thermal Resistance:	R5.56/inch as determined by ASTM C158.
Board Edges:	Square
- B. Provide tapered insulation as shown on drawings of same type as flat insulation.

2.6 FLASHINGS

- A. Flexible Flashings: Same material as membrane.
- B. Counter Flashings: Same material as membrane.
- C. Reglet: As recommended by membrane manufacturer.

2.7 ACCESSORIES

- A. If another manufacturer is substituted, their equal components for the items listed below shall be submitted for approval.
- B. Pipe flashings: Carlisle Split Pipe Seals pipe flashing appropriate for each situation.
- C. Roof Drains: manufacturer's standard.
- D. At roof to wall intersections provide manufacturer's reinforced transition strips.
- E. Walkway Pads: Carlisle Sure-Weld Heat Weldable Walkway Rolls.
- F. Sealants: As recommended by membrane manufacturer.

- G. Roofing Nails: Galvanized, hot dipped or non-ferrous type, size as required to suit application
- H. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
- I. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- J. Heavy gauge wall cap in color to be selected from manufacturer's standard selection during construction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and reglets are in place.

3.2 PREPARATION – OSB DECK

- A. Fasten insulation to OSB deck as recommended by manufacturer.
- B. Fasten recovery board as recommended by manufacturer.

3.3 MEMBRANE APPLICATION

- A. Apply membrane and adhesive in accordance with manufacturer's instructions.
- B. Roll out membrane, free from air pockets, wrinkles, or tears. Firmly press sheet into place without stretching.
- C. Overlap edges and ends and seal with Seam Tape, minimum 3 inches. Seal permanently waterproof.
- D. Shingle joints on sloped substrate in direction of drainage.
- E. Extend membrane a minimum of 12 inches up vertical surfaces.
- F. Seal membrane around roof penetrations.

3.4 FLASHINGS AND ACCESSORIES

- A. Apply Reinforced Transition Strips at roof wall intersections as recommended by manufacturer.
- B. Secure to nailing strips at 4 inches (100 mm) o.c. and reglets.
- C. Coordinate installation of roof drains plumbing and related flashings.
- D. Seal flashings and flanges of items penetrating membrane.
- E. Roof Cap: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
- F. Install walkway pads in accordance with manufacturer's instructions and with three strips of Seam Tape, around all mechanical units and along a path from each roof access to mechanical units..

3.5 FIELD QUALITY CONTROL

- A. Correct identified defects or irregularities.

- B. Require site attendance of roofing and insulation materials' manufacturers as required for warranty during installation of the Work.

3.6 CLEANING

- A. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- B. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.7 PROTECTION

- A. Protect building surfaces against damage from roofing work.
- B. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract from the front of the Specification book, including General Conditions and Supplementary General Conditions, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sheet metal flashing and trim.
 - 2. Fasteners and attachment devices.
 - 3. Coatings and slip sheets to isolate sheet metal from dissimilar materials.
- B. Wood blocking, nailers, edge strips, and battens are not specified in this section.
- C. Related Sections:
 - 1. Siding: Elsewhere in Division 7.
 - 2. Rough carpentry: Division 6.
 - 3. Finish Carpentry: Division 6. Asphalt shingles: Elsewhere in Division 7.

1.3 REFERENCES

- A. Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA); 1987.
- B. ASTM B 209-92a -- Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 1992.
- C. FS TT-C-494B -- Coating Compound, Bituminous, Solvent Type, Acid Resistant; 1985.

1.4 QUALITY ASSURANCE

- A. Installer: A company familiar with installing products included in this section and which has completed at least 20 installations similar in scope to work included in this section.

- B. Quality Standard:
 - 1. Fabricate and install sheet metal work in accordance with Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual," unless specifically indicated otherwise.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Sheet: ASTM B 209, Type 3003 H14.
 - 1. Minimum thickness: 20 B & S gage (.032 inch) , unless indicated otherwise.
 - 2. All flashing to be vinyl coated.

2.2 ACCESSORY MATERIALS

- A. Fasteners: Corrosion-resistant metal of same material as the material being fastened, or other material recommended by sheet metal manufacturer. Match finish and color of exposed fastener heads to finish and color of sheet material being fastened.
- B. Sealant: As specified in Division 7.
 - 1. Use noncuring type for concealed joints.
 - 2. Use nonsag elastomeric type for exposed joints.
- C. Joint Adhesive: Two-component noncorrosive epoxy adhesive, recommended by metal manufacturer for sealing of nonmoving joints.
- D. Bituminous Coating: Heavy bodied, sulfur-free, asphalt-based paint; FS TT-C-494.

2.3 FABRICATION - GENERAL

- A. Form sheet metal to match profiles indicated, substantially free from oil-canning, fish-mouths, and other defects.
- B. Comply with SMACNA "Architectural Sheet Metal Manual" for applications indicated.
- C. Provide for thermal expansion of exposed sheet metal work exceeding 15 feet running length.
 - 1. Flashing and trim: Provide movement joints at maximum spacing of 10 feet; no joints allowed within 2 feet of corner or intersection.

- D. Conceal fasteners and expansion provisions wherever possible.
 - 1. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- E. Form a 1/2-inch hem on underside of exposed edges.
- F. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - 1. Gage: As recommended by SMACNA or metal manufacturer for application, but in no case less than gage of metal being secured.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which products of this section are to be installed and verify that work may properly commence. Do not proceed with the work until unsatisfactory conditions have been fully resolved.
 - 1. Verify that nailers, blocking, and other attachment provisions for sheet metal work are properly located and securely fastened to resist effects of wind and thermal stresses.

3.2 PREPARATION

- A. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- B. Isolate dissimilar metals by means of a heavy bituminous coating, approved paint coating, adhered polyethylene sheet, or other means approved by the architect.

3.3 INSTALLATION

- A. General: Comply with sheet metal manufacturer's installation methods and recommendations in the SMACNA "Architectural Sheet Metal Manual."

- B. Sealed Joints: Form minimum 1-inch hooked joints and embed flange into sealant or adhesive. Form metal to completely conceal sealant or adhesive.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.
 - 2. Moving joints: When ambient temperature is moderate (40-70 degrees F) at time of installation, set joined members for 50 percent movement either way. Adjust setting position of joined members proportionally for temperatures above 70 degrees F. Do not install sealant at temperatures below 40 degrees F. Refer to section on sealants elsewhere in Division 7 for handling and installation requirements for joint sealers.

3.4 CLEANING AND PROTECTION

- A. Repair or replace work which is damaged or defaced, as directed by the architect.
- B. Remove from sheet metal surfaces any debris or substances which will inhibit uniform weathering.
- C. Protect sheet metal work as recommended by the installer so that completed work will be clean, secured, and without damage at substantial completion.

END OF SECTION 07600

SECTION 07811 - SPRAYED FIRE-RESISTIVE MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exposed SFRM.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for surface conditions required for structural steel receiving SFRM.

1.3 DEFINITIONS

- A. SFRM: Sprayed fire-resistive material.
- B. Exposed: Fire-resistive materials applied to surfaces that are exposed to view when the Work is completed, that are accessible through suspended ceilings and that are identified as exposed on Drawings.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Structural framing plans indicating the following:
 - 1. Locations and types of surface preparations required before applying SFRM.
 - 2. Extent of SFRM for each construction and fire-resistance rating, including the following:
 - a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.

- b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
 - 3. Treatment of SFRM after application.
- C. Product Certificates: For each type of SFRM, signed by product manufacturer.
- D. Qualification Data: For installer, manufacturer and testing agency.
- E. Compatibility and Adhesion Test Reports: From SFRM manufacturer indicating the following:
 - 1. Materials have been tested for bond with substrates.
 - 2. Materials have been verified by SFRM manufacturer to be compatible with substrate primers and coatings.
 - 3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed SFRM.
- G. Research/Evaluation Reports: For SFRM.
- H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by SFRM manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.
- B. Source Limitations: Obtain SFRM through one source from a single manufacturer.
- C. SFRM Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.
 - 1. SFRMs are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

2. Testing is performed on specimens of SFRMs that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
 3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.
- D. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.
1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with SFRM.
- E. Fire-Test-Response Characteristics: Provide SFRM with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing SFRM with appropriate markings of applicable testing and inspecting agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for SFRM serving as direct-applied protection tested per ASTM E 119.
 2. Surface-Burning Characteristics: ASTM E 84.
- F. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

- B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
- C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply SFRM when ambient or substrate temperature is 40 deg F (4 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.8 COORDINATION

- A. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 - 2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 - 3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 - 4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
 - 5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
 - 6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of SFRM from substrates.
 - b. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED SFRM

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Exposed Cementitious SFRM:
 - a. Flame Control Coatings, LLC; Flame Control No. 50-69CX.
 - b. Cafco, Blaze-Shield II.
- B. Material Composition: Manufacturer's standard product, as follows:
 - 1. Exposed Cementitious SFRM: Factory-mixed, dry, cement aggregate formulation; or chloride-free formulation of gypsum or portland cement binders, additives, and inorganic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
 - 2. Designated for exterior exposure.
- C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWC Technical Manual 12-A, Section 5.4.5, "Displacement Method," but with an average density of not less than 28 lb/cu. ft. (352 kg/cu. m).
2. Bond Strength: 434 lbf/sq. ft. (21 kPa) minimum per ASTM E 736.
3. Compressive Strength: 51 lbf/sq. in. (351 kPa) minimum per ASTM E 761.
4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
5. Deflection: No cracking, spalling, or delamination per ASTM E 759.
6. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) per ASTM E 859.
8. Combustion Characteristics: Passes ASTM E 136.
9. Fire-Test-Response Characteristics: Provide SFRM with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 0.
10. Fungal Resistance: No observed growth on specimens per ASTM G 21.
11. For exterior applications of SFRM, provide formulation listed and labeled by testing and inspecting agency acceptable to authorities having jurisdiction for surfaces exposed to exterior.

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
 1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.
 2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

- C. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by manufacturer of intumescent mastic coating fire-resistive material. Include pins and attachment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
 - 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
 - 2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
 - 3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

- C. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.
- D. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of SFRM. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION, GENERAL

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply SFRM that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Install reinforcing mesh, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach mesh to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by SFRM manufacturer. Attach accessories where indicated or required for secure attachment of mesh to substrate.
- D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.
- E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer.

3.4 APPLICATION, EXPOSED SFRM

- A. Apply exposed SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if indicated.
- B. Provide a uniform finish complying with description indicated for each type of material and matching Architect's sample or, if none, finish approved for field-erected mockup.
- C. Apply exposed cementitious SFRM to produce the following finish:
 - 1. Spray-textured finish with no further treatment.
- D. Cure exposed SFRM according to product manufacturer's written recommendations.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspection and prepare reports:
 - 1. SFRM.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- C. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
 - 1. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
 - 2. If testing finds applications of SFRM are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

- D. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.
- E. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

3.6 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect SFRM, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- C. Coordinate application of SFRM with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect SFRM and patch any damaged or removed areas.
- D. Repair or replace work that has not successfully protected steel.

END OF SECTION 07811

SECTION 07 84 00 – FIRESTOPPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes firestopping for through-penetrations through the following fire-resistance rated assemblies, including both blank openings and openings containing penetrating items:
 - 1. Floor-ceiling assemblies.
 - 2. Roof-ceiling assemblies.
 - 3. Walls and partitions.
 - 4. Smoke barriers.
 - 5. Construction enclosing compartmentalized areas.
- B. Work Not Included: Repairing penetrations made in error and repairing penetrations which are too large to be sealed by the methods indicated; these are to be repaired using the original material of the construction.
- C. Related Sections include the following:
 - 1. Division 3 – Section 03 30 00 – Cast-In-Place Concrete
 - 2. Division 4 – Section 04 22 00 – Concrete Unit Masonry
 - 3. Division 7 – Section 07 90 00 – Joint Protection
 - 4. Division 9 – Section 09 20 00 – Plaster and Gypsum Board
 - 5. Division 15 – Section 15300 – Plumbing
 - 6. Division 15 – Section 15400 – HVAC
 - 7. Division 16 – Section 16000 – Electrical

1.3 PERFORMANCE CRITERIA

- A. FIRE TEST REQUIREMENTS
 - 1. Underwriters Laboratories, Inc. (UL):
 - a. ANSI/ UL1479, "Fire Tests of Through Penetration Firestops".
 - b. ANSI/ UL2079, "Tests for Fire Resistance of Building Joint Systems".
 - c. ANSI/ UL263, "Fire Tests of Building Construction and Materials".
 - d. ANSI/ UL723, "Surface Burning Characteristics of Building Materials".

2. American Society of Testing and Materials (ASTM):
 - a. ASTM E-814, "Fire Tests of Through Penetration Fire Stops".
 - b. ASTM E-1966, "Test Method for Fire Resistive Joint Systems".
 - c. ASTM E-119, "Fire Tests of Building Construction and Materials".
 - d. ASTM E-84, "Surface Burning Characteristics of Building Materials".

B. REFERENCES

1. Underwriters Laboratories (UL) of Northbrook, IL "Fire Resistance Directory".
 - a. Through Penetration Firestop Systems (XHEZ)
 - b. Joint Systems (XHBN)
 - c. Fill, Void or Cavity Materials (XHHW)
 - d. Firestop Devices (XHJI)
 - e. Forming Materials (XHKU)
 - f. Wall Opening Protective Materials (CLIV)
2. All major building codes:
 - a. International Building Code published by ICC.
3. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 101: Life Safety Code".
4. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 70: National Electrical Code".
5. Factory Mutual Approvals (FM) of Norwood, MA "FM 4991: Standard for Approval of Firestop Contractors".

C. PERFORMANCE REQUIREMENTS

1. Where firestopping system also serves to seal a penetration through the thermal barrier of the building the firestopping system selected shall also seal the penetration against air movement through the opening.
2. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
3. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
4. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.
5. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

6. When mechanical cable pathways are not practical, openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.
7. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words "Chase Wall Optional".
8. Provide fire-resistive joint sealants sufficiently flexible to accommodate movement such as thermal expansion and other normal building movement without damage to the seal.
9. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standards, ASTM E-1399, ASTM E-1966 or ANSI/ UL 2079.
10. Provide fire-resistive joint systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL2079 with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.

1.4 SUBMITTALS

- A. Product Data: For each type of firestopping product indicated.
- B. System Drawings: Submit documentation from a qualified third-party testing agency that is applicable to each firestopping system configuration for construction, joint opening width and/or penetrating items.
- C. Product Certificates: Certificate of conformance signed by manufacturers of firestopping products certifying that products comply with requirements.

1.5 QUALITY ASSURANCE

- A. Provide firestopping systems that comply with the following requirements and those specified in "Performance Criteria" Article:
 1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 2. Firestopping products bear classification marking of qualified testing and inspection agency.

- B. Engage an experienced installer who is certified, licensed, FM Approved in accordance with FM 4991 or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer's willingness to sell its firestopping products to Contractor or to an installer engaged by Contractor does not in itself confer qualifications on buyer.
- C. Obtain firestop systems for each type of penetration or joint opening and construction condition indicated from a single manufacturer.
- D. Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings".

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instructions for multicomponent materials.
- B. Store and handle materials for firestopping products to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

1.7 PROJECT CONDITIONS

- A. Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.
- B. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.
- C. Do not use materials that contain flammable solvents.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.
- C. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 – PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Provide firestopping products that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by firestopping products manufacturer based on testing and field experience.
- B. Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- C. Where firestopping system also serves to seal a penetration through the thermal barrier of the building the firestopping system selected shall also seal the penetration against air movement through the opening.

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with through-penetration firestop systems (XHEZ) and/or joint systems (XHBN) listed in Volume 2 of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:
 - 1. Specified Technologies, Inc. (STI), Somerville, New Jersey
800 – 992 – 1180
 - 2. Other manufacturers listed in the UL Fire Resistance Directory – Volume 2.

2.3 MATERIALS

- A. General: Use only firestopping products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type or joint opening width and movement capabilities, annular space requirements, and fire-rating involved for each separate instance.
- B. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) SpecSeal Series SSS Intumescent Sealant
 - 2. Specified Technologies, Inc. (STI) SpecSeal Series LCI Intumescent Sealant
 - 3. Specified Technologies, Inc. (STI) SpecSeal Series LC Endothermic Sealant

4. Specified Technologies, Inc. (STI) SpecSeal Series AS Elastomeric Spray
 5. Specified Technologies, Inc. (STI) SpecSeal Series ES Elastomeric Sealant
- C. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSC Firestop Collars
 2. Specified Technologies, Inc. (STI) SpecSeal Series LCC Firestop Collars
- D. Fire Rated Cable Pathways: STI EZ-PATH™ Brand device modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:
1. Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway
- E. Wall Opening Protective Materials: Intumescent, non-curing pads or inserts for protection of electrical switch and receptacle boxes to reduce horizontal separation to less than 24" , the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty Pads
 2. Specified Technologies, Inc. (STI) SpecSeal Series EP PowerShield Insert Pads
- F. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty
- G. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series RED Wrap Strip
 2. Specified Technologies, Inc. (STI) SpecSeal Series BLU Wrap Strip
- H. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag, the following products are acceptable:
1. Specified Technologies, Inc. (STI) SpecSeal Series SSB Firestop Pillows

- I. Mortar: Portland cement based dry-mix product formulated for mixing with water at Project site to form a non-shrinking, water-resistant, homogenous mortar, the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) SpecSeal Series SSM Firestop Mortar

- J. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag), the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) Pensil 300 Silicone Sealant
 - 2. Specified Technologies, Inc. (STI) Pensil 300 SL Self-Leveling Silicone Sealant

- K. Silicone Foam: Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam, the following products are acceptable:
 - 1. Specified Technologies, Inc. (STI) Pensil 200 Silicone Foam

PART 3 – EXECUTION

3.1 PREPARATION

- A. Examination of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

- B. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.

- C. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

- D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FIRESTOPPING INSTALLATION

- A. General Requirements: Install through-penetration firestop systems and fire-resistive joint systems in accordance with "Performance Criteria" Article and in accordance with the conditions of testing and classification as specified in the published design.

- B. Manufacturer's Instructions: Strictly comply with manufacturer's instructions for installation of firestopping products.
 - 1. Seal all openings or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of through-penetration firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.
4. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition might occur such as the intersection of a gypsum wallboard/steel stud wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.
5. Where joint application is exposed to the elements, fire-resistive joint sealant must be approved by manufacturer for use in exterior applications and shall comply with ASTM C-920, "Specification for Elastomeric Joint Sealants".

3.3 FIELD QUALITY CONTROL

- A. Inspections: Owner shall engage a qualified independent inspection agency to inspect through-penetration firestop systems.
- B. Keep areas of work accessible until inspection by authorities having jurisdiction.
- C. Where deficiencies are found, repair or firestopping products so they comply with requirements.

3.4 ADJUSTING AND CLEANING

- A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

3.5 PROTECTION

- A. Protect installed work during curing period.
- B. Protect installed work from damage from construction operations using substantial barriers if necessary.
- C. Repair damaged materials in accordance with manufacturer's instructions.

END OF SECTION 07 84 00

SECTION 07900 SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for the completion of caulking.
- B. Scope of Work (for sealant types refer to section 2.1.5):
 - 1. Exterior Joints
 - a. Vertical joints which are bordered on one or both sides by a I) porous building material such as concrete, natural stone (marble, granite, limestone, etc.) or masonry or ii) non-porous building material such as painted metal, anodized aluminum, mill finish aluminum, PVC or porcelain tile. Seal with Type 1 sealant.
 - b. Vertical joints which are bordered on one or both sides by an Exterior Insulation and Finish System (EIFS). Seal with Type 2 or Type 9 sealant.
 - c. Vertical joints which are bordered on one or both sides by glass. Seal with Type 4 sealant.
 - d. Horizontal expansion joints in sidewalks, terraces, decks, concrete floors, driveways and parking garages. Seal with Type 5 sealant.
 - e. All joints between mechanical/electrical penetrations and all types of siding. Seal with Type 4 sealant.
 - f. All joints in fiber cement siding and wood siding. Seal with Type 2 or 3 sealant.
 - g. All joints in PVC trim. Seal with Type 4 sealant.
 - h. Window casing to vinyl siding joints. Seal with Type 4 sealant.

2. Interior Joints

- a. Vertical expansion, control and air seal joints. Seal with Type 3 sealant.
- b. Trim, cabinets, countertops and finish joints experiencing minimal movement. Seal with Type 8 sealant.
- c. Sanitary applications for all bathroom joints and kitchen countertops. Seal with Type 6 sealant.
- d. Horizontal joints. Seal with Type 5 sealant.
- e. Gypsum wallboard Acoustical Sealant. Use Type 7 sealant.

C. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on drawings to be sealed or not.

D. Related work included elsewhere to be performed in compliance with this section:

1. Division 3 - Concrete
2. Division 4 - Masonry
3. Division 7 - Thermal & Moisture Protection
4. Division 8 - Doors & Windows
5. Division 9 - Finishes
6. Division 10 – Specialties

1.3 QUALIFICATIONS

A. Installation of sealant and caulking work shall be carried out by a recognized specialized applicator having skilled mechanics, thoroughly trained and competent in all phases of caulking work.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials to the jobsite in their original unopened containers, with all labels intact.
- B. Store materials in strict accordance with manufacturer's recommendations.

1.5 ENVIRONMENTAL CONDITIONS

- A. Apply sealants only to completely dry surfaces, and at air, substrate and material temperatures above minimum established by manufacturer's specifications.
- B. Dow Corning silicone sealants can be applied in temperatures ranging from -20F to 120F.

1.6 SUBMITTALS

- A. Product data: Manufacturer's data on each joint sealer, with instructions for substrate preparation and installation.
 - 1. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
(www.SWRIONLINE.org)
- B. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- D. Field Test Report Log: For each elastomeric sealant application.
- E. Warranties: Special warranties specified in this Section.

1.7 MOCK-UP

- A. Construct mock-ups of each sealant type to show location, size, shape, color and depth of joints complete with back-up material, primer and sealant. Mock-up may be part of finished work.
- B. Provide for scheduled Architect's site visit before proceeding with work.

1.8 GUARANTEE

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
- B. Workmanship Warranty: 3years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

- D. Available Manufacturers Warranty:
 - 1. Warranty Period for 5 years limited for Dow Corning Contractors Weatherproofing Sealant.
 - 2. Warranty Period for 20 years limited for Dow Corning 790 and 795 Silicone Building Sealant.
 - 3. 20 year Non-stain warranty for Dow Corning 790, Dow Corning 795 Silicone Building Sealant.
- E. Defective work shall include, but not be restricted to, joint leakage, cracking, crumbling, melting, running, loss of adhesion, loss of cohesion, or staining of adjoining or adjacent work or surfaces.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturer: The design is based on the manufacturer listed. Comparable products of the manufacturers listed will be considered for substitution:
 - 1. Tremco
 - 2. Dow Corning
- B. General: Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
 - 1. Provide only materials which are compatible with each other and with joint substrates.
 - 2. Colors of exposed sealers: As selected by the architect from manufacturer's standard colors.

2.2 MATERIALS

- A. Primers are to be type recommended by sealant manufacturer.
- B. Joint backing material shall be i) vertical surfaces (excluding EIFS) - Sof Rod an extruded polyolefin foam by Tremco Ltd. And ii) horizontal surfaces and EIFS surfaces - Standard Backer Rod a closed cell polyethylene foam by Tremco Ltd.
- C. Bond breaker, where joint configuration does not allow for proper depth/width ration (see Section 3.2.5) - a pressure sensitive plastic tape, which will not bond to the sealant such as 3M #226 or #481 or Valley Industries #40 shall be placed at the back of the joint.

- D. Use sealant(s) specified below:
1. Type 1: Medium modulus, moisture curing, one part silicone sealant meeting the specified requirements of the specifications below.
 - a. Use in glass to glass, glass to metal and metal to metal curtainwall joints, exterior siding joints, PVC trim joints and window casing to vinyl siding joints.
 - b. ASTM C920, Type S, Grade NS, Class 25, uses NT, G, A, O.
 - c. TT-S-001534A (COM-NBS) Interim Federal Specification for Sealing Compound: Silicone Rubber Base (for Sealant and Glazing in Buildings and Other Structures).
 - d. Joint movement capability +/- 50%
 - e. Non staining
 - f. SWRI validated at 50% movement (independent testing).
 - g. Products:
 - (1) Dow Corning 795
 - (2) Dow Corning 791
 - (3) Tremco Spectrem 2
 2. Type 2: Ultra low modulus, one component, moisture curing silicone sealant.
 - a. ASTM C-920, Type S, Grade NS, Class 25, Uses NT, M, A, O.
 - b. TT-S-00230C (COM-NBS) Interim Federal Specification for Sealing Compound: Elastomeric Type, Single-Component (for Caulking, Sealing and Glazing in Buildings and Other Structures)
 - c. Joint movement capability: plus 100%, Minus 50%.
 - d. Non Staining
 - e. SWRI validated at 100% movement (independent testing)
 - f. Products:
 - (1) Dow Corning 790
 - (2) Tremco Spectrem 1
 3. Type 3: Medium modulus, moisture curing, one part silicone sealant (5 year warranty). Use at all locations, except where another type is specified.
 - a. Use in glass to glass, glass to metal and metal to metal, exterior siding joints, Mortar, PVC trim joints and window casing to vinyl siding joints.
 - b. ASTM C920, Type S, Grade NS, Class 25, uses NT, G, A, O.
 - c. TT-S-001534A (COM-NBS) Interim Federal Specification for Sealing Compound: Silicone Rubber Base (for Sealant and Glazing in Buildings and Other Structures).
 - d. Joint movement capability +/- 40%
 - e. Non staining

- f. SWRI validated at 40% movement (independent testing).
- g. Products:
 - (1) Dow Corning (CWS) Contractors Weatherproofing Sealant
- 4. Type 4: Multi-component, polyepoxide urethane sealant. Use at all locations, except where another type is specified.
 - a. Product:
 - (1) Tremco DYmeric
- 5. Type 5: Low modulus, multi-component, oligomeric polyurethane sealant. Use on all EIFS joints, fiber cement joints, wood siding joints and at other locations as shown on the drawings.
 - a. Product:
 - (1) Tremco DYmeric 240 FC
- 6. Type 6: One part moisture curing polyurethane sealant or one part silicone. Dymonic or Dymonic FC by Tremco Ltd and Dow Corning CWS silicone sealant. Use on all fiber cement joints and wood siding joints.
 - a. Products:
 - (1) Dow Corning (CWS) Contractors Weatherproofing Sealant
 - (2) Tremco Dymonic
- 7. Type 7: Multi-component or single component self leveling or slope grade polyurethane sealant. Meeting the specified requirements of ASTM C920, Type M, Grade P, Class 25, Use T, M, A and O. THC 900 or THC 901 hybrid. Use in exterior and interior horizontal traffic joints. For areas where the slope of the deck makes self leveling material impractical THC 901 by Tremco Ltd. may be used.
 - a. Products:
 - (1) Tremco Vulkem 245
 - (2) Tremco Vulkem 45
- 8. Type 8: Mildew resistant, one component neutral cure silicone sealant. Tremsil 200 White by Tremco Ltd. Use on fixtures, bathtubs, vanity tops and kitchen countertops.
 - a. Product:
 - (1) Tremco Tremsil 200 White
- 9. Type 9: One component, non-skinning, non-hardening acoustical sealant. Use at all vapor barrier joints and openings in drywall systems as shown on the drawings or specified.
 - a. Product:
 - (1) Tremco Acoustical Sealant

10.Type 10: One component, paintable acrylic latex sealant. Use in interior non-moving joints that may be painted.

a. Product:

(1) Tremco Tremflex 834

- E. Cleaning material for surfaces to receive sealant as recommended by the manufacturer of sealant.
- F. Tooling Agents: Approved by sealant manufacturer; nonstaining to sealant and substrate.
- G. Masking Tape: Nonabsorbent, nonstaining.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify at the site that joints and surfaces have been provided and that joint conditions will not adversely affect execution, performance or quality of completed work; and that they can put into acceptable condition by means of preparation specified in this section.
- B. Ascertain that sealers and coatings applied to sealant substrates are compatible with sealant used and that full bond of the sealant and substrate is attained. Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and adhesion, if necessary.
- C. Verify that specified environmental conditions exist before commencing work.
- D. Ensure that releasing agents, coatings, or other treatments have either not been applied to joint surfaces or that they are entirely removed.
- E. Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.

3.2 PREPARATION

- A. Remove dust, paint, loose mortar and other foreign matter and dry joint surfaces.
- B. Remove dust, silt, scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

- C. Remove oil, grease and other coatings from non-ferrous metals with approved cleaning solvent.
- D. Examine joint sizes and correct as required to allow for anticipated movement and to achieve proper width/depth ratio per manufacturer's recommendations for specified sealant.
- E. Install joint backing material in all joints including but not limited to countertop/wall and cabinet/wall joints.
- F. Apply bond breaker tape to achieve correct joint depth and prevent three-sided adhesion.
- G. Where necessary to protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or caulking.
- H. Prime sides of joint using two cloth method in accordance with manufacturer's directions, immediately prior to caulking.
- I. Before any caulking or sealing is commenced, a test of the material shall be made for indications of staining, poor adhesion or other undesirable effects.

3.3 APPLICATION

- A. Do not proceed with installation until the mock up is approved.
- B. Apply sealants in accordance with manufacturer's instructions ensuring to fill voids and joints completely.
- C. Install backers at depth required to result in shape and depth of installed sealant which allows the most joint movement without failure.
 - 1. Make backers continuous, without gaps, tears, or punctures.
 - 2. Do not stretch or twist backers.
- D. Use bond breaker tape where indicated and wherever it is necessary to keep sealant from adhering to back or third side of joint.
- E. Neatly tool surface to a slight concave profile. Surface of sealant to be smooth, free from ridges, wrinkles, air pockets and embedded impurities.

3.4 CLEANING

- A. Clean adjacent surfaces immediately and leave work neat and clean. Remove excess and droppings using recommended cleaners as work progresses. Remove masking tape immediately after tooling of joints.

END OF SECTION

