

**SECTION 07 11 13
BITUMINOUS DAMPPROOFING**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies materials and workmanship for bituminous dampproofing on concrete and masonry surfaces, and on sheathing substrates of Portland cement plastering. .

1.2 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Product description.
 - 2. Application instructions.

1.3 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - D1227-95 (R2007)Emulsified Asphalt Used as a Protective Coating for Roofing

PART 2 - PRODUCTS

2.1 ASPHALT EMULSION (COLD APPLIED):

ASTM D1227, Type II (trowel grade).

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.
- B. Glass Fabric: Woven glass fabric, treated with asphalt, complying with ASTM D 1668, Type I.
- C. Joint Tape: Self-adhering butyl membrane laminated to a polyethylene film, 4" width. Include primers recommended by tape manufacturer.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

- A. Surfaces to receive dampproofing shall be clean and smooth.

- B. Remove foreign matter, loose particles of mortar or other cementitious droppings.
- C. Clean and wash soil or dirt particles from surface.
- D. Remove free water; surfaces may remain damp.

3.2 APPLICATION:

- A. Comply with Manufacturer written instructions for methods and rates of dampproofing application, cleaning and installation of any protection course.
- B. Trowel Grade: Trowel apply a coat of mastic asphalt emulsion dampproofing onto substrate at a minimum rate of 7 gal./100 sq. ft. (2.8 L/sq. m), to produce an average, dry-film thickness of 60 mils (1.5 mm) but not less than 30 mils (0.8 mm) at any point.
- C. At Gypsum Sheathing - Semimastic Grade: Emulsified asphalt semimastic, prepared with mineral-colloid emulsifying agents and containing fibers other than asbestos, complying with ASTM D 1227, Type III, Class 1.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.
- B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.
- C. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.
- D. Tape joints in substrate, including transitions between different materials, with accepted flashing and joint tape, or bond reinforcing and flashing mesh in manner recommended by prime materials manufacturer. Comply with details shown and manufacturer's recommendations.
 - 1. Tape all joints and penetrations in gypsum sheathing with a 4" wide layer of joint tape.
 - 2. Install flashing tape on all shelf angles, starting at nosing and working back toward wall, up shelf angle back leg, and onto back-up wall construction, lapping all joints and edges shingle fashion.
 - 3. Where joint tape and flashing tape will be used in conjunction with hot-applied bituminous dampproofing, install joint tape and flashing tape only after hot-applied dampproofing has cooled and only after cut-back type dampproofing has cured for a minimum of 24 hours.

Primers are not required for joint tape and flashing tape installed over dampproofing.

4. Tape all other joints of dampproofing substrate not suitable to receive flashing and joint tape with a 6" wide layer of glass fabric mesh tape set in initial coat of dampproofing. Topcoat tape extending topcoat application approximately 3" onto initial coat. Lap all tape splices shingle fashion a minimum of 3". Apply top coat of dampproofing material as specified.
- E. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.
- F. Prime substrate as recommended by prime materials manufacturer.
- G. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's recommendations except where more stringent requirements are indicated and where Project conditions require extra precautions to ensure satisfactory performance of work.
- B. Application: Apply dampproofing to the following surfaces.
 1. Gypsum sheathing surfaces in cavity walls, 100% coverage required.
 2. Exterior, below-grade surfaces of exterior concrete or masonry walls in contact with earth or other backfill and where space is enclosed on opposite side.
 3. Back side of concrete or masonry retaining walls and stone facing to prevent percolating of water through the wall or facing.
 4. Where indicated on the Drawings.
- C. Reinforcement: At changes in plane or where otherwise shown as "reinforced," install lapped course of glass fabric in first coat of dampproofing compound before it thickens.
- D. Bituminous Cant Strips: Install 2-by-2-inch (50-by-50-mm) cant strip of bituminous grout at base of vertical dampproofing where it meets horizontal surface.
- E. Apply vertical dampproofing down walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when the Project is completed.

3.3 COLD-APPLIED, ASPHALT EMULSION DAMPPROOFING

- A. Semimastic Grade: Brush or spray apply a coat of asphalt emulsion dampproofing at a rate of 5 gal./100 sq. ft. (2 L/sq. m), to produce a uniform, dry-film thickness of not less than 30 mils (0.8 mm).
- B. Trowel Grade: Trowel apply a coat of mastic asphalt emulsion dampproofing onto substrate at a minimum rate of 7 gal./100 sq. ft. (2.8 L/sq. m), to produce an average, dry-film thickness of 60 mils (1.5 mm) but not less than 30 mils (0.8 mm) at any point.

3.4 FIELD QUALITY CONTROL:

- A. The VA will engage an independent testing agency to perform field inspections, sample and test materials being used, and report whether tested Work conforms to or deviates from requirements.
 - 1. Testing agency will identify, seal, and certify samples of materials delivered to Project site, with Contractor present.
 - 2. Testing agency will perform tests for any of the product characteristics specified, using referenced test procedures and other tests cited in manufacturer's Product Data.
 - 3. Testing agency will verify thickness of dampproofing membrane.
 - 4. Testing agency will examine back side of dampproofed substrate and terminations for evidence of leaks.
- B. Correct deficiencies in or remove dampproofing that does not comply with requirements, repair substrates, reapply dampproofing, and repair sheet flashings.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

3.5 PROTECTION AND CLEANING

- A. Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

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VAMC WACO, TEXAS

**SECTION 07 17 00
BENTONITE WATERPROOFING**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies bentonite waterproofing materials used for below grade walls and below slab waterproofing.

1.2 QUALITY CONTROL:

Approval by the Project Manager/Contracting Officers Technical Representative (PM/COTR) is required of products of proposed manufacturers.

1.3 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Waterproofing.
2. Printed installation instructions.

C. Certificates:

1. 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.
2. Contractor Certificate: At time of bid, submit written certification that installer has current Approved Applicator status with waterproofing material manufacturer.

D. Samples:

1. Active Polymer Core Membranes, 150 mm (6 inches) square.
2. Base drain and prefabricated drainage composite.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to job in manufacturer's original unopened containers with brand name marked thereon.

B. Unload and store so as to prevent injury to materials.

1.5 WARRANTY

A. Waterproofing is subject to the terms of Article titled "Warranty of Construction", FAR clause 52.246-21, except that warranty period is extended to ten years.

B. Warranty eligibility for the project must be validated by Manufacturer, confirming acceptance of the installation and independent inspection

reports are in accordance with the manufacturer's quality assurance program requirements.

- C. **Waterproofing Material and Labor Warranty:** Upon installation completion and manufacturer acceptance of the work required by this section, the waterproofing materials manufacturer will provide to the project Owner, a written ten (10) year non-prorated warranty, covering both materials and labor.. Issuance of Manufacturer's Waterproofing Warranty requires the following: (1) Waterproofing System products and drainage composite products shall have been provided by a single manufacturer; (2) Installation of waterproofing products and prefabricated drainage composite by Manufacturer's Approved Applicator in full accordance with manufacturer's quality assurance program requirements; (3) Installation inspected by an approved and trained Independent Inspection Firm participating with the waterproofing manufacturer's Certified Inspection Program; (4) In Division 3 work, membrane Manufacturer's waterstop must be installed in all applicable concrete cold pour construction joints, including 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.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced by basic designation only.
- B. American Society for Testing and Materials (ASTM):
- D903 - 98(2004) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - D1970 - 09 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - D5385 - 93(2006) Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
 - D5084 - 03 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
 - D4632 - 08 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - D4833 - 07 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

1.7 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:** Waterproofing membranes and all accessory products shall be provided by a single manufacturer with a minimum of 10 years experience in the direct production and sales of waterproofing systems. Manufacturer shall be capable of providing field service representation during construction, approving an acceptable installer, and recommending appropriate installation methods.
- 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 Project Manager/Contracting Officers Technical Representative (PM/COTR), inspection firm, general contractor, waterproofing contractor, concrete contractor, excavating/backfill contractor, and mechanical and electrical contractors if work penetrates the waterproofing.
- D. **Materials:** Obtain waterproofing membrane with accessory products 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 in a timely manner to the Contractor, waterproofing installer, waterproofing material manufacturer, and Project Manager/Contracting Officers Technical Representative (PM/COTR). 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:** Waterproofing contractor shall supply project site water sample to waterproofing membrane manufacturer for analysis. Manufacturer shall conduct test free of charge. Contractor is responsible for collection and shipment 64-fluid ounces (2-liters) of actual site water. Water should be shipped in uncontaminated, sealed plastic container to Manufacturer. Also provide project name, city and state along with return address to forward test results.

1.8 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, as well as, damage from weather, excessive temperatures and prolonged sunlight. Remove damaged material from site and dispose of in accordance with applicable regulations.
- B. **Storage:** Do not double-stack pallets during shipping or 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.

1.9 PROJECT CONDITIONS

- A. Substrate Condition: Proceed with work only when substrate construction and preparation work is complete and in condition to receive waterproofing system. All plumbing, electrical, mechanical and structural items to be under or passing through the waterproofing shall be positively secured in their proper positions prior to waterproofing system installation. Substrate preparation shall be per waterproofing manufacturer’s guidelines.
- 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 in areas of standing or active water; or over ice and snow. Though exposure to precipitation and ground water seepage typically will not adversely affect ACTIVE POLYMER CORE MEMBRANE, the General Contractor shall maintain site conditions to remove standing water from precipitation or ground water seepage in a timely manner. Should ACTIVE POLYMER CORE MEMBRANE be subjected to pre-hydration as a result of prolonged immersion, inspection of the material and written acceptance from MANUFACTURER is required prior to concrete or backfill placement.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. ACTIVE POLYMER CORE MEMBRANE - APC WATERPROOFING MEMBRANES
 - 1. ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE MEMBRANE: 100-mil (2.3 mm) thick composite membrane consisting of an active-polymer core (APC) integrally bonded to a geomembrane liner using a proprietary mechanical process. ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE applications include backfilled walls, property line retention walls, and earth covered structures. Roll size: 4' x 25' (1.2 x 7.62 m)
 - 2. ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB MEMBRANE: 200-mil (4.7 mm) thick composite membrane consisting of an active-polymer core (APC) encapsulated by a geomembrane liner and a geotextile using a proprietary mechanical process. ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB application - under structural slabs. Roll size: 4' x 25' (1.2 x 7.62 m)

ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE performance properties:

PROPERTY	TEST METHOD	TYPICAL VALUE
Hydrostatic Pressure Resistance	ASTM D 5385 mod.	231 ft. (70 m)
Permeability	ASTM D 5084	<1 x 10 ⁻¹¹ cm/sec.
Grab Tensile Strength	ASTM D 4632	150 lbs.
Puncture Resistance	ASTM D 4833	70 lbs.

Low Temperature Flexibility	ASTM D 1970	Unaffected at -25°F (-32°C)
Elongation	ASTM D 4632	50%
Peel Adhesion to Concrete	ASTM D 903 mod.	10 lbs. /in.

ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB performance properties:

PROPERTY	TEST METHOD	TYPICAL VALUE
Hydrostatic Pressure Resistance	ASTM D 5385 mod.	231 ft. (70 m)
Permeability	ASTM D 5084	<1 x 10 ⁻¹¹ cm/sec.
Grab Tensile Strength	ASTM D 4632	300 lbs.
Puncture Resistance	ASTM D 4833	130 lbs.
Low Temperature Flexibility	ASTM D 1970	Unaffected at -25°F (-32°C)
Elongation	ASTM D 4632	75%
Peel Adhesion to Concrete	ASTM D 903 mod.	10 lbs. /in.

- B. Accessory Waterproofing Products: All accessory waterproofing materials shall be provided by the waterproofing manufacturer or shall have manufacturer's written approval for substitution.
1. Trowel grade detailing mastic
 2. Bentonite Tubes: 2" (50 mm) diameter x 2' (60 cm) long, water soluble tube container filled with active granular material
 3. Granular bentonite 50 lbs. (22.7 kg) bag of active granular material.
 4. SeamTape®: 2" (50 mm) wide butyl rubber sealant tape.
 5. Termination Bar: Min. 1/8" thick by 1" (25 mm) wide stainless steel or aluminum termination bar with pre-punched holes punched 6" (150 mm) on center for fastening.
 6. Cementitious Wall Board: ½" thick cementitious board for protection of waterproofing during the removal of metal soldier pile cap and top lagging boards.
 7. Cortex - A low permeable geotextile waterproofing material that utilizes Active Polymer Core (APC) technology.

8. A single-component polyether general sealant and adhesive as required by Manufacturer

9. TB-Boots - pre-formed, single piece thermoplastic cover for tie-back heads and soil nails. Three sizes available: TB-6SN, TB-8, and TB-10.

10. A self-adhering thermoplastic flashing membrane used for grade and thru-wall detailing. as required by Manufacturer

C. Base and Sheet Drainage Composite:

Drainage composite by manufacturer shall be used where specified to promote positive drainage. Use base drain accessory connectors and outlets as required.

1. Drainage Composite - 4-ft by 52-ft roll of a three-dimensional polypropylene drainage core with a nonwoven geotextile adhered to one side to allow water passage while restricting soil particles. Composite includes a thin polyethylene sheet on the back of the drainage core.

- a. Compressive Strength, 15,000psf (718 kPa);
- b. Water Flow Rate, 20gpm/ft (251 l/m/m);
- c. Thickness, 7/16" (11 mm)

2. Base Drain - 1" (25 mm) thick x 12" (300 mm) high base drain composite designed to collect water from sheet composite drainage and then discharge the water to proper sump system or gravity to daylight.

- a. Compressive Strength, 10,000psf (457 kPa);
- b. Water Flow rate, 97gpm/ft (1,197 l/m/m);
- c. Thickness, 1" (25 mm)

PART 3 - EXECUTION

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, WORKING MUD SLAB: Working concrete mud slabs should have a float finish to provide a planar surface; without sharp angular depressions, voids or raised features.
- C. COMPACTED SOIL OR GRAVEL SUB-GRADE: Sub-grade shall be compacted to a minimum Modified Proctor compaction of 85% or greater as Specified by civil/geotechnical engineer. The finished sub-grade surface shall be well-leveled, uniform, free of debris and standing water or ice. Aggregate sub-grades shall consist of ¾" (19 mm) stone or smaller and rolled flat, free from any protruding sharp edges. 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. Specific sub-grade preparation shall be approved by the project's civil or geotechnical engineer.

- D. MECHANICAL OR OTHER PENETRATIONS: Mechanical, structural, or architectural materials that will pass through the plane of the waterproofing membrane shall be properly installed and secured in their final position prior to installation of the waterproofing system.
- E. CONCRETE: Concrete to be waterproofed shall be properly placed and consolidated. 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. When hydrostatic conditions exist, install ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB under all footings, elevator pits and grade beams. 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. ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS can be installed on green structural concrete as soon as the forms are removed provided the contractor gains written approval from project structural engineer listing any site Specific concrete curing time requirement. Do not apply ACTIVE POLYMER CORE MEMBRANE waterproofing directly over lightweight insulating concrete, wood, or steel decking.
1. 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.
 2. Protect adjacent work areas and finished surfaces from damage or contamination from waterproofing products during installation operations.
 3. Form fins, ridges, ponding ridges and other protrusions should be level and smooth with concrete surface.
 4. Honeycombing, aggregate pockets, tie-rod holes and other voids shall be completely filled with non-shrink cementitious grout and level with monolithic concrete surface.
 5. Horizontal deck or roof concrete surfaces should be sloped for positive drainage to the deck drains or the perimeter edges. Deck drain positions should be designed with an appropriate sump depression surrounding the drain.
 6. Precast concrete deck units shall be installed and secured to structural supports in accordance with the concrete panel manufacturer's requirements and industry practice. All joints between precast units shall be completely grouted and flush with deck. Any differential in elevation between precast units shall be feathered for a smooth transition.
 7. All expansion joints should receive applicable expansion joint sealant product manufactured by others prior to the installation of the Waterproofing System. Expansion joint material is the primary seal at the expansion joint and the expansion joint material manufacturer is responsible for water tightness of the joint.

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. Property Line Walls, install ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS membrane with the APC core side in the direction to receive concrete pour; white liner side outward against retaining wall. Overlap ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS membrane edges minimum 4" (100mm). Underslab, install ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB with the white liner side facing down. Overlap ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB membrane edges minimum 4" (100 mm). Backfilled walls, install ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS with the white liner side outward, away from the concrete, facing the installer. For backfilled walls overlap ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS membrane edges a minimum 2" (50mm) and tape overlaps with MANUFACTURER Seamtape.
- B. Expansion Joints: ACTIVE POLYMER CORE MEMBRANE waterproofing is not an expansion joint filler or sealant, but may be used as an expansion joint cover over a properly installed expansion joint material placed during substrate preparation. To use ACTIVE POLYMER CORE MEMBRANE as an expansion joint cover, trowel 1/8" (3 mm) thick, 6" (150 mm) wide layer of Bentonite mastic centered over expansion joint. Install a 24" (60 cm) wide strip of ACTIVE POLYMER CORE MEMBRANE centered over the expansion joint. Then install the main course of ACTIVE POLYMER CORE MEMBRANE.

3.4 SLAB / BACKFILLED WALL FOOTING EDGE TRANSITION COURSE - ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE

- A. Inside the slab/footing form edge, secure ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS sheet horizontally oriented (poly side down; tan geotextile facing installer) to the top inside edge of the exterior slab/footing form with the sheet conforming to the interior form surfaces and then extending out onto the horizontal slab substrate a minimum 12" (300 mm). Overlap edges of adjacent ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS sheets a minimum 4" (100 mm) and secure to prevent sheet movement during construction or concrete placement.

3.5 UNDER SLAB INSTALLATION - ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB

- A. Install ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB under all footings, elevator pits and grade beams when hydrostatic conditions exists or are anticipated per the historical high ground water elevation reported in the project's geotechnical documents.
- B. Install ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB membrane (poly side down; tan geotextile side up) extending to interior edge of footing/slab edge, fully overlapping the 12" (300 mm) horizontal tail of the ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS slab edge sheet installed in Section 3.04B. Overlap edges of adjacent ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB sheets a minimum 4" (100 mm) and secure to prevent sheet movement during construction or concrete placement.
- C. Place ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB directly on properly prepared substrate (poly side down; tan 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 ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB 12" (300 mm) on center to prevent movement from construction operations or concrete placement. When the slab is poured in sections, extend ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB a minimum 12" (300 mm) beyond the slab edge to enable proper overlapping.

- C. Install waterproofing system at all grade beams, pile caps, and other detail areas in accordance with manufacturer's detail for Specific project condition(s).
- D. Slab Penetrations: For all pipe, rebar, structural or other penetrations install waterproofing system in accordance with manufacturer's standard detail for Specific project condition(s).
- E. Inspect finished ACTIVE POLYMER CORE MEMBRANE FOR UNDER SLAB installation and repair any damaged material prior to concrete slab placement.

3.6 BACKFILLED CAST-IN-PLACE CONCRETE WALLS - ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE

- A. Place Bentonite tubes along the wall/footing intersection with ends "budded" tightly together to form a continuous installation.
- B. Trowel 3/4" (18 mm) thick, continuous Bentonite mastic fillet at all inside wall corner transitions. Trowel Bentonite mastic form-tie pockets/patches and any slightly irregular concrete surface honeycomb areas.
- C. Starting at the base of the wall, install ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS sheet horizontally (APC side against the wall; white poly side facing installer) covering the Bentonite tubes 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 ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS using washer-headed mechanical fasteners maximum 24" (600 mm) on center and tape overlap with MANUFACTURER Seamtape. Overlap all adjacent sheet edges a minimum 2" (50 mm). Stagger all vertical overlap seams a minimum of 12" (300 mm). Tape all membrane overlap seams with MANUFACTURER Seamtape.
- D. After the bottom horizontal course, ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS sheets can be installed either vertically or horizontally oriented. Continue ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS installation up wall to finished grade elevation detail, staggering all sheet roll ends of adjacent courses a minimum 12" (300 mm). Do not allow horizontal ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS overlap joints to run at same elevation as the concrete pour lift joints. Overlap all adjacent ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS sheet edges a minimum 2" (50 mm) and secure with washer-head fastener maximum 24" (600 mm) on center. Tape all membrane overlap seams with MANUFACTURER Seamtape.
- E. Penetrations: For all pipe, rebar, structural and other penetrations install waterproofing system in accordance with manufacturer's detail for Specific project condition(s).
- F. Terminate ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS membrane 12" (300 mm) below finished grade elevation secured with washer-head fasteners maximum 12" (300 mm) on center to exterior surface of concrete wall. Per manufacturer's detail for Specific

project condition(s), install GS-40SA grade flashing to primed concrete substrate with bottom edge overlapping top edge of ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS membrane minimum 4" (100 mm). Overlap all roll ends a minimum 4" (100 mm) to form a continuous flashing. Height of flashing shall be per project details and Specifications. Install a rigid termination bar along the top edge of GF-40SA; fastened maximum 12" (300 mm) on center. Complete grade termination detail with tooled bead of CETSEAL along the top edge, at all penetrations through the flashing, and all exposed overlap seams.

- G. Inspect finished ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS installation and repair any damaged material prior to backfill placement. Assure that ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS is not displaced during backfill placement or soil compaction.

3.7 PREFABRICATED DRAINAGE COMPOSITE INSTALLATION (Non-Hydrostatic Walls)

- A. At the base of the wall, place base drain (base drain) base-drain horizontally oriented with the open core side up and the 2" (50 mm) flap of fabric side tight against the wall over the previously installed ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS waterproofing using wash-head mechanical fasteners or general construction adhesive. The 2" fabric flap along the top edge of base drain should be tightly secured against the wall. Use base drain accessory fittings, as required, to form a continuous installation. Install base drain discharge outlet fittings to connect to discharge pipes as required for the project.
- B. Install the bottom course of drainage composite sheet drainage (plastic core side against the wall) with the drainage composite bottom core edge in contact with open top core edge of base drain. Secure sheet drain to wall with washer-head fasteners. Secure extra fabric flap of drainage composite extending down the top front edge of base drain to prevent the passage of soil into the core at the connection.
- C. Install subsequent courses of drainage composite sheet drainage to within 12" (300 mm) of finished grade or as shown on the project drawings. Tightly abut adjoining sheet drain core edges together and secure the extra fabric flaps over the front of adjacent roll edges to prevent soil from entering the sheet drain. Secure sheet drain to wall with washer-head fasteners. Where drainage sheet panels are installed overlapped, bottom edge of higher course shall be installed to the outside of the lower course to shed water like a roof shingle.
- D. Around penetrations and tie-back heads, cut sheet drainage composite to fit and wrap extra filter fabric around open core edge to prevent soil from entering core.
- F. At the top of the sheet drain installation, wrap the filter fabric flap behind the exposed top core edge to prevent intrusion of soil into the core and secure sheet drain to wall with termination bar fastened 12" (300 mm) on center.

3.8 INSULATION

- A. Always apply ACTIVE POLYMER CORE MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS waterproofing directly to properly prepared structural concrete substrates. Insulation, if used, should be installed to the exterior of the waterproofing. Do not apply ACTIVE POLYMER CORE

MEMBRANE FOR BACKFILLED/BLINDSIDE OR TUNNELS waterproofing over lightweight insulating concrete.

3.9 BACKFILL EXCAVATED CAST-IN-PLACE CONCRETE WALLS

- A. Backfill shall be placed and compacted to minimum 85% Modified Proctor density promptly after waterproofing has been installed. Closely coordinate with contractor responsible for Backfill work by informing them each time a waterproofed area is ready for backfill. Backfill shall consist of compactable soil or angular aggregate (3/4" or less) free of debris, sharp objects, and stones larger than 3/4" (18 mm). Care should be used during backfill operation to avoid damage to the waterproofing system. If damage occurs, cease backfilling and report damage. Damaged waterproofing must be repaired per manufacturer's guidelines.

3.10 CLEAN UP

- A. 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. Remove all tools, equipment and remaining product on-site. Dispose of section work debris and damaged product following all applicable regulations.

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VAMC WACO, TEXAS

**SECTION 07 21 13
THERMAL INSULATION**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies thermal and acoustical insulation for buildings.
- B. Acoustical insulation is identified by thickness and words "Acoustical Insulation".

1.2 RELATED WORK

- A. Safing insulation: Section 07 84 00, FIRESTOPPING.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES .
- B. Manufacturer's Literature and Data:
 - 1. Insulation, each type used
 - 2. Tape
- C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.4 STORAGE AND HANDLING:

- A. Store insulation materials in weathertight enclosure.
- B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

1.5 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C553-08.....Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - C665-06.....Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
 - C954-10.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness

- C1002-07.....Steel Self-Piercing Tapping Screws for the
Application of Gypsum Panel Products or Metal
Plaster Bases to Wood Studs or Steel Studs
- E84-10.....Surface Burning Characteristics of Building
Materials
- F1667-05.....Stainless Steel for Fasteners, Nails, Spikes,
and Staples.

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL:

- A. Where thermal resistance ("R" value) is specified or shown for insulation, the thickness shown on the drawings is nominal. Use only insulation with actual thickness that is not less than that required to provide the thermal resistance specified.
- B. Where "R" value is not specified for insulation, use the thickness shown on the drawings.
- C. Where more than one type of insulation is specified, the type of insulation for each use is optional, except use only one type of insulation in any particular area.

2.2 EXTERIOR FRAMING OR FURRING INSULATION:

- A. Batt or Blanket: Optional.
- B. Mineral Fiber: ASTM C665, Type II, Class C, Category I where framing is faced with gypsum board.

2.3 ACOUSTICAL INSULATION:

- A. Mineral Fiber Batt or Blankets: ASTM C665, Type I. Maximum flame spread of 25 and smoke development of 450 when tested in accordance with ASTM E84.
- B. Thickness as shown; of widths and lengths to fit tight against framing, and of the thickness, density, and type tested by the drywall manufacturer for the required ratings.
 1. Substitute products of other manufacturers, in order to be considered, will require current certified acoustical tests utilizing current production materials as specified, showing sound transmission loss dB (N.R.C.) at each octave band frequency from 125 cps through 4,000 cps.

2.4 FASTENERS:

- A. Staples or Nails: ASTM F1667, zinc-coated, size and type best suited for purpose.
- B. Screws: ASTM C954 or C1002, size and length best suited for purpose with washer not less than 50 mm (two inches) in diameter.

2.5 TAPE:

- A. Pressure sensitive adhesive on one face.
- B. Perm rating of not more than 0.50.

PART 3 - EXECUTION**3.1 INSTALLATION - GENERAL**

- A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.
- B. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.
- C. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

3.2 EXTERIOR FRAMING OR FURRING BLANKET INSULATION:

- A. Pack insulation around door frames and windows and in building expansion joints, door soffits and other voids. Pack behind outlets around pipes, ducts, and services encased in walls. Open voids are not permitted. Hold insulation in place with pressure sensitive tape.
- B. Lap vapor retarder flanges together over face of framing for continuous surface. Seal all penetrations through the insulation.
- C. Fasten blanket insulation between metal studs or framing and exterior wall furring by continuous pressure sensitive tape along flanged edges.
- D. Ceiling Insulation and Soffit Insulation:
 - 1. At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing. Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.
 - 2. In areas where suspended ceilings adjoin areas without suspended ceilings, install either blanket, batt, or mineral fiberboard extending from the suspended ceiling to underside of deck or slab above. Secure in place to prevent collapse or separation of hung blanket, batt, or board insulation and maintain in vertical position. Secure blanket or batt with continuous cleats to structure above.

3.3 ACOUSTICAL INSULATION:

- A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.
- B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind

outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.

- C. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- D. Where acoustical insulation is installed above suspended ceilings install blanket at right angles to the main runners or framing. Extend insulation over wall insulation systems not extending to structure above.

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**SECTION 07 22 00
ROOF AND DECK INSULATION**

PART 1 - GENERAL

1.1 DESCRIPTION

A. Roof and deck insulation, on new construction where indicated.

1.2 RELATED WORK

A. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.

B. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):

90.1-07.....Energy Standard for Buildings Except Low-Rise Residential Buildings

C. ASTM International (ASTM):

F1667-05.....Driven Fasteners: Nails, Spikes, and Staples

D. National Roofing Contractors Association: Roofing and Waterproofing Manual

1.4 PERFORMANCE REQUIREMENTS

A. Thermal Performance: Provide roof insulation meeting minimum overall average R-value of 20, with minimum R-value at any location of 20.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:

1. Asphalt and adhesive materials, each type.

2. Roofing cement, each type.

3. Roof insulation, each type.

4. Fastening requirements.

C. Shop Drawings: Include plans, sections, details, and attachments.

1. Nailers, cants, and terminations.

2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

D. Samples:

1. Roof insulation, each type.
2. Nails and fasteners, each type.

E. Certificates:

1. Indicating type, thermal conductance, and minimum and average thickness of insulation.

F. Laboratory Test Reports: Thermal values of insulation products.

1.6 DELIVERY, STORAGE AND MARKING

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation requirements.

PART 2 - PRODUCTS

2.1 ADHESIVE MATERIALS

- A. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

2.2 ROOF AND DECK INSULATION

- A. Roof and Deck Insulation, General: Preformed roof insulation boards and listed as component of FM Approvals-approved roofing system.
- B. Owens-Corning Formular 600 high density extruded polystyrene, minimum 2" thickness each layer to equal 4" thickness, or equal.

2.3 INSULATION ACCESSORIES

- A. Cants and Tapered Edge Strips:
1. Wood Cant Strips: Refer to Division 06 Section "Rough Carpentry."
- B. Nails: ASTM F1667. Type as designated for item anchored and for substrate.

PART 3 - EXECUTION

3.1 RIGID INSULATION INSTALLATION

- A. Insulation Installation, General:
1. Install roof insulation in accordance with insulation manufacturer's written instructions.
- B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
 3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, fascias and similar items at no additional cost to the Government.
 5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).
- C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.
- D. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement. Unless otherwise recommended by insulation manufacturer.
- E. Cut to fit tight against blocking or penetrations.
- F. Installation Method:
1. Adhered Insulation:
 - a. Prime substrate as required.
 - b. Set each layer of insulation firmly in solid mopping of hot asphalt.
 - c. Set each layer of insulation firmly in ribbons of bead-applied insulation adhesive.
 - d. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.

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**SECTION 07 32 13
CLAY ROOF TILES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the installation of roofing tiles.
- B. Related work
 - 1. Metal Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
 - 2. Sealants: Section 07 92 00, JOINT SEALANTS.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: Tiles to show color range.
- C. Shop Drawings: Details of fabricated custom shapes.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver tiles and setting materials in manufacturer's original, unopened containers clearly identifying manufacturer and the contents.
- B. Do not store tiles in flat position.

1.4 WARRANTY

- A. Warrant materials and workmanship to be free from defects and leaks and subject to the terms of the "Warranty of Construction", FAR clause 52.246-21, except that warranty period is two years.
- B. Leakage shall be defined as water in liquid form which enters the roof system or building interior from external sources through roof components installed by the Contractor.
- C. Perform repairs within seven (7) days of notification at no expense to the Owner.
- D. Repair visible defects, whether leak related or not including slippage of materials, separated flashing joints, or other defects resulting from defective workmanship.
- E. Provide manufacturer's material warranty for membrane underlayment.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A580-08.....Stainless Steel Wire
 - B99-06.....Copper - Silicon Alloy Wire for General Applications
 - C270-10.....Mortar for Unit Masonry

- C920-10.....Elastomeric Joint Sealants
 C1167-03.....Clay Roof Tiles
 D226-09.....Asphalt-Saturated Organic Felt Used in Roofing
 and Waterproofing
 D1970-09.....Self-Adhering Polymer Modified Bituminous Sheet
 Materials Used as Steep Roof Underlayment for
 Ice Dam Protection
 D4586-07.....Asphalt Roof Cement, Asbestos Free
 F1667-05.....Driven Fasteners: Nails, Spikes, and Staples
 C. National Roofing Contractor's Association (NRCA): The NRCA Roofing and
 Waterproofing Manual.

PART 2 - PRODUCTS

2.1 CLAY ROOF TILES

- A. Spanish Roofing Tile, matching existing tile in design, color blend and texture, manufactured by Ludowici-Celadon or approved substitute.
 B. Special shapes: Eave closures, under eave piece, gable rake, and hands, valley, ridge covers, top fixtures, and other shapes required.
 C. Contractor shall include in Base Bid tiles that are damaged during shipping, storage, handling, installation or due to roof traffic until Project completion.

2.2 ROOF CEMENT

- A. ASTM D4586, Type II.
 B. Modified bituminous types are acceptable.

2.3 NAILS BRADS, STAPLES AND SPIKES

- A. ASTM F1667.
 B. Nails: Type I, Style 23, Hard copper roofing nails length for 19 mm (3/4 inch) penetration into deck.
 C. Staples: Type IV, Style 3, Flat top crown staple, zinc coated.

2.4 FELT UNDERLAYMENT

- A. ASTM D226, Type II, nominal 13.6 kg (30 pounds.)
 B. Without perforations.

2.5 MORTAR

- A. ASTM C270.
 B. Type N or 0.

2.6 SEALANT

- A. ASTM C920, Type S or M, Grade NS Class 25.
 B. Use Polyurethane, Shore hardness 15-25.

2.7 WIRE

- A. Stainless steel: ASTM A580, Type 302 or 304, minimum 0.74 mm (0.029 inch) diameter.
 B. Copper: ASTM B99, minimum 1.27 mm (0.05 inch) diameter.

2.8. SELF-ADHERING SHEET UNDERLAYMENT

- A. Modified bituminous waterproofing sheet, self-adhering, high temperature resistant, Vycor Ultra by W.R. Grace, or approved substitute. Provide complete with all required primers.

2.9 ROOF TILE TREATED WOOD BATTENS AND BLOCKING

- A. Southern Pine No. 2 (SPIB), preservative treated accordance with AWWPA Standard Specification P-5 with a dry salt retention of 0.25-lb./cu. ft. and kiln dry members after treatment to 15% MC. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review. Provide 1" (5/4) x 2" (or proper height) treated wood battens and blocking to carry cover, hip and ridge tile.

2.10 CONTINUOUS RIDGE VENT

- A. Cloaked extruded plastic continuous ridge vent fabricated to provide a minimum of 6 square inches of net free area per foot of length and fabricated with flashing flanges arranged to trap and weep blowing water to the plane of the roof underlayment and receive cemented-on cover tiles for nearly invisible installation.

PART 3 - EXECUTION**3.1 JOB CONDITIONS**

- A. Do not set tiles in mortar when the ambient temperature is less than 4 °C (40 °F).
- B. Do not start installation until other trades requiring traffic on roof have completed their work.
- C. Do not start installation until vent pipes and other projections through roofs and flashing materials are in place.
- D. Protect existing roofs from damage.

3.2 WOOD SUPPORT BATTENS

Install treated wood support battens by toe-nailing through opposite sides of batten base into roof deck in accordance with roof tile manufacturer's printed installation instructions. Place and space battens accurately at pan-cover tile module and perpendicular to eaves. Install and secure supplemental wood at ridge locations.

3.3. Self-Adhering Sheet Underlayment:

- A. Install wrinkle free, complying with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm), staggered 24 inches (600 mm) between succeeding courses. Roll laps with roller. Cover underlayment within seven days.
1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
 2. Extend self-adhering sheet underlayment over entire roof deck.

- c. Valleys: Extend from lowest to highest point 18 inches (450 mm) on each side.
- d. Hips: Extend 18 inches (450 mm) on each side.
- e. Ridges: Extend 36 inches (914 mm) on each side.
- f. Sidewalls: Extend 18 inches (450 mm) beyond sidewalls and return vertically against sidewalls not less than 4 inches (100 mm).
- g. Roof-Penetrating Elements: Extend 18 inches (450 mm) beyond penetrating elements and return vertically against penetrating elements not less than 4 inches (100 mm).
- h. Roof Slope Transitions: Extend 18 inches (450 mm) on each roof slope.

3.4 LAYING FELT UNDERLAYMENT

- A. Lay single thickness of felt parallel to eaves with double thickness at hips, valleys, and ridges, under tile roofing.
- B. Lap horizontal joints 75 mm (3 inches) and vertical joints 150 mm (6 inches) with vertical joints staggered. Lap in direction of flow.
- C. Extend felt up 150 mm (6 inches) at abutting vertical walls, chimneys and parapets.
- D. Lap felt not less than 100 mm (4 inches) under edges at built-in gutters, valleys, flashing, and metal flashings.
- E. Staple felt 125 mm (5 inches) on centers along laps and edges.

3.5 CONTINUOUS RIDGE VENTS

- A. Install continuous ridge vents in longest lengths possible (up to 48"), setting base flanges flush with plane of underlayment. Strip ridge vent flanges onto main roof underlayment with a 6" width of rubberized asphalt underlayment, lapping stripping end joints 4" minimum. Turn up flashings minimum of 4-inches at abutting construction. Cover cloaked ridge vents with tile in accordance with roof tile manufacturer's printed instructions to provide a continuous ridge vent installations that is nearly invisible in the completed construction.

3.6 LAYING TILE

- A. Tile Installation: Beginning at the eaves, install clay tile roofing in accordance with manufacturer's written instructions and with details and recommendations of NRCA's "The NRCA Roofing and Waterproofing Manual." Provide minimum 3" lap between succeeding courses of tile. Drive nails to clear the tile so that tile hangs from nail and is not drawn up tight.
 - 1. Color Blend: Install tile with color blend to match existing clay tile roof areas. Install matching, specially shaped units at ridges, rakes and hips.
- B. Lay courses parallel with eaves.
- C. Do not stretch courses.

- D. Space course to finish even and parallel at top of level terminations.
- E. Fit tiles closely at ridges, around vent pipes, flashing and other like projections through roof.
- F. Secure tile by at least two nails, where practicable.
- G. Use copper or stainless steel wire fastening where nails are not used through tile.
- H. Cover nails and wire fastenings in finished work.
- I. Lay tile with an end lap of at least 75 mm (3 inches).
- J. Recess eave closure of pan and cover tile at least 38 mm (1-1/2 inches) from lower end of tile.
- K. Fill laps of ends bands, of cover tile on ridges, and of gable rakes to end bands and field tiles with roof cement.
 - 1. Limit amount of roof cement used for leveling tile to 6 mm (1/4 inch) thickness.
 - 2. Use mortar for leveling and bedding tile where thickness exceeds 6 mm (1/4 inch).
- K. Use sealant for pointing around eave closures ridge cover joints, and top fixtures.
 - 1. Apply sealant cap bead over exposed fasteners sealing opening.
 - 2. Apply as specified in Section 07 92 00, JOINT SEALANTS.
- L. Coordinate with Section 07 60 00, FLASHING AND SHEET METAL for installation of flashing with tile work. Keep flashing concealed except where exposed on vertical surfaces or Counterflashing (cap).
- M. Contractor shall be responsible for all roofing tiles, new and existing, that are broken by Contractor activities.

3.7 CLEANING AND REPAIR

- A. Upon completion remove any cement splatter from tile and adjacent surfaces.
- B. Replace broken, cracked, or stained tile with discolored surface.

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VAMC WACO, TEXAS

**SECTION 07 60 00
FLASHING AND SHEET METAL**

PART 1 - GENERAL

1.1 DESCRIPTION

Formed sheet metal work for flashing is specified in this section.

1.2 RELATED WORK

- A. Sealant compound and installation: Section 07 92 00, JOINT SEALANTS.
- B. Flashing of Roof Drains: Section 22 11 00, FACILITY WATER DISTRIBUTION, Section 22 13 00, FACILITY SANITARY SEWERAGE, Section 22 14 00, FACILITY STORM DRAINAGE.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - Flashings
 - Gutter
- C. Manufacturer's Literature and Data:
 - Thru wall flashing
 - Nonreinforced, elastomeric sheeting
 - Bituminous coated copper

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below for a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A167-99(R 2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - A653/A653M-09a.....Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process
 - B32-08.....Solder Metal
 - B370-09.....Copper Sheet and Strip for Building Construction

 - B749-03(2009) Lead and Lead Alloy Strip, Sheet, and Plate Products

- C920-10.....Elastomeric Joint Sealants.
- D173-03.....Bitumen-Saturated Cotton Fabric Used in Roofing
& Waterproofing
- D412-06.....Vulcanizing Rubber and Thermoplastic Elastomers
Tension
- D1187-97 (R2002).....Asphalt Base Emulsions for Use as Protective
Coatings for Metal
- D4586-07.....Asphalt Roof Cement, Asbestos Free
- C. Sheet Metal and Air Conditioning Contractors National Association
(SMACNA): Architectural Sheet Metal Manual (2003 Edition).
- D. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-505-88.....Metal Finishes Manual
- E. Federal Specification (Fed. Spec):
A-A-1925A.....Shield, Expansion; (Nail Anchors)
UU-B-790A.....Building Paper, Vegetable Fiber
- F. International Building Code (IBC):
Latest Edition

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Solder: ASTM B32; flux type and alloy composition as required for use
with metals to be soldered.
- B. Stainless Steel: ASTM A167, Type 302B, dead soft temper.
- C. Copper ASTM B370, cold-rolled temper, 16 ounce for flashings, 20 ounce
for clips and cleats. Copper at all roof areas.
- D. Bituminous Coated Copper: Minimum copper ASTM B370, weight not less
than 1 kg/m² (3 oz/sf). Bituminous coating shall weigh not less than 2
kg/m² (6 oz/sf); or, copper sheets may be bonded between two layers of
coarsely woven bitumen-saturated cotton fabric ASTM D173. Exposed
fabric surface shall be crimped.
- E. Sheet Lead: ASTM B749, minimum 4 lbs/sq.ft. (0.0625 inches thick).
- E. Galvanized Sheet: ASTM, A653.
- F. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to
thermoplastic state and extruded into continuous homogenous sheet
(0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi)
tensile strength and not more than seven percent tension-set at 50
percent elongation when tested in accordance with ASTM D412. Sheeting
shall show no cracking or flaking when bent through 180 degrees over a

1 mm (1/32 inch) diameter mandrel and then bent at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).

1. Locations: Perimeter of windows and exterior doors and elsewhere as indicated.

G. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m² (6 lbs/100 sf).

H. Bituminous Paint: ASTM D1187, Type I.

I. Fasteners:

1. Use copper, copper alloy, bronze, brass, or stainless steel slater's nails with minimum 3/8 inch head for copper, and copper clad stainless steel, and stainless steel for stainless steel. Use galvanized steel or stainless steel for galvanized steel.

2. Nails:

a. Minimum diameter for copper nails: 3 mm (0.109 inch).

b. Minimum diameter for aluminum nails: 3 mm (0.0105 inch).

c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.

c. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.

3. Rivets: Not less than 3 mm (1/8 inch) diameter.

4. Expansion Shields: Fed Spec A-A-1925A.

J. Sealant:

1. Sealant: ASTM C 920, Type S, Grade NS, Class 25, single component, chemical curing, non-staining, non-bleeding, non-sagging, Sonolastic NP-1, by Sonneborne Building Products, or approved equal, in color(s) chosen by Owner.

2. Tape: Butyl tape, 100 percent solids, in width and thickness to match application.

3. High Temperature Sealant: Type II, Class A, ASTM C 920, Type S, Grade NS, Class 25, use NT, M, and A; Sonneborne Omniseal Silicone, or approved equal.

4. Roof Penetration Flashing Sealer: ASTM C 920, Type S, Grade P, class 25, use TM; Sonneborne SL-1, one-part self-leveling polyurethane sealant, or approved equal.

K. Roof Cement: ASTM D4586.

L. Downspout Boots: Cast iron or cast aluminum, Style B-25 by Barry Pattern and Foundry or approved substitute, finished in color selected by Owner, meeting the requirements below:

1. Cast Iron: Cast iron conforming to ASTM A 48-70 or AASHO M-105-621 specifications or:
2. Cast Aluminum: From high grade 319 alloy aluminum.
3. Boot shall be minimum six (6) feet tall overall dimension.
4. Boots shall be sized to fit existing and new underground storm drain connections.
5. Boots shall include lower offsets to move downspout connection away from existing wall.
6. Boot lower connections shall snugly fit existing or new underground storm drain connections.

2.2 SHEET METAL THICKNESS

A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:

B. Concealed Locations (Built into Construction):

1. Copper: 16 oz. minimum.
2. Stainless steel: 0.25 mm (0.010 inch) thick.
3. Galvanized steel: 0.5 mm (0.021 inch) thick.

C. Exposed Locations:

1. Copper: 20 oz., except 24 oz. for gutters and downspouts.
2. Stainless steel: 0.4 mm (0.015 inch).

D. Thickness of galvanized steel is specified with each item.

2.3 FABRICATION, GENERAL

A. Jointing:

1. In general, copper, and stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
3. Joints shall conform to following requirements:
 - a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
 - b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
 - c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.

4. Flat and lap joints shall be made in direction of flow.
 5. Edges of bituminous coated copper, shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
 6. Soldering:
 - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of uncoated copper, stainless steel, and copper clad stainless steel.
 - b. Wire brush to produce a bright surface before soldering lead coated copper.
 - c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
 - d. Completely remove acid and flux after soldering is completed.
- B. Expansion and Contraction Joints:
1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
 2. Space joints as shown or as specified.
 3. Space expansion and contraction joints for copper, stainless steel, and copper clad stainless steel at intervals not exceeding 7200 mm (24 feet).
 4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
 5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
 6. Fabricate joint covers of same thickness material as sheet metal served.

2.4 FINISH

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
 1. Copper: Mill finish.
 2. Stainless Steel: Finish No. 2B or 2D.

2.5 THROUGH-WALL FLASHINGS

- A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
 2. Fabricate so keying nests at overlaps.
- B. For Masonry Work When Concealed Except for Drip:
1. Either copper, or stainless steel.
 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
 3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.
- C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
1. Use same metal and thickness as counter flashing.
 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
 3. Form exposed portion as snap lock receiver for counter flashing upper edge.
- D. For Flashing at Stone Panels.
1. Use plan flat sheet of stainless steel.
 2. Form exposed portions with drip as specified or receiver.
- E. Window Sill Flashing and Lintel Flashing:
1. Use nonreinforced elastomeric sheeting, bituminous coated copper.
 2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
 3. Turn up back edge as shown.
 4. Form exposed portion with drip as specified or receiver.
- F. Door Sill Flashing:
1. Where concealed, use either 0.5 Kg (20 oz) copper, 0.5 mm (0.018 inch) thick stainless steel.
 2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) stainless steel, or 0.6 mm (0.024 inch) thick stainless steel.
 3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

2.6 BASE FLASHING

- A. Pipe Flashing: (Other than engine exhaust or flue stack)
1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
 2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
 3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
 - a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
 - b. Allow for loose fit around and into the pipe.
 4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
 - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
 - b. Allow for loose fit around pipe.

2.7 HANGING GUTTERS

- A. Fabricate gutters of not less than 0.6 Kg (24 oz) copper and to match existing gutters.
- B. Fabricate hanging gutters in sections not less than 2400 mm (8 feet) long, except at ends of runs where shorter lengths are required.
- C. Building side of gutter shall be same height as exterior side, unless otherwise indicated.
- D. Gutter Bead: Stiffen outer edge of gutter by folding edge over approximately 19 mm (3/4 inch) toward roof and down approximately 19 mm (3/4 inch) unless shown otherwise.
- E. Gutter Spacers:
1. Fabricate of same material and thickness as gutter.
 2. Fabricate 25 mm (one inch) wide strap and fasten to gutters not over 900 mm (36 inches) on center.
 3. Turn back edge up 25 mm (one inch) and lap front edge over gutter bead.
 4. Rivet and solder to gutter except rivet and seal to aluminum.
- F. Outlet Tubes:
1. Form outlet tubes to connect gutters to conductors of same metal and thickness as gutters extend into the conductor 75 mm (3 inch).
Flange upper end of outlet tube 13 mm (1/2 inch).
 2. Lock and solder longitudinal seam.

3. Solder tube to gutter .
4. Fabricate basket strainers of same material as gutters.

G. Gutter Brackets:

1. Fabricate of same metal as gutter. Use minimum 1/4 by one inch) copper.
2. Fabricate to gutter profile.
3. Drill two 5 mm (3/16 inch) diameter holes in anchor leg for countersunk flat head screws.

2.8 REGLETS

- A. Fabricate reglets of one of the following materials:
 1. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
- B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
- C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
- D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
- E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
 2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
 3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
 4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.

5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.

3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
 4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
 5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
 6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
 7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
 8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
 9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
 10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
 11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
 12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
 13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
 14. Continue flashing around columns:
 - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
 - b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).
- B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.
- C. Flashing at Top of Concrete Floors (except where shelf angles occur): Place flashing in horizontal masonry joint not less than 200 mm (8

inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).

D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.

E. Flashing at Veneer Walls:

1. Install near line of finish floors over shelf angles or where shown.
2. Turn up against sheathing.
3. At stud framing, hem top edge 19 mm (3/4 inch) and secure to each stud with stainless steel fasteners through sheathing.
4. At concrete backing, extend flashing into reglet as specified.
5. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.

F. Lintel Flashing when not part of shelf angle flashing:

1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.

G. Window Sill Flashing:

1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
2. Turn back edge up to terminate under window frame.
3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.

H. Door Sill Flashing:

1. Install flashing under bottom of plate sills of doors over curbs opening onto roofs. Extend flashing out to form counter flashing or receiver for counter flashing over base flashing. Set in sealant.
2. Extend sill flashing 200 mm (8 inch) beyond jamb opening. Turn ends up one inch in vertical masonry joint, extend end to face of wall. Join to counter flashing for water tight joint.
3. Where doors thresholds cover over waterproof membranes install sill flashing over water proof membrane under thresholds. Extend beyond opening to cover exposed portion of waterproof membrane and not less

than 150 mm (6 inch) beyond door jamb opening at ends. Turn up approximately 6 mm (1/4 inch) under threshold.

I. Flashing at Masonry, or Stone Copings:

1. Install flashing with drips on both wall faces unless shown otherwise.
2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

3.3 REGLETS

- A. Install reglets in a manner to provide a watertight installation.
- B. Locate reglets not less than 225 mm (9 inch) nor more than 400 mm (16 inch) above roofing, and not less than 125 mm (5 inch) nor more than 325 mm (13 inch) above cant strip.
- C. Butt and align end joints on each section of reglet and securely hold in position until concrete or mortar are hardened:
 1. Coordinate reglets for anchorage into concrete with formwork construction.
 2. Coordinate reglets for masonry to locate horizontally into mortar joints.

3.4 HANGING GUTTERS

- A. Hang gutters with high points equidistant from downspouts. Slope at not less than 1:200 (1/16 inch per foot).
- B. Lap joints, except for expansion joints, at least 25 mm (one inch) in the direction of flow. Rivet and seal or solder lapped joints.
- C. Support gutters in brackets spaced not more than 600 mm (24 inch) on centers, brackets attached to facial or wood nailer by at least two screws or nails.
 1. For copper gutters use brass or bronze brackets.
 2. Use brass or stainless steel screws.
- D. Secure brackets to gutters in such a manner as to allow free movement of gutter due to expansion and contraction.
- E. Gutter Expansion Joint:
 1. Locate expansion joints midway between outlet tubes.
 2. Provide at least a 25 mm (one inch) expansion joint space between end baffles of gutters.
 3. Install a cover plate over the space at expansion joint.
 4. Fasten cover plates to gutter section on one side of expansion joint only.

5. Secure loose end of cover plate to gutter section on other side of expansion joint by a loose-locked slip joint.

F. Outlet Tubes: Set bracket strainers loosely into gutter outlet tubes.

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VAMC WACO, TEXAS

**SECTION 07 72 00
ROOF ACCESSORIES**

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies self-flashing insulated roof curbs, and self flashing roof vent collars.

1.2 RELATED WORK

- A. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
- B. General insulation: Section 07 21 13, THERMAL INSULATION

1.3 QUALITY CONTROL

- A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.
- B. Each accessory type shall be the same and be made by the same manufacturer.
- C. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- C. Manufacturer's Literature and Data: Each item specified.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Material (ASTM):
 - A653 / A653M - 09a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - C612-04.....Mineral Fiber Block and Board Thermal Insulation
 - D4811 - 06 Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing
- C. National Roofing Contractor's Association (NRCA) Roofing and Waterproofing Manual.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Galvanized Sheet Steel: ASTM A653; G-90 coating.
- B. Insulation: ASTM C612, Class 1 or 2.
- C. EPDM sheet, ASTM D4811.

2.2 ROOF CURBS

- A. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
- B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch-thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.
 - 1. Provide preservative-treated wood nailers at tops of curbs and formed flange at perimeter bottom for mounting to roof.
 - 2. On clay tile roofs, form flange at perimeter bottom to conform to roof profile.
 - 3. Provide manufacturer's standard rigid or semirigid insulation.
 - 4. Provide formed cants and base profile coordinated with roof insulation thickness.
 - 5. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
 - 6. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.3 SELF-FLASHING ROOF VENT COLLARS:

- A. Fabricate of EPDM sheet material with a serviceable temperature range of -60 deg. F. to +270 deg. F. minimum. EPDM shall be resistant to ozone and ultraviolet rays. Each unit shall have a self-sealing waterproof surface to seal to the decking surface and shall have galvanized steel bases with EPDM collar. Mayco Industries "Auto-Caulk Flashings".

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install roof accessories where shown.
- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.

E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

F. Separate metal surfaces from dissimilar metals, and from wood and cementitious substrates, by a thick coating of fibrated bituminous compound or other separation as recommended by the metal manufacturer, and as required to prevent corrosive action. Bed flanges of roof accessories in mastic or compound which is compatible with roofing and flashing. Anchor permanently to the substrate, by methods which are adequate for the sizes and locations of units. install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual."

3.4 PROTECTION

Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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VAMC WACO, TEXAS**SECTION 07 81 00
APPLIED FIREPROOFING****PART 1 - GENERAL****1.1 DESCRIPTION**

This section specifies mineral fiber and cementitious coverings to provide fire resistance to interior structural steel members shown.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Manufacturer's complete and detailed application instructions and specifications.
 - 2. Manufacturer's repair and patching instructions.
- C. Certificates:
 - 1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
 - a. List thickness and density of material required to meet fire ratings.
 - b. Accompanied by complete test report and test record.
 - 2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.
- D. Miscellaneous:
 - 1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.
 - 2. Manufacturer's written approval of completed installation.
 - 3. Manufacturer's written approval of the applicators of fireproofing material.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver to job-site in sealed containers marked and labeled to show manufacturer's name and brand and certification of compliance with the specified requirements.
- B. Remove damaged containers from the site.
- C. Store the materials off the ground, under cover, away from damp surfaces.
- D. Keep dry until ready for use.

E. Remove materials that have been exposed to water before installation from the site.

1.4 QUALITY CONTROL

A. Test for fire endurance in accordance with ASTM E119, for fire rating specified, in a nationally recognized laboratory.

B. Manufacturer's inspection and approval of surfaces to receive fireproofing as specified under paragraph Examination.

C. Manufacturer's approval of fireproofing applications.

D. Manufacturer's approval of completed installation.

E. Manufacturer's representative shall observe and advise at the commencement of application, and shall visit the site as required thereafter for the purpose of ascertaining proper application.

F. Pre-Application Test Area.

1. Apply a test area consisting of a typical overhead fireproofing installation, including not less than 4.5 m (15 feet) of beam and deck.

a. Apply to one column.

b. Apply for the hourly ratings used.

2. Install in location selected by the Resident Engineer, for approval by the representative of the fireproofing material manufacturer and by the Government.

3. Perform Bond test on painted steel in accordance with ASTM E736.

4. Do not proceed in other areas until installation of test area has been completed and approved.

5. Keep approved installation area open for observation as criteria for sprayed-on fireproofing.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

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

E84-10.....Surface Burning Characteristics of Building Materials

E119-10.....Fire Tests of Building Construction and Materials

E605-93 (R2006).....Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members

- E736-06.....Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
- E759-92 (R2005).....The Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
- E760-92 (R2005).....Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
- E761-92 (R2005).....Compressive Strength of Fire-Resistive Material Applied to Structural Members
- E859-93 (R2006).....Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members
- E937-93 (R2005).....Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members
- E1042-02.....Acoustically, Absorptive Materials Applied by Trowel or Spray.
- ASTM E1354 - 10Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- G21-09.....Determining Resistance of Synthetic Polymeric Materials to Fungi
- C. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory...Latest Edition including Supplements
- D. Warnock Hersey (WH):
Certification Listings..Latest Edition
- E. Factory Mutual System (FM):
Approval Guide.....Latest Edition including Supplements

PART 2 - PRODUCTS

2.1 SPRAYED-ON FIREPROOFING

- A. ASTM E1042, Class (a), Category A.
1. Type I, factory mixed cementitious materials with approved aggregate.
 2. Type II, factory mixed mineral fiber with integral inorganic binders minimum 240 kg/m^3 (15 lb/ft^3) density per ASTM E605 test unless specified otherwise. Use in areas that are completely encased.
- B. Materials containing asbestos are not permitted.
- C. Materials shall meet the following physical performance standards:
1. Dry Density: The field density shall be measured in accordance with ASTM Standard E605. Minimum average density shall be that required by the manufacturer, or as listed in the UL Fire

- Resistance Directory for each rating indicated, or as required by the authority having jurisdiction, or a minimum average 240 kg/m³ (15 pcf) whichever is greater.
2. Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.
 3. Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or delaminate from the surface to which it is applied.
 4. Bond Strength: Fireproofing, when tested in accordance with ASTM E736, shall have a minimum average bond strength of 9.6 kN/m² (200 psf) and a minimum individual bond strength of 7.2 kN/m² (150 psf).
 5. Air Erosion: Maximum allowable total weight loss of the fireproofing material shall be 0.00 g/m² (0.00 g/ft²) when tested in accordance with ASTM E859. Sample surface shall be "as applied" (not pre-purged) and the total reported weight loss shall be the total weight loss over a 24 hour period from the beginning of the test.
 6. High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 12.7 m/s (47 km/h) [2500 ft/min (29 mph)] when tested per ASTM E859.
 7. Compressive Strength: The fireproofing shall not deform more than 10% when subjected to compressive forces of 71 kPa (1,483 psf) when tested in accordance with ASTM E761.
 8. Corrosion Resistance: Fireproofing applied to steel shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.
 9. Abrasion Resistance: No more than 15 cm³ shall be abraded or removed from the fireproofing substrate when tested in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection
 10. Impact Penetration: The fireproofing material shall not show a loss of more than 6 cm³ when subjected to impact penetration tests in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.
 11. Surface Burning Characteristics: Material shall exhibit the following surface burning characteristics when tested in accordance with ASTM E84:

Flame Spread	0
Smoke Development	0
 12. Resistance to Mold: The fireproofing material shall be formulated at the time of manufacturing with a mold inhibitor. Fireproofing material shall be tested in accordance with ASTM G21 and shall show resistance to mold growth for a period of 28 days for general use.
 13. Combustibility: Material shall have a maximum total heat release of 20 MJ/m² and a maximum 125 kw/m² peak rate of heat release 600 seconds after insertion when tested in accordance with ASTM E1354 at a radiant heat flux of 75 kw/m² with the use of electric spark ignition. The sample shall be tested in the horizontal orientation.

2.2 ADHESIVE

- A. Bonding adhesive for Type II (fibrous) materials as recommended and supplied by the fireproofing material manufacturer.
- B. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.

2.3 SEALER

- A. Sealer for Type II (fibrous) material as recommended and supplied by the fireproofing material manufacturer.
- B. Surface burning characteristics as specified for fireproofing material.
- C. Fungus resistant.
- D. Sealer may be an integral part of the material or applied separately to the exposed surface. When applied separately use contrasting color pigmented sealer, white preferred.

2.4 WATER

- A. Clean, fresh, and free from organic and mineral impurities.
- B. pH of 6.9 to 7.1.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify surfaces to receive fireproofing are clean and free of dust, soot, oil, grease, water soluble materials or any foreign substance which would prevent adhesion of the fireproofing material.
- B. Verify hangers, inserts and clips are installed before the application of fireproofing material.
- C. Verify ductwork, piping, and other obstructing material and equipment is not installed that will interfere with fireproofing installation.
- D. Verify concrete work on steel decking and concrete encased steel is completed.
- E. Verify temperature and enclosure conditions are required by fireproofing material manufacturer.

3.2 APPLICATION

- A. Do not start application until written approval has been obtained from manufacturer of fireproofing materials that surfaces have been inspected by the manufacturer or his representative, and are suitable to receive sprayed-on fireproofing.
- B. Coordinate application of fireproofing material with other trades.
- C. Mix and apply in accordance with manufacturer's instructions.
 - 1. Mechanically control material and water ratios.

2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
 3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
 4. Minimum applied dry density per cubic meter (cubic foot) for the underside of the walk on deck (interstitial) hung purl in or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms shall be as follows:
 - a. Type I - 240 kg/m³ (15 lb/ft³).
 - b. Type II - 350 kg/m³ (22 lb/ft³).
- D. Application shall be completed in one area, inspected and approved by Resident Engineer before removal of application equipment and proceeding with further work.

3.3 FIELD TESTS

- A. Tests of applied material will be performed by VA retained Testing Laboratory. See Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Resident Engineer will select area to be tested in specific bays on each floor using a geometric grid pattern.
- C. Test for thickness and density in accordance with ASTM E605. Areas showing thickness less than that required as a result of fire endurance test will be rejected.
- D. Areas showing less than required fireproofing characteristics will be rejected on the following field tests.
 1. Test for cohesion/adhesion: ASTM E736.
 2. Test for bond impact strength: ASTM E760.

3.4 PATCHING AND REPAIRING

- A. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered by subsequent construction.
- B. Perform corrective measures in accordance with fireproofing material Manufacturer's recommendations.
 1. Respray areas requiring additional fireproofing material to provide the required thickness, and replace dislodged or removed material.
 2. Spray material for patching by machine directly on point to be patched, or into a container and then hand apply.
 3. Hand mixing of material is not permitted.
- C. Repair:

1. Respray all test and rejected areas.
2. Patch fireproofing material which is removed or disturbed after approval.

D. Perform final inspection of sprayed areas after patching and repair.

3.5 SCHEDULE

A. Apply fireproofing material in interior structural steel members and other areas as indicated, except on following surfaces:

1. Areas used as air handling plenums.
2. Steel to be encased in concrete or designated to receive other type of fireproofing.

B. Type I:

1. Two hour fire rating, unless otherwise indicated.

C. Type II:

1. Two hour fire rating, unless otherwise indicated.

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VAMC WACO, TEXAS**SECTION 07 84 00
FIRESTOPPING****PART 1 GENERAL****1.1 DESCRIPTION**

- A. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK

- A. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- B. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS and Section 23 37 00, AIR OUTLETS AND INLETS.
- C. Spray applied fireproofing: Section 07 81 00, APPLIED FIREPROOFING

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

1.4 DELIVERY AND STORAGE

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.
- B. Store in a location providing protection from damage and exposure to the elements.

1.5 WARRANTY

Firestopping work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to five years.

1.6 QUALITY ASSURANCE

FM, UL, or WH or other approved laboratory tested products will be acceptable.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 E84-10.....Surface Burning Characteristics of Building Materials
 E814-10.....Fire Tests of Through-Penetration Fire Stops
- C. Factory Mutual Engineering and Research Corporation (FM):
 Annual Issue Approval Guide Building Materials
- D. Underwriters Laboratories, Inc. (UL):
 Annual Issue Building Materials Directory
 Annual Issue Fire Resistance Directory
 1479-03.....Fire Tests of Through-Penetration Firestops
- E. Warnock Hersey (WH):
 Annual Issue Certification Listings

PART 2 - PRODUCTS**2.1 FIRESTOP SYSTEMS**

- A. Manufacturer: HILTI Corporation (NO SUBSTITUTIONS). Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 100 mm (4 in) nominal pipe or 0.01 m² (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
1. Contain no flammable or toxic solvents.
 2. Have no dangerous or flammable out gassing during the drying or curing of products.

3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 4. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall have following properties:
1. Classified for use with the particular type of penetrating material used.
 2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
 3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be asbestos free.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

- A. Use silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Use mineral fiber filler and bond breaker behind sealant.
- C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION

Submit product data and installation instructions, as required by article, submittals, after an on site examination of areas to receive firestopping.

3.2 PREPARATION

- A. Remove dirt, grease, oil, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (six inches) on either side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

3.3 INSTALLATION

- A. Do not begin work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.
- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.

3.4 CLEAN-UP AND ACCEPTANCE OF WORK

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the Project Manager/Contracting Officers Technical Representative (PM/COTR).
- C. Clean up spills of liquid type materials.

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VAMC WACO, TEXAS**SECTION 07 92 00
JOINT SEALANTS****PART 1 - GENERAL****1.1 DESCRIPTION:**

Section covers all sealant and caulking materials and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK:

- A. Sealing of site work concrete paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- B. Masonry control and expansion joint: Section 04 20 00, UNIT MASONRY.
- C. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.
- D. Glazing: Section 08 80 00, GLAZING.
- E. Aluminum-Framed Entrances: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES.
- F. Aluminum windows: Section 08 15 13, ALUMINUM WINDOWS.
- G. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.
- H. Mechanical Work: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.3 QUALITY CONTROL:

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by

reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.

4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
1. Locate test joints where indicated or, if not indicated, as directed by Contracting Officer.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Resident Engineer seven days in advance of dates and times when test joints will be erected.
- E. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
 1. Caulking compound
 2. Primers
 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

1.5 PROJECT CONDITIONS:

- A. Environmental Limitations:
 1. Do not proceed with installation of joint sealants under following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 °C (40 °F).
 - b. When joint substrates are wet.
- B. Joint-Width Conditions:

- 1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:

- 1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 DELIVERY, HANDLING, AND STORAGE:

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 5° C (40° F) or less than 32° C (90° F).

1.7 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.8 WARRANTY:

- A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be extended to two years.
- B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C717-10.....Standard Terminology of Building Seals and Sealants.
 - C920-10.....Elastomeric Joint Sealants.
 - C1021-08.....Laboratories Engaged in Testing of Building Sealants.

- C1193-05.....Standard Guide for Use of Joint Sealants.
- E84-10.....Surface Burning Characteristics of Building Materials.

C. Sealant, Waterproofing and Restoration Institute (SWRI).
The Professionals' Guide

PART 2 - PRODUCTS

2.1 SEALANTS:

- A. S-1:
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type M.
 - 3. Class 25.
 - 4. Grade NS.
 - 5. Shore A hardness of 20-40
- B. S-2:
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type M.
 - 3. Class 25.
 - 4. Grade P.
 - 5. Shore A hardness of 25-40.
- C. S-3:
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type S.
 - 3. Class 25, joint movement range of plus or minus 50 percent.
 - 4. Grade NS.
 - 5. Shore A hardness of 15-25.
 - 6. Minimum elongation of 700 percent.
- D. S-4:
 - 1. ASTM C920 polyurethane or polysulfide.
 - 2. Type S.
 - 3. Class 25.
 - 4. Grade NS.
 - 5. Shore A hardness of 25-40.
- E. S-6:
 - 1. ASTM C920, silicone, neutral cure.
 - 2. Type S.
 - 3. Class: Joint movement range of plus 100 percent to minus 50 percent.
 - 4. Grade NS.
 - 5. Shore A hardness of 15-20.

6. Minimum elongation of 1200 percent.

F. S-9:

1. ASTM C920 silicone.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

G. S-11:

1. ASTM C920 polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 35 to 50.

H. S-12:

1. ASTM C920, polyurethane.
2. Type M/S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade P/NS.
5. Shore A hardness of 25 to 50.

2.2 CAULKING COMPOUND:

- A. C-1: ASTM C834, acrylic latex.
- B. C-2: One component acoustical caulking, non drying, non hardening, synthetic rubber.

2.3 COLOR:

- A. Sealants used with exposed masonry shall match color of mortar joints.
- B. Sealants used with unpainted concrete shall match color of adjacent concrete.
- C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise.
- D. Caulking shall be light gray or white, unless specified otherwise.

2.4 JOINT SEALANT BACKING:

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

- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32° C (minus 26° F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 FILLER:

- A. Mineral fiber board: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

2.6 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.7 CLEANERS-NON POUROUS SURFACES:

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer

paint, or other foreign matter that would tend to destroy or impair adhesion.

1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
 1. Apply primer prior to installation of back-up rod or bond breaker tape.
 2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION:

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.

- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.4 SEALANT DEPTHS AND GEOMETRY:

- A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.
- B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION:

- A. General:
 - 1. Apply sealants and caulking only when ambient temperature is between 5° C and 38° C (40° and 100° F).
 - 2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
 - 3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
 - 4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
 - 5. Avoid dropping or smearing compound on adjacent surfaces.
 - 6. Fill joints solidly with compound and finish compound smooth.
 - 7. Tool joints to concave surface unless shown or specified otherwise.
 - 8. Finish paving or floor joints flush unless joint is otherwise detailed.
 - 9. Apply compounds with nozzle size to fit joint width.
 - 10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.
- C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all

cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as recommended by sealant manufacturer:
 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for first 300 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform one test for each 300 m (1000 feet) of joint length thereafter or one test per each floor per elevation.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- C. Inspect tested joints and report on following:
 1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 3. Whether sealants filled joint cavities and are free from voids.
 4. Whether sealant dimensions and configurations comply with specified requirements.

- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
- B. After filling and finishing joints, remove masking tape.
- C. Leave adjacent surfaces in a clean and unstained condition.

3.8 LOCATIONS:

- A. Exterior Building Joints, Horizontal and Vertical:
 - 1. Metal to Metal: Type S-1, S-2
 - 2. Metal to Masonry or Stone: Type S-1
 - 3. Masonry to Masonry or Stone: Type S-1
 - 4. Cast Stone to Cast Stone: Type S-1
 - 5. Threshold Setting Bed: Type S-1, S-3, S-4
 - 6. Masonry Expansion and Control Joints: Type S-6
 - 7. Wood to Masonry: Type S-1
- B. Metal Reglets and Flashings:
 - 1. Flashings to Wall: Type S-6
 - 2. Metal to Metal: Type S-6
- C. Sanitary Joints:
 - 1. Walls to Plumbing Fixtures: Type S-9
 - 2. Counter Tops to Walls: Type S-9
 - 3. Pipe Penetrations: Type S-9
- D. Horizontal Traffic Joints:

1. Concrete Paving: Type S-11 or S-12

E. Interior Caulking:

1. Typical Narrow Joint 6 mm, (1/4 inch) or less at Walls and Adjacent Components: Types C-1, C-2 and C-3.
2. Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Masonry Surfaces: Types C-1, C-2 and C-3.
3. Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1, C-2 and C-3.
4. Exposed Isolation Joints at Top of Full Height Walls: Types C-1, C-2 and C-3.
5. Exposed Acoustical Joint at Sound Rated Partitions Type C-2.
6. Concealed Acoustic Sealant Type S-4, C-1, and C-2.

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