SECTION 07111

COMPOSITE SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Below-grade wall waterproofing.

2. Vault deck waterproofing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-in-Place Concrete" for concrete placement, curing, and finishing.

2. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.

3. Division 7 Section "Joint Sealants" for joint sealant materials and installation.

1.3 PERFORMANCE REQUIREMENTS

General: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current sheet membrane.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of waterproofing specified, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.

C. Shop Drawings showing locations and extent of waterproofing, including details for substrate joints and cracks, sheet flashings, penetrations, tie-ins with adjoining construction, and other termination conditions.

D. Samples, 3-by-6-inch (75-by-150-mm) minimum size, of each waterproofing material required for Project.

E. Installer certificates signed by manufacturer certifying that Installers comply with requirements under the "Quality Assurance" Article.

F. Product test reports from a qualified independent testing agency evidencing compliance of waterproofing with requirements and other physical properties reported by manufacturer based on comprehensive testing of products according to current standard test methods within previous 5 years.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is certified in writing by waterproofing manufacturer as qualified to install manufacturer's waterproofing.

B. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.

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

1. Before installing waterproofing, meet with the Government, waterproofing manufacturer, and other concerned entities.

2. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, inspection and testing procedures, and protection and repairs.

3. Notify participants at least 7 days before conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

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

B. Special Warranty: Submit a written warranty signed by waterproofing manufacturer and installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight during the specified warranty period. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch (1.6 mm) in width. Warranty Period: 1 year after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products (Rubberized-Asphalt Composite Sheet): Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. PQ 7100; American Permaquik Inc.

2. QSC 701; Carlisle Corporation, Carlisle Coatings & Waterproofing Inc.

3. Bituthene; Grace: W.R. Grace & Co.

4. Elasto-Ply; Karnak Corporation.

5. Mel-rol; Meadows: W.R. Meadows, Inc.

6. Miradri; Nicolon/Mirafi Inc.

7. Nordtene; Nord Bitumi U.S. Inc.

8. Duramem 700-SM; Pecora Corporation.

9. Polyguard 650; Polyguard Products, Inc.

10. Plastiwrap 60; Progress Unlimited, Inc.

2.2 SELF-ADHERING COMPOSITE SHEET

Rubberized-Asphalt Composite Sheet: 60-mil- (1.5-mm-) thick self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil- (0.10-mm-) thick polyethylene film with release liner on adhesive side.

A. Sheet Type: Manufacturer's standard composite sheet for use when ambient and substrate temperatures exceed 40 deg F (5 deg C).

B. Physical Properties: Provide waterproofing complying with the following:

1. Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.

2. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.

3. Pliability: No cracks when bent 180 degrees over a 1-inch (25-mm) mandrel at minus 25 deg F (minus 32 deg C); ASTM D 146.

4. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3.2-mm) movement; ASTM C 836.

5. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.

6. Hydrostatic-Head Resistance: 150 feet (45 m) minimum; ASTM D 5385.

7. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing sheet membrane. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended by manufacturer of sheet waterproofing material for substrate.

C. Sheet Flashing: Self-adhering, rubberized-asphalt composite sheet of same material, construction, and thickness as waterproofing sheet membrane.

D. Liquid Membrane: Elastomeric, 2-component, liquid, cold fluid-applied, trowel grade or low viscosity as recommended by waterproofing manufacturer for application.

E. Patching Membrane: Low-viscosity, 2-component, asphalt-modified coating.

F. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

2.4 MOLDED-SHEET DRAINAGE PANELS

Composite drainage panels, 3-dimensional, nonbiodegradable, manufactured with a permeable geotextile bonded to molded-plastic-sheet drainage core and designed to effectively convey water.

A. Geotextile: Nonwoven geotextile fabric of polypropylene or polyester fibers, or combination of both.

B. Minimum Flow Rate: 15 gpm/foot (1.45 L/s/1000 mm) at a hydraulic gradient of 1.0 and 3600-psf (172-kPa) normal pressure when tested according to ASTM D 4716.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.

C. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

D. Notify the Government in writing of anticipated problems using waterproofing over substrate.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.

C. Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D 4258. Install membrane strip and center over construction and control joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Inside Corners: Prepare, prime, and treat inside corners according to waterproofing manufacturer's written instructions. Install membrane strip centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:

1. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

2. At deck-to-wall intersections, extend liquid membrane or sheet membrane flashing onto deck waterproofing and to finished height of sheet flashing.

G. Outside Corners: Prepare and treat outside corners according to waterproofing

manufacturer's written instructions. Install strip of membrane 12 inches (300 mm) wide, centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge and cover with sheet membrane strips.

3.3 SELF-ADHERING COMPOSITE SHEET APPLICATION

A. Install self-adhering composite sheet according to waterproofing manufacturer's written instructions.

B. Apply primer to substrate at required rate and allow to dry. Limit priming to areas that will be covered by waterproofing membrane in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheet membrane over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures exceed 40 deg F (5 deg C), install manufacturer's standard rubberized-asphalt composite sheet.

2. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and 5 deg C), install manufacturer's standard, low-temperature, rubberized-asphalt composite sheet.

D. Apply sheet membrane from low point to high point of deck to ensure side laps shed water.

E. Apply continuous sheet membrane over membrane strips bridging each type of joint to dimensions indicated or required by manufacturer.

F. Seal exposed edges of membrane terminations not concealed by metal counterflashings or ending in reglets with mastic or sealant.

G. Install sheet membrane and auxiliary materials to tie in adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not meeting requirements. Slit and flatten fishmouths and blisters. Patch with sheet membrane extending 6 inches (150 mm) beyond repaired areas in all directions.

3.4 DRAINAGE PANEL INSTALLATION

Place and secure drainage panels according to manufacturer's written instructions. Use adhesives and mechanical fasteners recommended by manufacturer that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed panels during subsequent construction. Molded-sheet drainage panels may be used in lieu of protection course to vertical applications when approved by waterproofing manufacturer.

3.5 FIELD QUALITY CONTROL

A. Test each deck area for leaks after waterproofing and before protection course and overlaying construction are placed. Plug or dam drains and fill with water to a depth of 2 inches (50 mm) or to within 3 inches (75 mm) of top of sheet flashings. Maximum water depth shall not exceed 4 inches (100 mm). Flood each area for 24 hours.

B. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings. After flood tests, repair leaks and make further repairs until waterproofing installation is watertight.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

3.6 PROTECTING AND CLEANING

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

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07111

SECTION 07160

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following: Cold-applied asphalt emulsion dampproofing.

B. Related Sections: The following Sections contain requirements that relate to this Section: Bituminous sheet waterproofing is specified in Division 7 Section "Sheet Membrane Waterproofing."

1.3 SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Section "Submittals." : Product Data - Include data substantiating that materials comply with specified requirements for each dampproofing material specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed bituminous dampproofing work similar in material, design, and extent to that indicated for Project and that has resulted in construction with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain primary dampproofing materials and primers from a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing work only after substrate construction and penetrating work have been completed.

B. Weather: Proceed with dampproofing work only when existing and forecast weather conditions will permit work to be performed in accordance with manufacturer's recommendations.

C. Ventilation: Provide adequate ventilation during application of solvent-based components in enclosed spaces. Maintain ventilation until dampproofing membrane has thoroughly cured.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING, GENERAL

Odor Elimination: For interior and concealed-in-wall uses, provide type of bituminous dampproofing material that is warranted by manufacturer to be substantially odor-free after drying for 24 hours under normal conditions.

2.2 COLD-APPLIED ASPHALT EMULSION DAMPPROOFING

A. Asphalt Emulsion: Asphalt-and-water-emulsion coating, compounded to penetrate substrate and build to moisture-resistant coating. Provide heavy fibrated-type mastic asbestos-free emulsion; ASTM D 1227, Type IV, except containing nonasbestos, inorganic fibrous reinforcement materials.

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

1. Celotex Corporation.

2. ChemRex, Inc./Sonneborne Building Products Div.

3. GS Roofing Products Company, Inc.

4. J & P Petroleum Products, Inc.

5. Karnak Chemical Corporation.

6. Koch Materials Company.

7. Koppers Company, Inc.

8. Lunday Thagard Company.

9. Manville Building Materials Corporation.

10. Tamko Corporation.

11. Tremco, Inc.

2.3 MISCELLANEOUS MATERIALS

A. Glass-Fiber Mat: Nonwoven fiberglass fabric of continuous filament or jack-straw filament/yarn pattern of glass fiber, impregnated and bound together with type of organic/synthetic binder that is compatible with type of bituminous compound indicated to be reinforced, weighing 1.0 to 1.5 lbs. per 100 sq. ft., 36-inch-wide rolls.

B. Bituminous Grout: Comply with ASTM D 147.

C. Plastic Cement: Asphalt based, complying with ASTM D 491, except provide coal tar base where specifically recommended by manufacturer of bituminous dampproofing materials.

D. Protection Course, Board Type: Asphalt-impregnated and coated organic fiberboard, 1/2 inch thick.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBSTRATE

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. 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 manufacturer's recommendations. Give particular attention to requirements at building expansion joints, if any.

E. Prime substrate as recommended by prime materials manufacturer.

F. 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.

G. Install 1/2" cement fiber board over sand bed as substrate for damp proofing under floor of cable vault.

3.2 INSTALLATION, GENERAL

Comply with manufacturer's recommendations, except where more stringent requirements are indicated or specified and where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

3.3 BITUMINOUS DAMPPROOFING INSTALLATION

A. General: Apply dampproofing to all exterior below-grade surfaces of exterior underground walls in contact with earth or other backfill and where space is enclosed on opposite side.

B. Reinforcement: At changes in plane or where otherwise shown as "Reinforced," install lapped course of glass-fiber mat in first coat of dampproofing compound before it thickens.

C. Bituminous Cant Strips: Install 2-inch by 2-inch cant strip of bituminous grout at base of vertical dampproofing where it meets horizontal surface.

D. Extend vertical dampproofing down walls from finished grade line to top of footing, extend over top of footing, and turn down minimum of 6 inches over outside face of footing. Extend 12 inches onto intersecting walls and footings but do not extend onto surfaces that will be exposed to view when project is completed.

3.4 ASPHALT EMULSION ON EXTERIOR AND INTERIOR SURFACES

A. Apply coat of fibrated, mastic, asphalt emulsion dampproofing material, by troweling onto substrate at a minimum rate of 9 gal. per 100 sq. ft., to produce minimum wet film of 1/8 inch.

B. Underground Vault: Apply 1 coat as described above. Within 4 hours, apply glass fabric membrane cloth over all surfaces of coating, overlapping all edges at least 3 inches. Press firmly into place without wrinkes. Within 24 hours, apply an additional coat of fibrated mastic, asphalt emulsion dampproofing. Allow to set before installing protection course. Extend horizontal dampproofing over footing and turn down 6 inches over outside face of footing., Prior to forming and placing

of concrete walls. After wall forms have been stripped, install dampproofing on walls and extend over top of footing, and turn down minimum of 6 inches over outside face of footing.

3.5 INSTALLATION OF DAMPPROOF PROTECTION COURSE

General: Where indicated, install protection course of type indicated over completed-and-cured dampproofing treatment. Comply with dampproofing materials manufacturer's recommendations for method of support or attachment of protection materials. Support with spot application of plastic cement where not otherwise indicated.

END OF SECTION 07160

SECTION 07210

BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Insulation under slabs-on-grade.

2. Foundation wall insulation (supporting backfill).

3. Block/board cavity wall insulation.

4. Safing insulation.

5. Building insulation in batt form.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 4 Section "Unit Masonry" for polyisocyanurate foam board insulation installed in cavity walls.

2. Division 9 Section indicated below for sound attenuation insulation installed as part of metal-framed wall and partition assemblies: "Gypsum Drywall."

1.3 DEFINITIONS

Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of insulation product specified.

C. Samples for verification purposes in full-size units of each type of exposed insulation indicated for each color specified.

D. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including r-values (aged values for plastic foam insulations), fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.

E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of plastic foam insulations with building code in effect for Project.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristic: ASTM E 84.

2. Fire Resistance Ratings: ASTM E 119.

3. Combustion Characteristics: ASTM E 136.

B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by

moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

A. Extruded Polystyrene Board Insulation:

1. Amoco Foam Products Co.
2. DiversiFoam Products.
3. Dow: The Dow Chemical Company.
4. UC Industries, Inc.

B. Polyisocyanurate Board Insulation:

1. NRG Barriers, Inc.
2. Apache Products Co.
3. Atlas Energy Products, A division of Atlas Roofing Corp.

C. Manufacturers of Glass Fiber Insulation:

1. CertainTeed Corp.
2. Knauf Fiber Glass GmbH.

3. Manville: Building Insulations Div., Manville Sales Corp.

4. Owens/Corning Fiberglas Corp.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards. Preformed unit sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5-year aged r-values of 5.4 and 5 at 40 and 75 deg F (4.4 and 23.9 deg C), respectively; and as follows:

1. Type IV, 1.6 pcf min. density, unless otherwise indicated.

2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 75 and 450, respectively.

C. Polyisocyanurate Board Insulation: Rigid, cellular thermal insulation with glass-fiber-reinforced polyisocyanurate closed-cell foam core and aluminum foil facing laminated to both sides; complying with FS HH-I-1972/1, Class 2; aged r-values of 8 and 7.2 at 40 and 75 deg F (4.4 and 23.9 deg C), respectively; and as follows: Surface Burning Characteristics - Maximum flame spread and smoke developed values of 20 and 200, respectively.

D. Unfaced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass.

2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

E. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft or foil-scrim-polyethylene vapor-retarder membrane on one face, and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass.

2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

3. Flanged Units: Provide blankets/batts fabricated with facing incorporating 4-inch-wide flanges along their edges for attachment to framing members.

2.3 SAFING INSULATION AND ACCESSORIES

A. Semi-Refractory Fiber Board Safing Insulation: Semi-rigid boards designed for use as a fire stop at openings between edge of slab and exterior wall panels, produced by combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C 612, Class 1 and 2; nominal density of 4.0 pcf; passing ASTM E 136 for combustion characteristics; r-value of 4.0 at 75 deg F (23.9 deg C).

B. Calking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.

C. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

2.4 VAPOR RETARDERS

A. Polyethylene Vapor Retarder: ASTM D 4397, 6.0 mils thick, with a maximum permeance rating of 0.13 perms.

B. Reinforced-Polyethylene Vapor Retarder: Multiple layers of polyethylene film reinforced with inner layers of nylon cord reinforcing and laminated together with a rubber adhesive to produce two outer layers of polyethylene film and one inner layer of nylon reinforcing, with an overall thickness of 6.0 to 8.0 mils.

C. Tape for Vapor Retarder: Pressure sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following - Reinforced Polyethylene Vapor Retarder: "Griffolyn T-65," Griffolyn Div., Reef Industries, Inc.

2.5 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding the insulation, anchors, or substrates.

B. Adhesively Attached Pin Anchors: Perforated plate, 2 inches square, welded to projecting pin, with self-locking washer, complying with the following requirements:

1. Plate: Zinc-plated steel, 0.106 inch thick.

2. Pin: Copper-coated low carbon steel, fully annealed, 0.106 inches in diameter, length to suit depth of insulation indicated and, with washer in place, to hold insulation tightly to substrate behind insulation.

3. Self-Locking Washer: Mild steel, 0.016 inch thick, size as required to hold insulation securely. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers.

C. Protection Board: Premolded, semi-rigid asphalt/fiber composition board, 1/4 inch thick, formed under heat and pressure, standard sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of insulation.

B. Protect below-grade insulation on vertical surfaces (from damage during back-filling) by application of protection board. Set in adhesive in accordance with recommendations of manufacturer of insulation.

C. Protect top surface of horizontal insulation (from damage during concrete work) by application of protection board.

3.5 INSTALLATION OF CAVITY-WALL AND MASONRY-CELL INSULATION

On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified under Division 4 "Unit Masonry."

3.6 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for

firestopping. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Stuff glass fiber insulation into miscellaneous voids such as between steel joists or at top of exterior masonry walls. Compact to approximately 40 percent of normal maximum volume (to a density of approximately 2.5 pcf).

3.7 INSTALLATION OF SAFING INSULATION

Install safing insulation to fill gap between edge of concrete floor slab and back of exterior spandrel panels on safing clips spaced as needed to support insulation but not further apart then 24 inches o.c. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of slab with calking approved by safing insulation manufacturer for this purpose. Leave no voids in completed installation.

3.8 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission, film processing, film finising and restrooms. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners 16 inches o.c.

C. Seal overlapping joints in vapor retarders with adhesives or tape per vapor retarder manufacturer's printed directions. Seal butt joints and fastener penetrations with tape of type recommended by vapor retarder manufacturer. Locate all joints over framing members or other solid substrates.

D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with tape of type recommended by vapor retarder manufacturer to create an airtight seal between penetrating objects and vapor retarder.

F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

3.9 PROTECTION

General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07212

BOARD INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Adhesive bed, Board insulation.

B. Board insulation and integral vapor and air barrier at cavity wall construction, perimeter foundation wall, underside of floor slabs.

1.2 RELATED SECTIONS

A. Section 07216 - Loose Fill insulation.

B. Section 07531: Rigid insulation at flat roof system.

1.3 REFERENCES

A. ANSI/ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

B. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.

C. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

D. FS HH-I-1972/GEN - Insulation Board, Thermal, Faced, Polyurethane or Polyisocyanurate.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate special environmental conditions required for installation, and installation techniques.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS - INSULATION MATERIALS

A. Apache.

B. Atlas.

C. Dow Corning.

D. Allowable substitutions: Items of same function and performance are acceptable in comformance with Section 01600.

2.2 INSULATION MATERIALS

Extruded Polystyrene Insulation: ASTM C578 Type VI; extruded cellular type, conforming to the following:

A. Thermal Resistance: 5 year aged R of 5.0 @ 40 deg F

B. Thickness: Thickness as required to achieve R-value indicated.

C. Edges: Square for under slab, Tongue and groove for walls.

2.4 ADHESIVES

Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

B. Verify substrate surface is flat, free of honeycomb fins, irregularities, and

materials or substances that may impede adhesive bond.

3.2 INSTALLATION - FOUNDATION PERIMETER

Adhere boards to foundation grade beam perimeter, vertically. Place boards in a method to maximize contact bedding. Stagger side joints. Butt edges and ends tight to adjacent board and to protrusions. Use type of adhesive recommended by manufacturer of insulation.

3.3 INSTALLATION - CAVITY WALLS

A. Adhere boards on block surface horizontally. Place membrane surface of insulation against adhesive. Use type of adhesive recommended by manufacturer of insulation.

B. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions. Tape all joints.

3.4 INSTALLATION - UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Prevent insulation from being displaced or damaged while placing vapor barrier and placing slab.

END OF SECTION

SECTION 07216

LOOSE FILL INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

Granular insulation in cells of concrete masonry unit walls.

1.2 RELATED SECTIONS

Section 04300 - Unit Masonry System:Masonry wall system.

1.3 REFERENCES

A. ANSI/ASTM C549 - Perlite Loose Fill Insulation.

B. ANSI/ASTM E84 - Surface Burning Characteristics of Building Materials.

C. ASTM C520 - Test Methods for Density of Granular Loose-Fill Insulations.

D. FS HH-I-574 - Insulation, Thermal (Perlite).

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.

1.5 COORDINATION

Coordinate the Work with masonry Section 04300 for placement of insulation materials.

PART 2 - PRODUCTS

2.1 MATERIALS

Granular Insulation: ANSI/ASTM C549, FS HH-I-574 Perlite type, water repellent, fire resistant, flame/fuel/smoke contribution of 0/0/0 in accordance with ANSI/ASTM E84, Type 2 for poured application.

PART 3 - EXECUTION

3. 1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

B. Verify spaces are free of mortar to allow free flow of insulation.

3.2 PREPARATION

Verify holes and openings have been sealed to prevent escape of insulation.

3.3 INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Place after masonry wall has sufficiently dried and attained optimum moisture content. Place prior to covering cores with bond beams or lintels.

C. Place as wall is erected. Completely fill spaces. Place in lifts. Do not exceed 6 ft pouring height.

END OF SECTION

SECTION 07270

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: A firestopping system consisting of fiberglass insulation and a setting type sealing compound for penetrations in fire-rated floors and walls as follows:

1. Cast-in-place concrete floors.
2. Precast concrete floors.
3. Cast-in-place concrete walls.
4. Masonry walls.
5. Plaster partitions.
6. Veneer plaster partitions.
7. Gypsum board partitions.
8. Shaftwalls.
9. Area separation walls.
10. All Fire Rated walls

B. Related Sections:

1. Section 03300, Cast-In-Place Concrete.
2. Section 03400, Precast Concrete.
3. Section 04200, Unit Masonry.
4. Section 09210, Plaster.
5. Section 09215, Veneer Plaster.
6. Section 09250, Gypsum Board.

7. Section 09265, Area Separation Walls.

8. Section 09950, Prefinished Gypsum Wall Panels.

1.2 REFERENCES

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

1. C 569, Test Method for Indentation Hardness of Preformed Thermal Insulations.

2. C 665, Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

3. E 84, Test Method for Surface Burning Characteristics of Building Materials.

4. E 119, Standard Methods for Fire Tests of Building Construction and Materials.

5. E 814, Standard Methods for Fire Tests of Through-Penetration Fire Stops.

B. Underwriters Laboratories, Inc. (UL):

1. UL 263, Fire Tests of Building Construction and Materials.

2. UL 723, Surface Burning Characteristics of Building Materials.

3. ANSI/UL 1479, Fire Tests of Through-Penetration Firestops.

1.3 SYSTEM DESCRIPTION

Performance Requirements: Provide firestopping systems that meet the requirements for an F Rating, for time periods equal to or exceeding the fire resistance ratings of the construction assemblies being penetrated, when tested in accordance with ASTM E 814 or ANSI/UL 1479.

1.4 SUBMITTALS

A. Product Data: Manufacturer’s specifications and installation instructions for each product specified.

B. Shop Drawings: Show materials and installation details for penetrations in each type of construction to be firestopped. Shop Drawings are not required for types of penetrations illustrated in the Product Data.

C. Quality Control Submittals:

1. Test Reports: Showing that firestopping system has been tested and that it meets the specified Performance Requirements.

2. Certificates:

a. Manufacturer's certification that the products provided comply with local regulations controlling the use of volatile organic compounds (VOCs) and are nontoxic.

b. Contractor's certification that the installer has the specified experience.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Experience in the installation of firestopping that is similar in material, design, and extent to the firestopping indicated for this Project.

B. Mock-Ups:

1. Install a mock-up of each type of floor and wall penetration firestop to show materials used and quality of workmanship. Obtain the Architect's approval of mock-up locations.

2. Do not start firestopping work until mock-ups are approved by the Architect. Remove mock-ups that are not approved and provide additional mock-ups, at the same location, as necessary to obtain approval.

3. Approved mock-ups may be left in place as part of the Work.

C. Pre-Installation Conference: Prior to beginning of firestopping, hold a meeting at the job site with the firestopping material's manufacturer and installer to review the firestopping requirements. Notify the Owner and Architect at least 3 days in advance of the meeting.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Shipping: Have materials shipped in manufacturer's original packages showing manufacturer's name and product brand name.

B. Storage and Protection: Store materials inside and protected from damage by the elements.

1.7 PROJECT CONDITIONS

Environmental Requirements: Install firestopping only after the building is enclosed and the permanent heating, ventilating, and air conditioning system is in operation. Maintain the temperature in the building at 40 deg. F or above during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. National Gypsum Co.

B. United States Gypsum

C. Hilti

D. 3M

2.2 MATERIALS

A. Insulation: A combination of mineral fibers manufactured from glass and thermosetting resins, with a min. density of 0.5 pcf, complying with ASTM C 665, Type I (blankets without membrane facing).

B. Sealing Compound: A lightweight, low density, vinyl based, non-asbestos setting compound formulated to mix easily with water (Gold Bond Sta-Smooth FS 90 Fire-Shield Compound Fire and Smoke Stop).

PART 3 - EXECUTION

3.1 INSTALLATION

In accordance with the manufacturer's recommendations.

3.2 PROTECTION

A. Protect firestopping installations from damage and deterioration until the date of Substantial Completion.

END OF SECTION

SECTION 07410

PREFORMED METAL ROOFING, SIDING & SOFFIT

PART 1 - GENERAL

1.1 WORK INCLUDED

Preformed metal siding system for fascias and perforated metal soffit with related structural support brackets, flashings, and accessory components. Standing seam metal roofing.

1.2 RELATED WORK

A. Section 05500: Structural Steel Framing.

B. Section 07600: Flashing and Sheet Metal

1.3 REFERENCED STANDARDS

A. ANSI/ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.

B. ANSI/ASTM A446 - Steel Sheet, Zinc Coated Galvanized by the Hot-Dip Process, Structural Quality.

C. ANSI/ASTM D226 - Asphalt-Saturated Roofing Felt Used in Roofing and Waterproofing.

D. ASTM B209 - Aluminum-Alloy Sheet and Plate.

E. ASTM E84 - Surface Burning Characteristics of Building Materials.

F. AISI - Specification for the design of cold-forming steel structural members.

G SMACNA - Architectural sheet metal manual.

H. UL 580-80 - Standards for test for wind-uplift resistance of roof assemblies.

1.4 DESIGN AND PERFORMANCE CRITERIA

A. Thermal Movement

1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

2. Interface between panel and clip shall provide for minimum three inches of thermal movement in each direction along the longitudinal direction.

B. Uniform wind load capacity: Installed roof system shall withstand positive and negative design wind loading pressures complying with ASTM E330, class I-90.

C. Static pressure air infiltration complying with ASTM E283

1. Static pressure water infiltration complying with ASTM E331.

2. Water penetration complying with AAMA 501.1.

1.5 SUBMITTALS

A. Prepare and submit shop drawings and product data in accordance with Section 01300.

B. Indicate dimensioning, panel layout, profiles, sizes of members, construction details, method of anchorage, fasteners, structural design calculations and method and sequence of installation and trim.

C. Submit manufacturer's installation instruction and color samples for selection in accordance with Section 01300.

1.6 WARRANTY

A. Furnish manufacturer's standard 20-year warranty stating architectural fluorocarbon finish will be:

2. Free of fading or color change in excess of 5 NBS units as measured per, ASTM D 2244-68;

3. Will not chalk in excess of numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D 659-74;

4. Will not peel, crack, chip or delaminate.

B. Furnish written warranty signed by applicator for two-year period from date of substantial completion of building covering repairs required to maintain roof and

flashing in watertight conditions.

C. Warranties shall commence on date of Substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Fascia Panel: Special 1/2" Rib Panel as manufactured by Ventaire Corporation or approved equal.

B. Soffit Panel : Perforated; Ventaire Corporation; "Rollex".

C. Standing Seam Metal Roof: IMETCO, Series 300 standing seam roofing system or approved equal.

D. Decorative Structural Decking: 3" x 16" aluminum ceilok; manufactured by Ventaire Corporation.

E. Allowed substitutions: Items of same function and performance are acceptable in conformance with Section 01600.

2.2 MATERIALS

A. Fascia Panel: special 1/2" Rib Panel: ASTM B209 grade aluminum alloy; 0.032 minimum thickness; 1.0 mil minimum dry film thickness Kynar 500 paint finish.

1. Minimum 24 gauge sheet stock steel or 0.032 inches thickness aluminum; profile as shown on drawings; nominal 36 inches wide panel; lapped edges.

2. Internal and External Corners: Same materials, thickness and finish as Fascia; profile to suit system; brake formed; mitered to required angles; mitered to required angles; mitered internal corners, back braced with minimum 24 gauge sheet stick, to maintain continuity of profile.

3. Expansion Joints: Same material and thickness as Fascia panels where exposed finish panels; manufacturer's standard brake formed type, of profile to suit system. Exposed fasteners same finish as Fascia system.

4. Trim, Closure Pieces, Caps, and In fills: Same material, and where exposed, finish as sheet stock Fascia panels; brake formed to required profiles.

5. Anchorage and Support Members: Minimum 18 gauge thick galvanized steel; shape, size, and spacing determined by manufacturer's engineering design.

6. Fasteners: Manufacturer's standard type to suit application.

7. Bituminous paint: Type recommended by manufacturer.

B. Decorative Structural Decking: ASTM B209 grade aluminum alloy: 0.050 minimum thickness; 1.0 mill minimum dry film thickness Kynar 500 paint finish.

C. Soffit Panel: 22 gauge pre-coated aluminum alloy, lapped edges.

D. Standing seam metal roofing (Batten Type):

1. Panel material .032, thickness equal to 3003-H14 Aluminum alloy, smooth surface per ASTM B209.

2. Flashing and flat stock material fabricated of same material, thickness and finish as roofing system.

3. Seam minimum height, 2 3/8".

4. Batten panel width, 11".

5. Panel length, full length without joints.

6. Stiffing ribs, located in flat of panel to minimize oil canning and telegraphing of structural members, 3/8" maximum height.

7. Seam Cap, snap on cap shall be of continuous length up to 45 feet. Cap shall be designed to receive continuous gasketing sealant. Caps shall be seamed by means of manufacturer's standard seaming machine.

8. Anchor clips, clips shall have projecting legs for panel alignment and provision for thermal movement. Batten seam styles 311-B aluminum alloy 6061-T6 minimum thickness .090".

9. Closures, factory pre-cut cell foam meeting ASTM D3575 a cross-linked closed cell polyolefin foam, enclosed in a metal channel matching panels when used at hip and ridge.

10. Provide all miscellaneous accessories for complete installation.

2.3 SUPPORT FRAMEWORK

ASTM A36 steel; ANSI/ASTM A153 1.25 oz./sq. ft.

2.4 FINISH

A. Face Finish: Kynar 500 fluoropolymer paint; 1.0 mil minimum thickness; color to match base standard.

B. Back Face Finish: Kynar 500 fluoropolymer paint; 1.0 mil minimum thickness; color to be white.

C. Support Framework: Shop prime 3.2 mil minimum wet film thickness and 2 coats alkyd enamel paint finish 3.6 mils minimum wet film thickness per coat (refer to paint Specifications Section 09900).

D. Touch-up Paint: As recommended by manufacturer.

E. **Custom Color**: Color to match "Terra Cotta", as approved by the Base Civil Engineer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect installed work of other trades and determine if substrate is acceptable to receive work of this section.

B. Notify Contracting Officer in writing if deficiencies are present that will prevent the proper installation of the systems.

C. Beginning of installation means acceptance of substrate conditions.

3.2 INSTALLATION

A. Fascia panels:

1. Install framework and related items in accordance with manufacturer's instructions and maintain neat appearance.

2. Remove debris from site.

3. Permanently fasten Fascia system to structure; align, level and plumb, within specified tolerance. Provide expansion control joints where necessary.

4. Protect contact points of dissimilar metals from galvanic reaction with bituminous paint.

5. Tolerances.

   a. Maximum offset from true alignment between adjacent members butting or in line: 1/16 inch.
   b. Maximum variation from plane or location indicated on drawings: 1/8 inch.

6. Touch up exposed fasteners using paint furnished by panel manufacturer and matching exposed panel surface finish.

7. Clean exposed surfaces of roofing and accessories after completion on installation. Touch up minor abrasions and scratches in finish.

B. Standing seam roofing:

1. Install roofing and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

2. Install 30# roofing felt between plywood substrate and roofing panels.

3. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate and panels.

4. Limit exposed fasteners to extent indicated on shop drawings.

5. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.

6. Seal laps and joints in accordance with roofing systems manufacture's product data.

7. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with standards of SMACNA manual using continuous cleats at all exposed edges.

8. Installed system shall be true to line and plane and free of dents and

physical defects with a minimum of oil canning.

9. Remove damaged work and replace with new, undamaged components.

11. Touch up exposed fasteners using paint furnished by panel manufacturer and matching exposed panel surface finish.

12. Clean exposed surfaces of roofing and accessories after completion on installation. Touch up minor abrasions and scratches in finish.

C. Decorative Structural Decking:

1. Install roofing and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

2. Limit exposed fasteners to extent indicated on shop drawings.

3. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations.

4. Installed system shall be true to line and plane and free of dents and physical defects with a minimum of oil canning.

5. Remove damaged work and replace with new, undamaged components.

6. Touch up exposed fasteners using paint furnished by panel manufacturer and matching exposed panel surface finish.

7. Clean exposed surfaces of roofing and accessories after completion on installation. Touch up minor abrasions and scratches in finish.

D. Soffit Panel

1. Limit exposed fasteners to extent indicated on shop drawings.

2. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations.

(8) Installed system shall be true to line and plane and free of dents and physical defects with a minimum of oil canning.

4. Remove damaged work and replace with new, undamaged components.

5. Touch up exposed fasteners using paint furnished by panel manufacturer and matching exposed panel surface finish.

6. Clean exposed surfaces of roofing and accessories after completion on installation. Touch up minor abrasions and scratches in finish.

7. All trim shall match in color and finish that of adjacent panels.

END OF SECTION

SECTION 07511

BUILT-UP ASPHALT ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following: Asphalt glass-fiber felt roof membrane with aggregate surface.

B. This Section also includes the following roofing related work:

1. Roof insulation.

2. Vapor retarder.

C. Related Sections: The following Sections contain requirements related to this Section:

1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and wood cants.

2. Division 7 Section "Flashing and Sheet Metal" for metal counter flashings.

1.3 DEFINITIONS

A. Thermal Resistivity (r-value) is the reciprocal of thermal conductivity (k-value) which is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees F between two parallel surfaces required to cause 1 Btu to flow through 1 sq. ft. of a homogenous material exactly 1 inch thick per hour at the mean temperature indicated.

B. Thermal Resistance (R-value) is the reciprocal of thermal conductance (C-value) which is the rate of heat flow through a material of the thickness indicated. Thermal resistance (R-value) is expressed by the temperature difference in degrees F between the two exposed faces required to cause 1 Btu to flow through 1 sq. ft. per

hour at the mean temperature indicated.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Product data, including manufacturer's technical product information, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements. For asphalt bitumen, provide a label on each container or certification with each load of bulk bitumen, indicating flash point (FP), softening point (SP), and equiviscous temperature (EVT).

C. Manufacturer's Certification indicating that all bulk bituminous materials delivered to Project comply with required standards. Include quantity and statistical and descriptive data for each product. Submit certificate with each load before it is used. Include continuous log showing time and temperature for each load of bulk bitumen, indicating date obtained from manufacturer, where held, and how transported prior to final heating and application on roof.

D. Field Test Reports: Submit daily softening-point test reports on samples of asphalt used on Project, taken at beginning of each day's work and at 2-hour intervals during course of the work thereafter. Use Ring and Ball Test, ASTM D 36, or similar recognized test method. Submit samples to independent laboratory for testing or perform tests in field at Contractor's option.

E. Samples of the following:

1. 3-lb sample of aggregate surfacing material.

2. 12-by-12-inch square samples of each color mineral surface cap sheets to be exposed as finished roof surface.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer (Roofer) to perform built-up asphalt roofing work who has specialized in installing built-up asphalt roofing systems similar to that required for this Project and who is acceptable to manufacturer of primary roofing materials.

1. Installer Certification: Obtain written certification from manufacturer of built-up roofing system certifying that Installer is approved by manufacturer to install specified roofing system. Provide copy of certification for

Contracting Officer prior to awarding roofing work.

2. Installer's Field Supervision: Require Installer to maintain a full-time supervisor/foreman who is on job site during times that built-up asphalt roofing work is in progress and who is experienced in installing roofing systems similar to type and scope required for this Project.

B. Manufacturer Qualifications: Obtain primary products, including each type of roofing sheet (felt), bitumen, composition flashings, and any vapor retarder, from a single manufacturer. Provide secondary products as recommended by manufacturer of primary products to use with roofing system specified.

C. Insurance Certification: Assist Government in preparing and submitting roof installation acceptance certification as necessary in connection with fire and extended-coverage insurance on roofing and associated work.

D. UL Listing: Provide built-up roofing system and component materials that have been tested for application and slopes indicated and that are listed by UL for Class A external fire exposure.

1. Provide roof-covering materials bearing UL Classification Marking on bundle, package, or container indicating that materials have been produced under UL's Classification and Follow-up Service.

2. Provide built-up roofing system that can be installed to comply with UL requirements for Fire Classified and Class 60 uplift resistance requirements.

E. FM Listing: Provide built-up roofing system and component materials that have been evaluated by FM System for fire spread, uplift resistance, and hail damage and are listed in "Factory Mutual Approval Guide" for Class I construction. Provide roof covering materials bearing FM approval marking on bundle, package, or container, indicating that material has been subjected to FM's examination and follow-up inspection service.

F. Fire Performance Characteristics: Provide insulation materials that are identical to materials whose fire performance characteristics, per requirements listed in Part 2 of this Section, have been determined from tests by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

G. Pre-Roofing Conference: Approximately 1 week prior to scheduled commencement of built-up roofing installation and associated work, meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work--including mechanical work, Contracting Officer roofing system manufacturer's representative, and other representatives directly concerned with

work performance, including Government's insurers, test agencies, and governing authorities, where applicable.

1. Review foreseeable methods and procedures related to roofing work, including, but not necessarily limited to, the following:

    a. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, curbs, penetrations, and other preparatory work performed by other trades.
    b. Review structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.
    c. Review roofing system requirements: drawings, specifications, and other contract documents.
    d. Review required submittals, both complete and incomplete.
    e. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    f. Review required inspection, testing, certifying, and material use accounting procedures.
    g. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing, if it is not a mandatory requirement.

2. Record (Contractor) discussions of conference, including decisions and agreements or disagreements reached, and furnish a copy for each attendee. If substantial disagreements exist at the conclusion of the conference, determine how disagreements will be resolved and set a date for reconvening the conference.

1.6 PROJECT CONDITIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements.

B. Temporary Roofing: When adverse job conditions or weather conditions prevent permanent roofing and associated work from being installed according to requirements and Contractor determines that roofing cannot be delayed because of need for job progress or protection of other work, install temporary roofing. Engage roofing installer to provide temporary roofing and to remove it prior to proceeding with permanent roofing work.

1.7 DELIVERY, STORAGE, AND HANDLING

Store and handle roofing materials to ensure dryness. Store in a dry, well-ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end on pallets or another raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deck deflection.

1.8 WARRANTY

A. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's standard Limited Service Warranty agreement, including flashing endorsement, signed by an authorized representative of built-up roofing system manufacturer, on form that was published with product literature as of date of Contract Documents.

B. Warranty Period: 20 years from date of Substantial Completion.

C. The warranty shall not deprive the Government of other rights the Government may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 TEMPORARY ROOFING

Temporary Roofing Membrane: Two plies of asphalt, glass-fiber felt complying with ASTM D 2178, Type IV, set in and glaze-coated with hot moppings of ASTM D 312, Type III asphalt. Provide base of rigid perlite or glass-fiber board roof insulation over metal deck surfaces of minimum thickness as required to span between top flutes of deck without deflection, but not less than 3/4 inch. Attach to deck with FM-approved fasteners.

2.2 VAPOR RETARDER

Bituminous Vapor Retarder: Two plies of asphalt, glass-fiber felt, complying with ASTM D 2178, Type IV, set in and glaze-coated with ASTM D 312, Type III asphalt. Provide rigid perlite or glass-fiber board roof insulation substrate over metal deck surfaces, thickness as required to span flutes without deflection, but not less than 1 inch. Mechanically fasten to deck.

2.3 ROOF INSULATION

A. Polyisocyanurate Foam Board: Rigid boards of minimum 2.0 pcf density

polyisocyanurate-based foam core, permanently bonded to roofing felt facer sheets. Provide in thickness required with minimum aged r-value of 20.00, when conditioned per RIC/TIMA Bulletin No. 281-1.

B. Insulated-Deck, Asphalt, Glass-Fiber, Aggregate Roofing (IAGA-BUR): Provide built-up, aggregate-surfaced roof system with asphalt bitumen, vented base sheet, and three plies of glass-fiber felts for layup as follows:

1. Primer: Asphalt, cut-back primer, complying with ASTM D 41.

2. Base Ply: Asphalt, glass-fiber felt complying with ASTM D 2178, Type IV.

3. Base Sheet: Single ply of asphalt-coated, heavyweight, glass-fiber felt.

4. Ply Felts: Three plies of asphalt-impregnated, glass-fiber felts, complying with ASTM D 2178, Type IV.

5. Bitumen: Roofing asphalt, complying with ASTM D 312, Type II.

6. Comply with NRCA "Roofing and Waterproofing Manual," Specification Plate 42--IAGA, Diagram A.

7. Comply with NRCA "Roofing and Waterproofing Manual," Specification Plate 52--CAGA, Diagram A.

8. Available Products: Subject to compliance with requirements, built-up asphalt roofing systems that may be incorporated in the Work include, but are not limited to, the following:

9. Products: Subject to compliance with requirements, provide one of the following built-up asphalt roofing system systems:

a. Celotex Corp.; Specification G.A.-4-C-G.
b. GAF Corp.; Specification I-O-4-G.
c. GS Roofing Products Co.; Specification AAA-3-2.
d. Manville Building Materials Corp.; Specification 4GIG.
e. Owens-Corning Fiberglas Corp.; Specification 41-IG.
f. Tamko Asphalt Products, Inc.; Specification 503.

2.4 BUILT-UP ASPHALT ROOFING SYSTEM EDGE/PENETRATION MATERIALS

A. Roofing Cement: Asphaltic cement, asbestos-free, complying with ASTM D 4586.

B. Glass-Fiber Fabric: Minimum 1.5-lb woven glass-fiber sheet impregnated with

asphalt, complying with ASTM D 1668.

C. Preformed Edge Strips: Rigid insulation units matching roof insulation, or asphalt-impregnated organic-fiber insulation units, molded to form 3-1/2-by-3-1/2-inch by 45-degree cant strips and 1-5/8-by-18-inch tapered-edge strips to receive roofing ply-sheet courses and lift edges above main roofing surface.

2.5 SHEET METAL ACCESSORY MATERIALS

A. Coordinate below with Section 07600, "Flashing and Sheet Metal."

B. Zinc-Coated Steel: ASTM A 526, with 0.20 percent copper, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359 inch thick (20 gage), unless indicated otherwise.

C. Stainless Steel: ASTM A 167, AISI type 302/304, No. 2D finish, temper as required for forming and performance; 0.015 inch thick (28 gage), unless indicated otherwise.

D. Copper: ASTM B 370, cold-rolled, unless soft temper required for forming and performance; 16 oz., 0.0216 inch thick, unless indicated otherwise.

E. Lead-Coated Copper: ASTM B 101, Type I, Class A, coated one side, except coated both sides where both exposed, cold-rolled, unless soft temper required for forming and performance; 16-oz. sheet before coating (0.0216 inch thick), unless indicated otherwise.

F. Aluminum: ASTM B 209, alloy 3003, temper H 14, unless harder temper required for forming and performance, AA-C22A41 clear-anodized finish; 0.032 inch thick (20 gage), unless indicated otherwise.

G. Solder for Sheet Metal: Unless indicated otherwise or recommended by metal manufacturer, provide 50:50 tin/lead type (ASTM B 32) for tinning and soldering joints; use rosin flux. Solder stainless steel joints with 60:40 tin/lead type solder.

2.6 SURFACING AGGREGATE

A. Clean, water-worn, opaque gravel complying with ASTM D 1863.

B. Crushed slag complying with ASTM D 1863.

C. Crushed stone, free of sharp edges, complying with ASTM D 1863. Where ASTM D 1863 aggregate is not available, provide aggregate complying with gradation sizes 6, 7, and 67 of ASTM D 448, provided that moisture content by weight is 3

percent or less and aggregate meets other requirements of ASTM D 1863.

2.7 MISCELLANEOUS MATERIALS

A. Wood Members, Units: Comply with requirements of "Rough Carpentry" Section for nailers, walkway units, and other wood members indicated as roofing system work. Provide wood pressure treated with waterborne preservatives for above-ground use (AWPB LP-2).

B. Walkway Protection Boards: Mineral-surfaced, bituminous composition boards, approximately 1/2 inch thick, manufactured specifically for hot bituminous application on built-up roofing as a protection course for foot traffic.

1. Available Products: Subject to compliance with requirements, products may be incorporated in the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:

a. Carey-Tread, Celotex Corp.
b. J-Walk, Manville Building Materials Corp.
c. White Walk, W.R. Meadows, Inc.

C. Substrate Joint Tape: 6-inch- or 8-inch-wide, coated, glass-fiber joint tape.

D. Asphaltic Primer: Comply with ASTM D 41.

E. Fasteners: Provide industry-standard types of mechanical fasteners for built-up asphalt roofing system work, tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1-inch-diameter nail heads or 1-3/8-inch-diameter by 30-gage sheet metal caps for nails used to secure base sheets, felts, or insulation boards of roofing system.

2.8 FABRICATING SHEET METAL ACCESSORIES

A. SMACNA and NRCA Details: Conform metal work with details shown and with applicable fabrication requirements of Architectural Sheet Metal Manual by SMACNA. Comply with installation details of NRCA Roofing and Waterproofing Manual.

B. Prefabricate units as indicated or provide standard manufactured units complying with requirements; fabricate from sheet metal indicated or, if not otherwise indicated, from lead-coated copper.

C. Provide 4-inch-wide flanges set in roofing cement for applying built-up asphalt roofing system membrane concealed by composition stripping.

D. Fabricate work with flat-lock soldered joints and seams; except where joint movement is necessary, provide 1-inch-deep interlocking hooked flanges filled with mastic sealant.

E. Fabricate roof insulation vents with 4-inch-diameter stack, 12 inches high, filled with glass-fiber insulation. Equip stack with 6-inch-diameter by 3-inch-high weatherproof vent cap.

F. Fabricate penetration sleeves with minimum 8-inch-high stack of diameter 1 inch larger than penetrating element. Counterflashing is specified as work of another section of these specifications.

PART 3 - EXECUTION

3.1 INSPECTING SUBSTRATE

A. Examine substrate surfaces to receive built-up roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Verify that flatness and fastening of metal roof decks comply with the following:

1. Top Flanges: No concavity or convexity in excess of 1/16 inch across any three adjacent flanges.

2. Side Laps: Properly nested and mechanically fastened at a maximum spacing of 3 feet o.c.

3. End Laps: Minimum 2-inch laps located over and fastened to supports.

4. Deck secured to each supporting member in every other rib, maximum spacing 12 inches o.c., with puddle welds or approved mechanical fasteners.

C. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane. Check for proper spacing between adjacent wood panels.

D. Test concrete substrate for excessive moisture by pouring 1 pint of hot bitumen at 400 deg F (204 deg C) or Equiviscous Temperature Method (ETM) on deck at start

of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling--then substrate is too wet.

3.2 GENERAL INSTALLATION REQUIREMENTS

A Cooperate with inspection and test agencies engaged or required to perform services in connection with installing built-up roofing system.

B. Protect other work from spillage of built-up roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace/restore other work damaged when installing built-up roofing system work.

C. Insurance/Code Compliance: Install and test, where required, built-up roofing system to comply with governing regulations and the following insurance requirements:

1. FM requirements for Class I or Noncombustible, including zoned wind resistance as specified by FM.

2. UL Fire Classified and Class 60 uplift resistance.

D. Coordinate installing insulation, roofing sheets, flashings, stripping, coatings, and surfacings so that insulation and felts are not exposed to precipitation or exposed overnight. Provide cutoffs at end of each day's work to cover exposed felts and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cutoffs immediately before resuming work.

E. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT more than 1 hour prior to application. Discard bitumen that has been held at a temperature exceeding finished blowing temperature (FBT) for more than 3 hours. Determine flash point, FBT and EVT of bitumen, either by information from bitumen producer or by suitable tests. Determine maximum fire-safe handling temperature and do not exceed that temperature in heating bitumen. In no case heat bitumen to a temperature higher than 25 deg F (minus 4 deg C) below flash point. For aggregate-surfaced pour coats of bitumen, limit application temperature to minimum required for proper aggregate embedment and maximum that will permit retaining a coating of weight required (depends on slope of surface). Keep kettle lid closed except when adding bitumen.

F. Bitumen Mopping Weights: For interply mopping, and for other moppings except as otherwise indicated, apply bitumen between plies at the rate of 25 lb of asphalt per roof square (plus or minus 20 percent on a total-job average basis).

G. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or damage insulation, vapor retarders, or other construction. Where mopping is applied directly to a substrate, tape joints or, in the case of steep asphalt, hold mopping back 2 inches from both sides of each joint.

H. Cutoffs: At the end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of the next day's work. Glaze-coat areas of completed organic ply sheets that cannot be flood-coated and aggregate-surfaced before the end of each day's work.

3.2 TEMPORARY ROOF INSTALLATION

A. Temporary Roofing over Nailable Decks: Apply two plies of No. 15 asphalt-impregnated roofing felt, lapping each felt 19 inches (plus or minus 1/2 inch) over preceding one, mopping between felts with Type III asphalt at a rate of 20 lb per square (plus or minus 25 percent on a total-job average basis). Nail each felt 9 inches o.c. at a line approximately 2 inches down from concealed edge. Glaze-coat completed surface with Type III asphalt at rate of 20 lb per square (plus or minus 25 percent on a total-job average basis).

1. Install one lapped course of loose rosin-sized building paper before installing temporary roofing on wood or plywood decks.

2. Comply with NRCA "Built-Up Roofing Manual" Specification 10-TR and Diagram TR-N.

B. Temporary Roofing on Nonnailable Decks (Except Steel): Prime deck with 0.75 gallons of asphaltic primer per square. Apply two plies of No. 15 asphalt-impregnated roofing felt, lapping each felt 19 inches (plus or minus 1/2 inch) over preceding one. Solid mop between felt laps and spot mop felts to deck with 6-inch-diameter spots spaced 24 inches o.c., using Type III asphalt at a rate of 20 lb per square (plus or minus 25 percent). Glaze-coat completed surface with Type III asphalt at rate of 20 lb per square (plus or minus 25 percent). Comply with NRCA "Built-Up Roofing Manual" Specification 10-TR and Diagram TR-C.

C. Temporary Roofing on Steel Decks: Apply continuous ribbons of Type III hot asphalt to deck at 6 inches o.c.; thickness sufficient to spread to 2 inches in width when insulation is placed. Install one course of perlite-board or wood fiberboard roof insulation in hot asphalt; thickness required to span deck flutes but not less than 1/2 inch thick. Apply two plies of No. 15 asphalt-impregnated roofing felt, lapping each felt 19 inches over preceding one. Solid mop 20 lb per square (plus or minus 25 percent) of Type III asphalt between felts and to fiberboard. Glaze-coat

completed surface with Type III asphalt at rate of 20 lb per square (plus or minus 25 percent). Comply with NRCA "Built-Up Roofing Manual" Specification 10-TR and Diagram TR-SI.

D. Remove temporary roof completely prior to installing permanent roofing system.

3.3 INSTALLING INSULATION

A. General: Comply with insulation manufacturer's instructions and recommendations handling, installing, and bonding or anchoring insulation to substrate.

B. Prime surface of concrete deck with asphalt primer at rate of 3/4 gallon of primer per 100 sq. ft. and allow primer to dry.

C. Set insulation in hot solid mopping of Type III asphalt, applied within temperature range of EVT plus or minus 25 deg F (minus 4 deg C) and at rate of 25 lb per 100 sq. ft. (plus or minus 25 percent on total-job average basis). Run long joints of insulation in continuous straight line, perpendicular to roof slope, with end joints staggered between rows.

D. Secure insulation to deck using mechanical fasteners specifically designed and sized for attaching specified board-type insulation to deck type shown. Fasten insulation over entire area of roofing at spacing as required by FM for Windstorm Resistance Classification I-60. Run long joints for insulation in continuous straight lines, perpendicular to roof slope with end joints staggered between rows.

E. Two-Layer Installation: Where overall insulation thickness is 2 inches or greater, install required thickness in two layers with joints of second layer offset from joints of first layer a minimum of 12 inches each direction. Install second layer in full mopping of hot Type III asphalt applied within temperature range of EVT plus or minus 25 deg F (minus 4 deg C) and at rate of 25 lb per 100 sq. ft. (plus or minus 25 percent on total-job average basis).

F. Trim surface of insulation where necessary at roof drains so completed surface is flush with drain ring.

G. Nailers: Where insulated substrates slope more than 1/2 inch per foot, install wood nailers of same thickness as insulation, set between insulation boards and spaced not more than 20 to 21 feet apart, depending on insulation board size. Anchor nailers to substrate. Run nailers perpendicular to slope of roof unless otherwise indicated.

3.4 ROOF MEMBRANE INSTALLATION

A. Shingling Plies: Except as otherwise indicated, install membrane with ply sheets

shingled uniformly to achieve required amount of membrane thickness throughout. Shingle in proper direction to shed water on each large area of roofing where slope is significant (over 1/2 inch per foot).

B. Nailing, General: Comply with governing regulations, insurance requirements, prime roofing manufacturer's recommendations, and recognized industry standards, but not less than one nail per 1.5 sq. ft. of built-up roofing. Where possible, nail simultaneously through two ply sheets by nailing at laps as second sheet is installed. Where nailing is to prevent slippage, nail each sheet of built-up roofing membrane. On non-nailable substrates, nail membrane to each nailer in substrate. Conceal nailing within ply-sheet makeup of roofing membrane, with no exposed nails before applying roof coatings or aggregate surfacing.

C. Cant Strips/Tapered-Edge Strips: Except as otherwise shown, install preformed 45-degree insulation cant strips at junctures of built-up asphalt roofing system membrane with vertical surface. Provide preformed, tapered-edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

D. Base Ply: Install one lapped course of base ply. Nail to nailable substrates and elsewhere as indicated. Mop to non-nailable substrate with steep asphalt, except use special adhesive where indicated.

E. Interply Sheets: Install the number and type(s) of ply sheets (felts) indicated, lapped (shingled) amount specified to form a continuous, uniform membrane with continuous bitumen moppings between sheets so that ply sheet does not touch ply sheet. As ply-sheet membrane is laid up, glaze-coat top surface with a 20-lb mopping per square of same bitumen.

1. Mop base of membrane to base ply, or directly to substrate if no base ply used.

2. Nail base of membrane to substrate without mopping.

3. Extend built-up roofing membrane to 2 inches (nominal) above top edge of cant strip and terminate.

4. Provide a folded-back envelope at edges and penetrations of built-up roofing membrane where it is not turned up on a tapered strip to provide positive protection against flow of bitumen into building or off the edge. Extend base sheet to form envelope or, where no base sheet is provided, install one ply of coated felt set in steep asphalt with joints sealed. Seal corners and other interruptions of envelope with large beads of roofing cement to protect against bitumen flow.

5. Nail edges of roofing membrane to wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascias. Space nails at minimum 8

inches o.c.

3.5 COMPOSITION FLASHING AND STRIPPING

A. Install composition flashing at cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof. Install one ply of No. 15 asphalt-impregnated organic fabric and one ply of glass-fiber-reinforced flashing, each set in a continuous coating of roofing cement and extended onto deck 4 inches and 6 inches, respectively. Nail or provide other forms of mechanical anchorage of composition flashing to vertical surfaces as recommended by manufacturer of primary roofing materials. Except where concealed by elastic flashing, apply a heavy coating of roofing cement over composition flashing.

B. Install composition stripping where metal flanges are set on roofing. Provide not less than one ply of glass-fiber fabric and one ply of reinforced glass-fiber flashing; set each in a continuous coating of roofing cement and extended onto the deck 4 inches and 6 inches, respectively. Except where concealed by aggregate surfacing or elastic flashing, apply a heavy coating of roofing cement over composition stripping.

C. Allow for expansion of running metal flashing and edge trim that adjoins roofing.

D. Counter-Flashings: Counter-flashings, cap flashings, expansion joints, and similar work to be coordinated with built-up roofing work are specified in other sections of these specifications.

E. Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other devices, and any major items of roof accessories to be coordinated with built-up roofing system work are specified in other sections of these specifications.

F. Aggregate Surfacing: Promptly after completing built-up roof membrane, edge treatment and set-on accessories in each substantial area of roofing, flood-coat surface as indicated and, while each small area is hot and fluid, cast the following approximate weight of aggregate in a uniform course.

1. Flood Coat: 60 lb per square of Type II or Type III asphalt; except provide steep asphalt where slope exceeds 3/4 inch per foot.

2. Aggregate: Slag, averaging 400 lb per square.

3. Aggregate: Gravel, averaging 500 lb per square.

4. Do not install flood coating of bitumen and aggregate surface source at of roofing edges until composition flashing and stripping work has been

completed. Glaze-coat ply sheet courses where surfacing cannot be installed on the same day. Delay aggregate surfacing only as long as necessary to substantially complete edge work and any tests.

G. Cap Sheet Surfacing: Promptly after completion of ply-sheet membrane (same day where possible), apply one lapped course of cap sheet-type indicated. Set cap sheet in uniform mopping of same hot bitumen used in ply-sheet courses, at average rate of 15 lb per square. Lap ends 6 inches minimum.

3.6 ROOF WALKWAYS

Composition Board Walkways: Provide walkway protection boards at locations shown, using units of size shown or, if size not shown, using units of manufacturer's standard size, 1/2 inch thick. Set units in additional pour coat of hot bitumen after aggregate surfacing of built-up roof membrane.

3.7 PROTECTING ROOFING

A. Upon completing roofing, including associated work, institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, inspect roofing and prepare a written report with copies to Contracting Officer describing nature and extent of deterioration or damage found.

B. Repair or replace, as required, deteriorated or defective work found at time of above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to requirements of specified warranty.

END OF SECTION 07511

SECTION 07530

ADHERED SINGLE PLY EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Removal and replacement of existing roof membrane and wet insulation if applicable.

B. Roof Applicator's 2-year guarantee for labor and material against leaks with no financial limit, and Manufacturer's 20 year material and labor warranty.

C. Flashing of roof perimeter metal, offsets and roof penetrations.

D. Installation of tapered roof insulation underlayment to achieve slopes shown on roof plan at new construction. Average of R=30 insulation value.

E. Treating, overlay or replacement of rusted metal roof deck.

F. Factory Mutual FM I-60 Wind Up-lift Design. (It should be assumed that the existing deck and roof structure will meet FM I-60 requirements for substrate, if not indicated, no actual approval of this specific job site is required by Factory Mutual.)

G. Class "A" and Factory Mutual Class 1 fire resistance rating for insulation and membrane as tested for low slope roofs of 2:12 or less.

1.2 RELATED WORK

A. Section 06114 - Wood blocking, nailers, and sleepers.

B. Section 07600 - Metal flashings.

C. Section 07631 - Pre-finished metal gutters and downspouts.

D. Section 07900 - Sealants.

E. Division 15 - Piping penetrations.

F. Division 16 - Electrical penetrations.

1.3 REFERENCE STANDARDS

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

B. D297 - Methods for Rubber Products, Chemical Analysis.

C. D412 - Test Methods for Rubber Properties in Tension.

D. D471 - Test Method for Rubber, Effect of Liquids.

E. D573 - Test Method for Rubber, Deterioration in an Air Oven.

F. D624 - Test Method for Rubber Property, Tear Resistance.

G. D815 - Test Method for Rubber, Rubber Cements Strength.

H. D1149 - Test Method for Rubber Deterioration, Surface Ozone Cracking in a Chamber (Flat Specimen)

I. D1204 - Test Method for Linear Dimensional Changes of Non-Rigid Thermoplastic Sheeting of Film at Elevated Temperatures.

J. D2137 - Test Methods for Rubber and Rubber-Coated Fabrics, Brittleness Temperature by Impact.

K. Factory Mutual (FM) Class 1 Fire Resistance and I-60 Wind Uplift Specifications.

L. Undewriter's Laboratories (UL) Class "A" fire rating for low slope applications up to 2:12 slope.

1.4 SYSTEM DESCRIPTION

Adhered, white, 60 mil thick unreinforced or 45 mil thick reinforced, FM I-60 wind design class, "A" fire rated, single ply EPDM membrane roofing system. Roof Applicator's 2 year guarantee. Roofing Manufacturer's 10 year materials and 10 years warranty.

1.05 QUALITY CONTROL

A. Manufacturer: Company specializing in single ply roofing membrane manufacture with 3 years experience.

B. Applicator: Company specializing in installation of single ply roofing membranes with 3 years experience, trained and certified or authorized by membrane manufacturer to install work with manufacturer's warranty.

1.6 REGULATORY REQUIREMENTS

A. Factory Mutual (FM): Roof assembly classification, FM Construction Bulletin 1-28, Class I (I-60) Construction.

B. Undewriter's Laboratories (UL) Class "A" fire rating.

1.7 TESTING

A. Fastener pull tests shall be performed by the Contractor on each fastener type and deck type for mechanically fastened insulation and roof membrane system before proceeding with installation. Minimum 300 pounds pull-out strength shall be demonstrated.

B. Failure of pull tests to meet these requirements shall be sufficient cause for rejection of proposed fasteners or treatment of structurally damaged roof deck.

1.8 SUBMITTALS

A. Submit the following data in accordance with with Section 01300.

B. Submit shop drawings detailing lap seams, proposed seam locations special joints or termination conditions, and conditions of interface with other materials and tapered insulation layout patterns and approved fastener pattern to meet wind up lift requirements and insulation adheasive application pattern.

C. Submit product data for sheet membrane, flashing membrane, joint and lap adhesives, primers, sealants, insulation adheasive and insulation.

D. Submit manufacturer's installation data.

E. A letter from the roofing materials applicator stating the specific specification to be used for this building.

F. A letter from the roofing materials manufacturer stating that the roofing membrane meets the requirements for a UL Class "A" fire rating for low slope application up to 2:12 slope and that the applicator is licensed and certified to purchase and install the roofing products and to purchase the manufacturer's guarantee.

G. A sample of the mechanical fasteners and diagram of Factory Mutual approved fastener pattern for FM I-60 wind uplift design with seam locations shown.

H. Proposed adheasive pattern for concrete deck areas to meet FM I-60 wind uplift design.

I. Submit Material Product Safety Data Sheets and all pertinent information as applicable.

J. Upon completion of the roofing installation, and as a condition of its acceptance, deliver to the Owner a 2 year guarantee from the roofing membrane applicator with no limit to liability and the Roof Membrane Manufacturer's 20 year material and 10 year labor warranty against defects and leaks. (Refer to form at end of this section.)

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of the General Conditions.

B. Deliver materials in manufacturer's original containers, dry, undamaged, seals and labels intact.

C. Use all means necessary to protect roofing materials before, during and after installation and to protect the installed work of other trades.

D. Store and protect materials under provisions of the General Conditions.

E. Store membrane, adhesives, primer, pourable sealer and sealants at temperatures between 60 and 80 degrees F. If exposed to lower temperatures, restore to 60 degrees F prior to use.

F. Store materials in a dry area, not exceeding allowable live load of structure.

G. Do not store uncured flashing membrane on roof or at temperatures excceeding 75 degrees F.

H. In the event of damage, immediately make all repairs and replacements necessary for approval of the Base Civil Engineer at no additional cost to Owner.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Contact adhesives, insulation adhesive, and primer are extremely flammable. Avoid open flame, sparks, or smoking while handling.

B. Contact adhesives, insulation adhesive and primers contain petroleum distillates. Avoid breathing vapors or using within an enclosed, non-ventilated area. Comply with all applicable laws regulating use of Volatile Organic Compounds (VOC).

C. All surfaces to be adhered must be dry before and throughout entire application.

D. Do not apply membrane during inclement weather or when air temperature is below freezing.

E. Tear off of existing roof membrane shall be limited to an area which can be reinsulated and reroofed in the same working day and before inclement weather begins.

1.11 COORDINATION REQUIREMENTS

Roofing operations shall be coordinated with demolition and flashing and other related items of construction.

1.12 CONSTRUCTION CONFERENCE

Convene a preconstruction conference one week prior to commencing work after acceptance of submittals.

A. Persons required in attendance:

1. Superintendent

2. Roofing Applicator's Job Foreman.

3. Base Civil Engineer (Owner's Representative).

B. The Architect (Owner’s Representative) shall preside over this meeting and review the following:

1. Submittals.

2. Scheduling.

3. Installation Procedures and Coordination Requirements.

4. Special Job Conditions.

1.13 WARRANTY

Two (2) year guarantee from the Roofing Membrane Applicator with no limit to financial coverage, as described in Part 3 of this Section and including work of Section 07631 and Section 07900 and the manufacturer's (twenty) year material and (ten) year labor only warranty against defects and leaks.

PART 2 - PRODUCTS

2.1 ACCEPTABLE ROOFING MEMBRANE MANUFACTURERS AND SYSTEMS

Acceptable Manufacturers of Fully Adhered Systems:

A. Carlisle Design "A" Sure-Seal Adhered Roofing System.

B. Manville Specification S E 6 A.

C. Fully Adhered System by Kelly Energy Systems, Inc.

D. Gen Flex Fully Adhered Roof System; as manufactured by Gen Corp. Roofing Systems.

E. Firestone Fully Adhered Roofing System.

2.2 SHEET MATERIALS

EPDM Physical Properties:

Property	ASTM Test	Min. Product Spec.
Color	N/A	White
Product Thickness Reinforced or Unreinforced	N/A	60 mil Minimum Thickness
Specific Gravity	D-297	1.28 +/- .03
Tensile Strength	D-412	1,300 psi
Elongation	D-412	300%
Tear Resistance	D-624	125 pli
Ozone Resistance	D-1149	No Cracks in 168 hrs

Accelerated Heat Tensile Strength	D-573	1,200 psi/225% elongation
Water Absorption	D-471	+8% to -2% Max Volume Change
Permeability	E-96	2.0
Dimensional Stability		+/- 2.0% in 168 hrs
Low Temperature Brittleness	D-746	-49 degrees F
Water Vapor Transmission	E-96	.002
Fire Rating UL		Class "A"

2.3 ACCEPTABLE MANUFACTURERS OF NON-TAPERED INSULATION

A. Non-Tapered Insulation Cover Board:

1. Fesco Board as manufactured by Manville, or equal.

2. Wood Fiber Board meeting requirements of FS-LL-I-535A.

a. Celotex.

b. Temple Inland.

c. Recovery Board by Carlisle.

3. Type "X" fire rated 1/2" thick gypsum board by U.S. Gypsum or approved equal.

B. Allowed Substitutions: Items of same function and performance and if acceptable to the roof membrane manufacturer are acceptable in accordance with Section 01600.

2.4 ACCEPTABLE MANUFACTURERS OF TAPERED INSULATION

A Tapered Perlite Insulation Board: ASTM C728-82; rigid, homogeneous thermal insulation board formed by the expansion of perlite; tapered expanded perlite board; thermal conductivity (k-factor) 0.36 BTU/hr.sq.ft.degree F/ inch thickness;

water absorption 1.5% max. ASTM C209-72; taper 1/4" per foot in accordance with requirements on roof plans. Include mechanical fasteners to metal deck. Acceptable Manufacturers for Tapered Expanded Perlite Board:

1. Manville, (918) 743-8977.

2. Contour Taper Tile by Contour Total Products, .

3. Insulation Systems Inc., (214) 243-0693.

4. International Permalite, 1-800-835-2161.

5. Strip Corp. of America, 1-800-234-6162.

6. Contour Products, Inc., 1-800-835-2161.

B. Tapered Isocyanurate Foam by NRG or Celotex/Apache.

C. Tapered Extruded Polystyrene Foam, compressive strength of 25 psi.

D. Allowed Substitutions: Items of same function and performance and if acceptable to the roof membrane manufacturer are acceptable in accordance with Section 01600.

2.5 FLASHING MATERIAL

Flashing shall be same material as roof membrane or 60mil thickness cured EPDM or uncured Neoprene flashing color to match field of roof as recommended by roof membrane manufacturer.

2.6 PIPE PENETRATION FLASHING MATERIAL

Provide roof membrane manufacturer's factory molded rubber pipe seals with stainless steel clamps in sizes to suit application for all pipe penetrating roof membrane. Color to match roof membrane.

2.7 ACCESSORIES

A. Bonding Adhesive: Bonding adhesive as recommended by membrane manufacturer.

B. Splicing Cement: As recommended by membrane manufacturer.

C. Seam Lap Tape: As recommended by manufacturer.

D. Lap Sealant: Trowel or gun consistency as recommended by membrane manufacturer.

E. Sealing Mastic: As furnished by membrane manufacturer.

F. Prefabricated Flashings: Uncured butyl tape with EPDM membrane laminated or approved by membrane manufacturer.

G. Nite Seal: As furnished by membrane manufacturer.

H. Pourable Sealer: Horizontal grade; polyurethane elastomeric sealant or as furnished by membrane manufacturer.

I. Tremco THC 900.

J. Manvile Pourable Sealer.

K. Vulkem 202, 200, Vulkem 45 or approved equal.

L. Fastening Strip and Anchors: As furnished by membrane manufacturer.

M. Anchors: Coated or stainless steel screws furnished or approved by the roof membrane manufacturer.

N. Mechanical Fasteners for Insulation: Factory Mutual Approved; corrosion resistant coating performance shall pass minimum 30 cycles exposure to DIN Standard 50018, Test Procedure SFW2.05 (Factory Mutual #4470 Corrosion Test) in a Kesternick Cabinet) with no more than 25% red rust result; length to suit thickness of insulation material and to provide full penetration through the structural deck; fasteners approved by roof membrane manufacturer shall be placed to FM I-90 design and produce minimum 200 pounds pull-out strength.

2.8 INSULATION ADHESIVE

A. Insul Stik as manufactured by Insul foam.

B. Insulation Adhesive as, manufactured by Tremco.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Prior to all work of this Section, carefully inspect the roof deck. Remove all roofing, insulation and structurally damaged decking. Verify that all demolition work and deck repairs are complete to the point where insulation and membrane roofing installation may commence. Verify that substrate is dry, clean, smooth and free of sharp edges, rust, loose material, oil, grease or other foreign matter. The completed installation shall be instrict accordance with the design as indicated on the Drawings and herein specified. In the event of discrepancy, immediately notify the Base Civil Engineer and Owner in writing of the nature and extent of differing conditions.

B. Superficial rusted deck: Remove superficial rust with wire brush and galvanize with ZRC cold galvanizing compound.

3.2 INSULATION BOARD INSTALLATION

A. Install rigid insulation per insulation and roof membrane manufacturer's fastening requirements and Factory Mutual (FM) I-90 wind uplift design.

B. Fit insulation tightly to nailers and penetrations.

C. Fill voids larger than 1/4 inch with insulation.

D. Use approved mechanical fasteners.

E. Position boards so that end joints are staggered and edges are supported by the roof deck.

F. Install stress and bonding plates 6" inside seams, smooth side up according to approved patterns.

G. Secure stress or bonding plate to roof deck with required fastener and washer.

H. Install fastener as tight as possible, flush with bonding plate. Avoid severely bowing bonding plate away from membrane. If fastener is not secure, remove and replace to achieve a firm hold.

I. Lay tapered insulation board to slope to establish pitch as called for on drawings.

3.3 PERIMETER ANCHORAGE APPLICATION

A. Install wood nailers at roof perimeters, base flashings, and around penetrations exceeding 18 inches in diameter or as required by the Drawings or manufacturer. Anchorage must be sufficient to resist a 200 lb force in any direction. Minimum

two (2) fasteners per board with a maximum spacing of 24 inches of blisters.

B. Install metal flashing assembly at roof perimeter. Position base rail and attach with approved fasteners. Refer to Section 07600.

3.4 ROOF MEMBRANE INSTALLATION

A. Install the complete membrane roofing system in strict accordance with manufacturer's current written recommendations and approved shop drawings.

B. Coordinate moving of roof top equipment, piping, and electrical items as necessary to provide complete installation of flashing and counterflashing.

C. Unroll membrane, without stretching. Position and allow to "relax" for a minimum of 30 minutes before fastening.

D. Extend membrane past perimeter edge. Fasten at perimeter in accordance with membrane manufacturer's recommendations.

E. Apply bonding adhesive over entire surface of substrate and matching surface on roof membrane with rollers at areas to be fully adhered as recommended by manufacturer.

F. Lay adjoining sheets with lap seam according to manufacturer's requirements. Turn membrane up at base flashings as recommended by manufacturer.

G. Lay additional sheets of membrane in shingle fashion beginning at the eaves so that water flows over rather than against the seams. Brush bonded portion of sheet with stiff bristle broom to assure full contact with substrate surface to be bonded.

I. Fold edge of overlapping sheet back to allow for any necessary cleaning of the membrane and to expose lap seams.

3.5 SEAMING

A. Seal lap splices using the following procedures:

B. Clean the seam areas as necessary to remove contaminants.

C. Apply primer evenly to both rubber surfaces with a paint brush in a scrubbing motion.

D. Allow approximately 15 minutes for solvent to flash-off.

E. Apply lap seam tape to prepared surfaces according to manufacturer's requirements.

F. Mate top sheet to lower sheet without stretching. Pat into place by hand and roll with a 2 inch steel roller to assure 100% adhesion as recommended by roof membrane manufacturer.

H. Apply bead of lap sealant along edge of the lap joint and feather each edge of the bead if recommended by manufacturer. Do not apply lap sealant to areas to be flashed prior to installation of flashing.

I. Complete sealing of all splices by end of each work day.

3.6 MOLDED PIPE SEALS

Install molded pipe seals according to roofing system manufacturer's manual and drawing details.

3.7 FLASHING

A. Install flashing as shown in the roofing system manufacturer's manual and drawing details and approved shop drawings.

B. Use splice adhesive and primer for rubber-to-rubber adhesion as required by manufacturer.

C. Use substrate appropriate adhesive for uncured rubber and all rubber to other surfaces, except that splice adhesive may be used on new metal.

3.8 ROOF PERIMETER ATTACHMENT INSTALLATION

Install roof perimeter adhesive and termination bar in accordance with roof membrane system manufacturer's requirements.

3.9 FIELD QUALITY CONTROL

The Owner's inspector will make periodic visits to the jobsite to observe compliance with Contract Documents.

3.10 GUARANTEE

Within 30 days after completion of the membrane roofing installation, and prior to acceptance by Owner, submit Manufacturer's 10 year guarantee for defects in materials and the Applicator's 2 year guarantee against leaks with no limit to liability to maintain the roof in a water tight condition for the duration of the guarantee.

SEE APPLICATOR'S GUARANTEE ON NEXT PAGE

ROOFING SYSTEM APPLICATOR'S CERTIFICATE OF GUARANTEE

We, _____, the Membrane Roofing System Applicator, agree to maintain the roofing, membrane flashing, sheet metal work and sealants connected with the roofing system on the below mentioned building for the period indicated.

This agreement is to render the roof, membrane flashing, sheet metal flashing and sealants waterproof, subject to the conditions outlined below.

Owner of Building Oklahoma Air National Guard, Address 4200 North 93rd East Ave.
City Tulsa
State Oklahoma
Name of Building ADAL Fire Station

Address 4200 North 93rd East Ave.
City Tulsa
State Oklahoma

Number of Square Feet in Roof _____

for the term of two (2) years from this date with no limit to financial coverage, provided any defects result from defective materials or workmanship and are not caused by other mechanics, fire, accidents, vandalism or by acts of providence over which there is no control.

It is understood and agreed that the Membrane Roofing System Applicator shall not be responsible for leaks in the roofing, sheet metal flashings, sealants or membrane flashings due to excessive winds, distortion of the foundation on which the roofing, sheet metal flashings, sealants or membrane flashings rest, excessive hailstorms, or any other condition over which there is no control.

Signed _____

By _____

Street _____

City _____

State _____

Date _____

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Metal counter flashing and base flashing (if any).
2. Metal wall flashing.
3. Gutters and downspouts (rain drainage).
4. Exposed metal trim.
5. Miscellaneous sheet metal accessories.
6. Elastic flashing.
7. Laminated and composition flashing.

B. Integral masonry flashings are specified as masonry work in sections of Division 4.

C. Roof accessory units of premanufactured, set-on type are specified in Division 7 Section "Roof Accessories."

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data, Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

C. Samples of the following flashing, sheet metal, and accessory items:

1. 8-inch-square samples of specified sheet materials to be exposed as finished surfaces.

2. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.

D. Shop drawings showing layout, profiles, methods of joining, and anchorages details, including major counterflashings, trim units, gutters, downspouts and scuppers. Provide layouts at 1/4-inch scale and details at 3-inch scale.

1.4 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 SHEET METAL FLASHING, CAP FLASHING AND TRIM MATERIALS

A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359-inch thick (20 gage) except as otherwise indicated.

B. Sheet Aluminum: ASTM B 209, alloy 3003, temper H14, AA-C22A41 clear anodized finish; 0.032-inch thick (20 gage) except as otherwise indicated.

C. Extruded Aluminum: Manufacturer's standard extrusions of sizes and profiles indicated, 60063-T52, AA-C22A41 clear anodized finish; 0.080-inch minimum thickness for primary legs of extrusions.

2.2 FLEXIBLE SHEET MEMBRANE FLASHING

A. Elastic Sheet Flashing/Membrane: Nonreinforced flexible, black elastic sheet flashing of 50 to 65 mils' thickness and complying with the following:

1. Shore A Hardness (ASTM D 2240): 50 to 70.

2. Tensile Strength (ASTM D 412): 1200 psi.

3. Tear Resistance (ASTM D 624, Die C): 20 lbs. per linear inch.

4. Ultimate elongation (ASTM D 412): 250 percent.

5. Low temperature brittleness (ASTM D 746): minus 30 deg F (minus 35 deg C).

6. Resistance to ozone aging (ASTM D 1149): no cracks for 10 percent elongated sample for 100 hours in 50 pphm (50.5 mPa) ozone at 104 deg F (70 deg C).

7. Resistance to Heat Aging (ASTM D 573): maximum hardness increase of 15 points, elongation reduction of 40 percent, and tensile strength reduction of 30 percent, for 70 hours at 212 deg F (100 deg C).

B. Acceptable Products:

1. Neoprene synthetic rubber sheet.

2. Butyl synthetic rubber sheet.

3. EPDM synthetic rubber sheet.

2.3 LAMINATED COMPOSITION SHEET FLASHING

A. Miscellaneous Materials and Accessories:

B. Solder: For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.

C. Fasteners: Same metal as flashing/sheet metal or other non- corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

D. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non- drying, nonmigrating sealant.

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

G. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.

H. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.

I. Paper Slip Sheet: 5-lb. rosin-sized building paper.

J. Polyethylene Underlayment: Minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E 154.

K. Reglets: Metal or plastic units of type and profile required, compatible with flashing indicated, noncorrosive.

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

M. Cast-Iron Drainage Boots: Grey iron castings of size and pattern indicated, ASTM A 48, bituminous shop-coated.

N. Gutter and Conductor-Head Guards: 20-gage bronze or nonmagnetic stainless steel mesh or fabricated units, with selvaged edges and noncorrosive fasteners. Select materials for compatibility with gutters and downspouts.

O. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

P. Roofing Cement: ASTM D 2822, asphaltic.

2.4 FABRICATED UNITS

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

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

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

D. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

F. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

G. Shop Finish, Rain Drainage: Provide manufacturer's standard baked-on colored acrylic shop finish on sheet metal rain drainage units (gutters, downspouts, and similar exposed units); 1.0-mil dry film thickness. (Minimum color selection chart, 16 colors.)

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

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

B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

D. Install reglets to receive counterflashing in recommended manner and by methods required. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

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

F. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

G. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

H. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters. Install "beehive"-type strainer-guard at conductor heads, removable for cleaning downspouts.

3.2 CLEANING AND PROTECTION

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

B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION 07600

SECTION 07710

MANUFACTURED ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Extruded aluminum fascia systems.
2. Sheet aluminum fascia systems.
3. Fascia panel systems.
4. Fascia and gravel stop.
5. Metal fascia panel support systems.
6. Aluminum coping.
7. Elastic bellows-type roof expansion joint cover.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Roof Specialties and Accessories" for the following Work:

a. Roof expansion joints.
b. Plastic skylights.
c. Manufactured curbs.
d. Roof hatches.
e. Gravity ventilators.
f. Penthouse ventilators.
g. Smoke vents.

2. Division 7 Section "Flashing and Sheet Metal" for the following Work:

   a. Metal flashing and counter flashing.
   b. Scuppers, gutters, and downspouts.
   c. Trim and fascia units.
   d. Miscellaneous sheet metal accessories.
   e. Elastic, laminated, and composition flashing.
   f. Roof and wall expansion joints.

3. Roof and wall expansion joints are specified in Division 7 Section "Roof Expansion Assemblies."

4. Roofing accessories installed integral with roofing membrane are specified in roofing system Sections as roofing work.

5. Sheet metal and flashings not part of fascia and coping systems included in this Section are specified in another Division 7 Section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's technical data, installation instructions and general recommendations for each product specified. Include data substantiating that materials and performance comply with requirements.

C. Shop drawings indicating layout, joining, profiles, accessories, anchorages, flashing connections, and relationship to supporting structure and to adjoining roof and wall construction.

D. Samples for initial selection purposes in form of manufacturer's sample finishes showing full range of colors and textures available for those units with factory-applied color finishes.

E. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected. Provide samples of not less than the following sizes:

1. Fascia: 8-inch-long sections of each distinctly different fascia component, including extenders (if any), exposed as finish work.

2. Coping: 8 inches long.

3. Fascia Panels: 8 inches square.

1.4 QUALITY ASSURANCE

A. Insurance Requirements: Provide fascia systems complying with Factory Mutual Loss Prevention Data Sheets 1-49 "Perimeter Flashing" requirements in either of the following categories and wind zones.

1. Approval by Factory Mutual Research Corporation for use indicated.

2. Accepted by Factory Mutual for Zone 1 use indicated.

3. Accepted by Factory Mutual for Zone 2 use indicated.

B. Industry Standards: Provide products which comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual," except as otherwise indicated.

1.5 JOB CONDITIONS

Coordinate work of this Section with adjoining work for proper sequencing of each installation to ensure best possible weather resistance and protection of materials and finishes against damage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

B. Aluminum Sheet: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, hot dipped galvanized in accordance with ASTM A 525, with G90 coating designation, mill phosphatized.

2.2 MISCELLANEOUS ITEMS

A. Exposed Fasteners: Stainless steel, non-magnetic, of type and size standard with manufacturer for product and application indicated. Match finish of exposed heads with material being fastened.

B. Concealed Fasteners: Same metal as item fastened or other noncorrosive metal as recommended by manufacturer.

C. Mastic Sealant: Polyisobutylene; non-hardening, nonskinning, nondrying, nonmigrating sealant.

D. Foam Rubber Seal: Manufacturer's standard foam.

E. Adhesives: Type recommended by manufacturer for substrate and project conditions, and formulated to withstand minimum 60 psf uplift force.

2.3 FASCIA SYSTEMS

A. Extruded Aluminum Panels: Manufacturer's standard extruded aluminum modular panels in the shapes, sizes, and thicknesses indicated but not less than 0.060 inch. Include trim, attachment clips and other accessories indicated or required for proper installation.

B. Formed Aluminum Panels: Manufacturer's standard modular panels formed from aluminum sheet not less than shapes and sizes indicated. Include trim, closure strips, and other accessories indicated or required for proper installation. Provide aluminum sheet of the following minimum thickness, unless otherwise indicated.

1. Thickness: 0.032 inch.

2. Thickness: 0.050 inch.

C. Fascia Batten and Panel Systems: Manufacturer's standard system of extruded or formed sheet aluminum battens combined with modular panels formed from aluminum sheet. Provide batten and sheet of profile, shape and size indicated. Include trim, closure strips, batten caps, batten retainers, and other accessories indicated or required for proper installation.

1. Minimum Sheet Thickness: 0.032 inch.

2. Minimum Sheet Thickness: 0.050 inch.

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

4. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

    a. Atas Aluminum Corp.
    b. Cheney Flashing Co.
    c. W. P. Hickman Co.
    d. Merchant and Evans, Inc.
    e. MM Systems Corp.
    f. Petersen Aluminum Corp.

D. Fascia for Built-Up Roofing: Manufacturer's standard system consisting of extruded aluminum fascia, extruded or formed aluminum compression clamp and minimum 26 gage (nominal 0.0217-inch-thick) formed, zinc-coated steel water dam/hold-down clip; of profile and fascia height indicated, with water dam and clamp of proper configuration and size for type of roofing system indicated; with concealed splice plates.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:

    a. Type E Fascia System; Architectural Products Co.
    b. Safeguard Gravel Stop System; W.P Hickman Co.
    c. F-Series Drip-Proof Fascia System; MM Systems Corp.

3. Accessories: Provide manufacturer's standard accessories of the following type, designed and manufactured to match and fit to fascia system indicated:

    a. Prefabricated corner units for both inside and outside corners, with miters welded in factory prior to finishing.
    b. Extruded wall cap of profile and size indicated.
    c. Two-piece water dam/hold-down clip.
    d. Extruded fascia extenders of profile and size indicated.
    e. Soffit closure/clips.
    f. Downspout starters (Fascia sump) with downspout starter hole. Provide stainless steel core.
    g. Overflow Scupper with prefabricated core.
    h. Spillout Scupper with prefabricated core.

E. Fascia for Single-Ply Roofing: Manufacturer's standard system consisting of extruded aluminum fascia, resilient gasket or compression spring, minimum 26 gage (nominal 0.0217-inch-thick) zinc-coated sheet steel water dam, aluminum fascia clip; of profile and fascia height indicated; with prefabricated accessories

including inside and outside corners and special fasteners.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following.

    a. Econosnap Roof Edge System; W.P. Hickman Co.
    b. Presto Lock Fascia and Flashing System; Manville Corp.
    c. Snap-Lok Fascia System; MM Systems Corp.

F. Fascia and Gravel Stop: Manufacturer's standard system consisting of fascia formed from minimum 0.050-inch-thick aluminum sheet designed to interlock with water dam, minimum 26 gage (nominal 0.0217-inch-thick), formed, zinc-coated steel water dam/hold-down clip, compression clamp with concealed screw attachment to water dam, and compression pad designed to maintain fascia engagement with water dam clip and compression clamp; of profile and size indicated; with prefabricated outside and inside corner, miters welded before finishing.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:

    a. Type TE Gravel Stop and Fascia; Architectural Products Co.
    b. Spring-Loc Fascia/Gravel Stop; Atas Aluminum Corp.
    c. Splice-Lock Roof Edging System; Cheney Flashing Co.
    d. Presto Lock Fascia and Flashing System; Manville Corp.
    e. Snap-Lok Fascia System; MM Systems Corp.

G. Fascia Panel Support System: Manufacturer's standard metal support system consisting of horizontal girts and vertical framing members including special connectors; of proper type for, and by manufacturer of, fascia panel system indicated. Provide components and spacing designed and tested to withstand the following loading:

1. Wind Pressure: Wind Zone 1, up through 30 psf (1.44kPa).

2. Wind Pressure: Wind Zone 2, 31 psf (1.48kPa) through 45 psf (2.15kPa).

3. Wind Pressure: Wind Zone 3, 46 psf (2.20kPa) and upward.

2.4 ALUMINUM COPING

A. Interlocking Multi-Part Coping System: Manufacturer's standard system consisting of coping formed from aluminum sheet to profile and of thickness indicated, minimum 24 gage (nominal 0.0276-inch-thick), zinc-coated steel anchor plate or cleat located at coping joint, and formed aluminum gutter chair or gutter/splice plate or compression pad/gutter; with prefabricated inside and outside corners, miters welded before finishing; without exposed fasteners.

1. Thickness of Coping: 0.063 inch.

2. Thickness of Coping: 0.050 inch.

3. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

4. Products: Subject to compliance with requirements, provide one of the following:

   a. Type AP Standard Coping; Architectural Products Co.
   b. Rapid-Loc Coping; Atas Aluminum Corp.
   c. Splice-Lock Coping Cover System; Cheney Flashing Co.
   d. Permasnap Coping; W. P. Hickman Co.
   e. Neo-Lock Coping; Merchant and Evans Industries, Inc.
   f. Snap-Lok Coping; MM Systems Corp.
   g. Pac-Loc Coping; Petersen Aluminum Corp.

2.5 ELASTIC, BELLOWS-TYPE EXPANSION JOINT COVERS

A. General: Provide units fabricated specifically for required applications (roof to roof, roof to wall, curb mounted). Provide prefabricated corner units, joint intersection units, splicing units, adhesives, coatings, and other components as recommended by joint unit manufacturer for a complete installation.

B. Metal-Flanged Elastic-Sheet Joint System: Provide units consisting of exposed elastic sheet over foam bellows, securely anchored at both edges to 3- to 4-inch-wide sheet metal nailing flanges, either plain or angle-formed to fit curbs as required. Bellows insulated from below with adhesively-applied, closed-cell, flexible, rubber or plastic insulation not less than 5/16 inch thick, adhered to elastic sheet.

1. Elastic Sheet: Neoprene, 60 mils.

2. Elastic Sheet: Neoprene, 60 mils, Hypalon coated.

3. Elastic Sheet: EPDM, 60 mils.

4. Elastic Sheet: Reinforced chlorinated polyethylene, 30 mils.

5. Elastic Sheet: Glass-reinforced vinyl, 40 to 50 mils.

6. Elastic Sheet Width: 5 to 6 inches between flanges.

7. Metal Flanges: Zinc-coated (galvanized) steel, minimum 28 gage (0.0149-inch) thickness.

8. Metal Flanges: Copper, minimum 16 oz. (0.0216-inch thickness).

9. Metal Flanges: Stainless steel, minimum 28 gage (0.015-inch) thickness.

10. Metal Flanges: Aluminum, minimum 0.032-inch thickness.

11. Mortar Flanges: Where flanges are indicated for embedment in concrete or mortar, provide manufacturer's standard perforated mortar flanges.

12. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:

13. Products: Subject to compliance with requirements, provide one of the following:

    a. Expansion Joint Shields; Celotex Corp.
    b. Metalastic; International Permalite, Inc.
    c. Expand-O-Flash; Manville Sales Corp.
    d. Rufseal; MM Systems Corp.
    e. Pate Expansion Joint Cover; The Pate Co.
    f. Superflash; York Manufacturing, Inc.

C. Concealed-Anchorage Elastic-Sheet Joint Systems: Provide units consisting of exposed elastic sheet covered foam bellows unit, with sheet extended not less than 4 inches each side of bellows section to act as flashing and to conceal manufacturer's standard nonmetallic or encapsulated-metallic continuous anchorage flange system with bellows insulated from below with adhesively applied, closed-cell, flexible, rubber/plastic insulation not less than 5/16 inch thick.

1. Elastic Sheet: Polyvinyl chloride, 60 mils.

2. Elastic Sheet: Reinforced polyvinyl chloride, 40 to 50 mils.

3. Elastic Sheet: Neoprene, 40 mils; canvas reinforced.

4. Elastic Sheet: Buna-N, 30 mils; 2-mil coating of polyvinyl fluoride.

5. Bellows Width: Minimum 6-inch width between flanges, 14-inch minimum overall cover sheet width.

6. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:

7. Products: Subject to compliance with requirements, provide one of the following:

   a. Expand-O-Flash TL-6; Manville Sales Corp.
   b. Metalastic; International Permalite, Inc.

2.6 FABRICATION

A. General: Provide items designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.

B. Expansion Provisions: Fabricate running lengths to allow controlled expansion not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation or damage.

2.7 ALUMINUM FINISHES

A. General: Comply with AMP 501 "Finishes for Aluminum" and AMP 505 "Applied Coatings" for finish designations and application recommendations, except as otherwise indicated. For components which are assembled or welded in factory, apply finish after fabrication is completed. Provide colors or color matches as indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

B. Mill Finish: AA-M10 (Unspecified mill finish) standard mill finish provided by manufacturer.

C. Class II Clear Anodized Finish: AA-M22C22A31 (Medium satin directional textured mechanical finish; chemical etch, medium matte; minimum 0.4-mil-thick

anodic coating.

D. Class II Clear Anodized Finish: AA-C22A31 (medium matte etched finish with minimum 0.4-mil-thick anodic coating).

E. Class I Clear Anodized Finish: AA-C22A41 (medium matte etched finish with minimum 0.7-mil-thick anodic coating.

F. Class I Color Anodized Finish: AA-C22A42 (medium matte etched finish with minimum 0.7-mil-thick, integrally colored anodic coating).

G. Baked Enamel Finish: AA-C12C42R1x (cleaned with inhibited chemicals, conversion coated with an acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below). Apply baked enamel finish in strict compliance with paint manufacturer's specifications for cleaning, conversion coating and painting. Organic Coating: Manufacturer's standard thermosetting acrylic enamel, minimum 0.8-mil dry film thickness.

H. Baked Enamel Finish on Embossed Surface: AA-M4xC12C42R1x (patterned mechanical finish as specified below, cleaned with inhibited chemicals, conversion coated with an acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below).

1. Mechanical Finish: Embossed with a stucco-like pattern.

2. Organic Coating: Manufacturer's standard thermosetting acrylic enamel, minimum 0.8-mil dry film thickness.

I. High Performance Coating: AA-C12C42R1x (cleaned with inhibitive chemicals, conversion coated with an acid-chromate-fluoride- phosphate treatment and painted with organic coating specified below). Apply in strict compliance with coating and resin manufacturer's instructions using a licensed applicator. Fluorocarbon Coating: Inhibitive thermo-cured primer, minimum 0.2-mil dry film thickness, and thermo-cured fluorocarbon coating containing "Kynar 500" resin, minimum 1.0-mil dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive work of this Section, with vapor retarders, roof insulation, roofing membrane, flashing, and wall construction; as required to ensure that each element

of the work performs properly, and that combined elements are waterproof and weathertight. Anchor products included in this Section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by aluminum producer.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch-up damaged metal coatings.

B. Protection: Provide protective measures as required to ensure that work of this Section will be without damage or deterioration at time of substantial completion.

END OF SECTION 07710

SECTION 07901

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:

    a. Control and expansion joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints between different materials listed above.
    d. Perimeter joints between materials listed above and frames of doors and windows.
    e. Control and expansion joints in ceiling and overhead surfaces.
    f. Other joints as indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below:

    a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    b. Joints between different materials listed above.
    c. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Tile control and expansion joints.
    d. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    f. Perimeter joints of toilet fixtures.

g. Other joints as indicated.

4. Interior joints in horizontal traffic surfaces as indicated below:

a. Control and expansion joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Exterior Insulation and Finish Systems - Class PB" for sealing system joints.

2. Division 7 Section "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.

3. Division 7 Section "Firestopping" for through-penetration firestopping systems.

4. Division 7 Section "Paving Joint Sealants" for sealing joints in portland cement concrete for pavements, walkways, and curbing.

5. Division 8 "Glass and Glazing" for sealants used in glazing.

6. Division 9 Section "Gypsum Drywall" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.

7. Division 9 Section "Acoustical Tile Ceiling" for sealing edge moldings at perimeter of acoustical ceilings.

8. Division 9 Section "Tile" for sealing tile joints.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

E. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.

F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

G. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

H. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to Contracting Officer's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the Work.

C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

D. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers samples of materials that will contact or affect joint sealants for compatibility and adhesion testing as indicated below:

1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates. Perform tests under normal environmental conditions that will exist during actual installation.

2. Submit not less than 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.

4. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.

5. Testing will not be required when joint sealant manufacturer is able to submit joint preparation data required above that are acceptable to Contracting Officer and are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

E. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Contracting Officer.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.

2. Include test results performed on joint sealants after they have cured for 1 year.

F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of the Division 1 Section covering this activity.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).

3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that

are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide selections made by Contracting Officer from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses. Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

B. Available Products: Subject to compliance with requirements, elastomeric sealants that may be incorporated in the Work include, but are not limited to, the products specified in each Elastomeric Sealant Data Sheet.

C. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

2.3 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Acrylic Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively:

1. 7-1/2 percent movement in both extension and compression for a total of 15 percent.
2. 12-1/2 percent movement in both extension and compression for a total of 25 percent.

B. Butyl Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free

time of 24 hours or less.

C. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.

D. Available Products: Subject to compliance with requirements, solvent-release-curing joint sealants that may be incorporated in the Work include, but are not limited to, the following:

E. Products: Subject to compliance with requirements, provide one of the following:

1. Acrylic Sealant:

a. "60+Unicrylic," Pecora Corp.
b. "PTI 738," Protective Treatments, Inc.
c. "PTI 767," Protective Treatments, Inc.
d. "Mono," Tremco, Inc.

2. Butyl Sealant:

a. "BC-158," Pecora Corp.
b. "PTI 757," Protective Treatments, Inc.
c. "Sonneborn Multi-Purpose Sealant," Sonneborn Building Products Div., ChemRex, Inc.
d. "Tremco Butyl Sealant," Tremco, Inc.

3. Pigmented Narrow Joint Sealant:

a. "PTI 200," Protective Treatments, Inc.

2.4 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that

accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

D. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acrylic-Emulsion Sealant:

a. "AC-20," Pecora Corp.
b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
c. "Tremco Acrylic Latex 834," Tremco, Inc.

2. Silicone-Emulsion Sealant: "Trade Mate Paintable Glazing Sealant," Dow Corning Corp.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.

2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Available Products: Subject to compliance with requirements, acoustical joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acoustical Sealant:

a. "SHEETROCK Acoustical Sealant," United States Gypsum Co.
b. "AC-20 FTR Acoustical and Insulation Sealant," Pecora Corp.

2. Acoustical Sealant for Concealed Joints:

a. "BA-98," Pecora Corp.
b. "Tremco Acoustical Sealant," Tremco, Inc.

2.6 TAPE SEALANTS

A. Tape Sealant: Manufacturer's standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.

B. Available Products: Subject to compliance with requirements, tape sealants that may be incorporated in the Work include, but are not limited to, the following:

1. "Extru-Seal Tape," Pecora Corp.
2. "Shim-Seal Tape," Pecora Corp.
3. "PTI 606," Protective Treatments, Inc.
4. "Tremco 440 Tape," Tremco, Inc.
5. "MBT-35," Tremco, Inc.

2.7 PREFORMED FOAM SEALANTS

A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.

2. Impregnating Agent: Manufacturer's standard.

3. Density: Manufacturer's standard.

4. Available Products: Subject to compliance with requirements, preformed foam sealants that may be incorporated in the Work include, but are not limited to, the following:

a. "Emseal," Emseal Corp.
b. "Emseal Greyflex," Emseal Corp.
c. "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.
d. "Wil-Seal 250," Wil-Seal Construction Foams Div., Illbruck.

2.8 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. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.

2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.

3. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.

4. Any material indicated above.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). 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 as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

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

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other 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.

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

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

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.
    c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion

of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

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

END OF SECTION 07901

SECTION 07905

PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following:

1. Expansion and contraction joints within portland cement concrete paving.

2. Joints between portland cement concrete paving and asphalt paving.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Portland Cement Concrete Paving" for construction of joints in concrete paving.

2. Division 2 Section "Hot-Mixed Asphalt Paving" for construction of joints between asphalt paving and concrete paving.

3. Division 7 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

C. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent

to joint sealants.

D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

E. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names, addresses, names of Contracting Officers and Governments, plus other information specified.

F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

G. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to Contracting Officer's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the Work.

C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

D. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers samples of materials that will contact or affect joint sealants for compatibility and adhesion testing as indicated below:

1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates. Perform tests under normal environmental conditions that will exist during actual installation.

2. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.

3. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.

4. Testing will not be required when joint sealant manufacturer is able to submit joint preparation data required above that are acceptable to Contracting Officer and are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

E. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Contracting Officer.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.

2. Include test results performed on joint sealants after they have cured for 1 year.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When ambient and substrate temperature conditions are outside the limits

permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).

3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Silicone Sealant for Concrete: One-part, low-modulus, neutral-cure silicone sealant complying with ASTM C 920 for Type S, Grade as indicated below, Class 25, and as follows:

1. Use Related to Exposure (As Recommended by Manufacturer): Use T.

2. Grade P for joints in horizontal paved surfaces.

3. Grade NS for vertical and other joints where installation of a Grade P (self-leveling) sealant would result in sealant flowing out of joint.

4. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.

B. Silicone Sealant for Concrete and Asphalt: One-part, low-modulus, neutral-cure silicone sealant complying with ASTM C 920, Type S, Grade P, Class 25, and Uses T, M, and as applicable to joints with concrete and asphalt substrates, O and with

the following requirements: Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated: 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.

C. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Grade P Silicone Sealant for Concrete:

a. "Roadsaver Silicone-SL," Crafco Inc.
b. "Dow Corning 888-SL," Dow Corning Corp.

2. Grade NS Silicone Sealant for Concrete:

a. "Roadsaver Silicone," Crafco Inc.
b. "Dow Corning 888," Dow Corning Corp.

3. Silicone Sealant for Concrete and Asphalt: "Dow Corning 890-SL," Dow Corning Corp.

2.3 JOINT FILLERS FOR CONCRETE PAVING

A. General: Provide joint fillers of thicknesses and widths indicated.

B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751: Asphalt saturated fiberboard.

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. Backer Rods for Cold-Applied Sealants: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible, plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and

nonoutgassing in unruptured state.

2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gram/cubic centimeter per ASTM C 1083.

3. Either material indicated above.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as 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 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer.

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

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.
    c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

F. Provide joint configuration to comply with recommendations of sealant manufacturer unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

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

END OF SECTION 07905