SECTION 07 13 26
SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes self-adhering modified bituminous sheet waterproofing.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.04 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.06 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side.

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

    a. American Hydrotech, Inc.; VM75.
    b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
    c. CETCO Building Materials Group, a subsidiary of AMCOL International Corp.; Envirosheet.
    d. Grace, W. R., & Co. - Conn.; Bituthene 3000/Low Temperature or Bituthene 4000.
    e. Henry Company; Blueskin WP 100/200.
    f. Meadows, W. R., Inc.; SealTight Mel-Rol.
    g. Nervastral, Inc.; BITU-MEM.
    h. Polyguard Products, Inc.; Polyguard 650.
    i. Protecto Wrap Company; PW 100/60.
    j. Tamko Building Products, Inc.; TW-60.
    k. York Manufacturing, Inc.; HydroGard.

2. Physical Properties:

    a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
    b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
    c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
    d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
    e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
    f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
    g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
    h. Hydrostatic-Head Resistance: 200 feet (60 m) minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

B. Modified Bituminous Sheet, Fabric Reinforced: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of rubberized-asphalt membrane with embedded fabric reinforcement, and with release liner on adhesive side.

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

    a. Protecto Wrap Company; Jiffy Seal 140/60.

b. Royston, Div. of Chase Specialty Coatings; 104AHT Membrane.

2. Physical Properties:

a. 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.
b. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
c. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.

3. Sheet Strips: Self-adhering, reinforced, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.02 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

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

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

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

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

G. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/8 inch (3 mm), nominal.
2. Thickness: 1/8 inch (3 mm), nominal, for vertical applications; 1/4 inch (6 mm), nominal, elsewhere.
3. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

H. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation faced on one side or both sides with plastic film, nominal thickness 1/4 inch (6 mm), with compressive strength of not less than 8 psi (55 kPa) per ASTM D 1621, and maximum water absorption by volume of 0.6 percent per ASTM C 272.

I. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch (13 mm) thick.

J. Protection Course: Molded-polystyrene board insulation, ASTM C 578, Type I, 0.90-lb/cu. ft. (15-kg/cu. m) minimum density, 1-inch (25-mm) minimum thickness.

2.03 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core; and with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

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

    a. American Hydrotech, Inc.; Hydrodrain 400 or Hydrodrain 420.
    b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRAIN 6000.
    c. Grace, W. R., & Co. - Conn.; Hydroduct 220 or Hydroduct 660.
    d. Protecto Wrap Company; Protecto Drain 2000-V.

2.04 INSULATION DRAINAGE PANELS

A. Unfaced Wall-Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type IV, 25-psi (173-kPa) or Type VI, 40-psi (276-kPa) minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

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

    a. DiversiFoam Products; CertiFoam 25 SL or CertiFoam 40 (with channel edges) Drainage Board.
    b. Dow Chemical Company (The); Styrofoam Perimate.

B. Unfaced Plaza-Deck Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VI, 40-psi (276-kPa) or Type VII, 60-psi (414-kPa) minimum compressive strength; unfaced; fabricated with shiplapped, channel, or tongue-and-groove edges and with one side having ribbed drainage channels.

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

a. American Hydrotech, Inc.; Hydroguard.
b. DiversiFoam Products; CertiFoam Plaza Deck.
c. Dow Chemical Company (The); Styrofoam Ribbed Roofmate.
d. Owens Corning Insulating Systems LLC; Foamular 404 RB.

PART 3 - EXECUTION

3.01 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Prepare surfaces and install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

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

C. Apply and firmly adhere sheets 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 range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-waterproofing terminations with mastic.

G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

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

I. Immediately install protection course with butted joints over waterproofing membrane.

1. Insulation drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.02 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install protection course before installing drainage panels.

3.03 INSULATION DRAINAGE-PANEL INSTALLATION

A. Install insulation drainage panels over waterproofed surfaces; cut and fit to within 3/4 inch (19 mm) of projections and penetrations.

B. Ensure that drainage channels are aligned and free of obstructions.

C. On vertical surfaces, set insulation drainage panels in adhesive or tape applied according to manufacturer's written instructions.

D. On horizontal surfaces, loosely lay insulation drainage panels according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.04 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

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

END OF SECTION

SECTION 07 14 00
FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of fluid-applied waterproofing Work on concrete surfaces as described below.

1. Earth-retaining surfaces of concrete walls and slabs that are common to occupied areas such as below grade operation levels, pipe galleries, drywells, access vaults, and underground pipe chases and galleries.

2. Inside faces of liquid and sludge containment walls common to occupied areas on the opposite face.

3. Inside faces of exterior liquid and sludge containment walls that extend above the exterior grade line on the opposite face. These walls shall be coated from top of wall down to 2 feet below the grade line.

B. Type of fluid applied waterproofing required for Project includes:

1. One-part or two-part urethane-based or polyurethane-based type.

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

1.02 REFERENCES

A. Reference Standards:

1. ASTM C 836 High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for use with Separate Wearing Course.
2. ASTM D 4258 Practice for Surface Cleaning Concrete for Coating.
3. ASTM D 4259 Practice for Abrading Concrete.
4. ASTM D 4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
5. ICRI 03732 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.03 DEFINITIONS

A. Potable Water Use: Products in contact with water anywhere within the potable water system (including intake, treatment, storage, and distribution) shall be tested and certified by the National Sanitation Foundation (NSF) or Underwriters Laboratories (UL) as a protective (barrier) material, as per ANSI/NSF Standard 61 (Listed Drinking Water System Components - Health Effects).

1.04 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 013300, Submittal Procedures covering the items included under this Section. Shop Drawing submittals shall include:

1. Product Data: Manufacturer's specifications, installation instructions, general recommendations, and proposed details for each waterproofing material required. Include data substantiating that materials comply with requirements. Sample of coating system applied to 1/4-inch plywood or similar rigid base. Submit 2 samples of each color and system to be used.

2. Certification: Applicator must submit a document providing proof of certification by the manufacturer of the primary materials.

B. Operation and Maintenance Manuals: Submit in accordance with Division 1, General Requirements, operation and maintenance manuals for items included under this Section. Identify common causes of damage with instructions for temporary patching until permanent repair can be made.

C. Warranty: Submit in accordance with Division 1, General Requirements, warranties covering the items included under this Section.

1.05 QUALITY ASSURANCE

A. Source Quality Control: Obtain primary waterproof materials of each type required from single manufacturer with not less than 3 years of successful experience in supplying principal materials for fluid-applied waterproofing work. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Installer Qualifications: A qualified installer who is certified, authorized, approved, or licensed by the waterproofing manufacturer to install manufacturer's products.

C. Pre-Application Conference: Approximately 2 weeks prior to scheduled commencement of fluid-applied waterproofing installation, meet at Site with Installer, Installers of deck or substrate construction to receive work, installers of other work in and around waterproofing work which must precede, follow or penetrate waterproofing work (including mechanical work if any), ENGINEER, OWNER, and waterproofing material manufacturer's representative. Record (CONTRACTOR) discussions of conference, together with decisions and agreements (or disagreements) reached. Furnish copy of record to each party attending. Review methods and procedures related to Work including, but not necessarily limited to, the following:

1. Tour Site areas to be waterproofed. Inspect and discuss condition of substrate, drains, curbs, penetrations, and other preparatory Work performed by other trades.
2. Review waterproofing requirements (Drawings, Specifications, and other Contract Documents).
3. Review required submittals, both completed and yet to be completed.
4. Review and finalize Construction Schedule related to waterproofing Work, and verify availability of materials, Installer's personnel, and equipment and facilities needed to make progress and avoid delays.
5. Review required inspection, testing, and certifying procedures.

1.07. PROJECT CONDITIONS

A. Substrate: Proceed with Work of this Section only after substrate construction and penetrating Work have been completed.

B. Weather: Proceed with Work of this Section only when existing and forecasted weather conditions will permit Work to be performed in accordance with manufacturer's recommendations.

C. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based components in enclosed spaces, and maintain ventilation until coatings have thoroughly cured.

1.08. WARRANTY

A. Special Warranty: Provide, in accordance with Division 1, General Requirements, warranties covering the items included under this Section of the Contract. The special warranty shall be jointly warranted by manufacturer and applicator. The warranty shall repair or replace defective components that fail in materials or workmanship within special warranty period.

1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Fluid Applied Waterproofing:

   a. Carboline.
   b. C.I.M. Industries.
   c. Futura Coatings, Inc.
   d. Sherwin Williams Company.
   e. Sonneborn, Degussa Building Systems.
   f. Tnemec CompanyTremco.

2. Protection Course:

   a. Backerboard No. 501-A, J&P Petroleum Prod.
   b. PC-2 Protection Course, W.R. Meadows, Inc.
   c. Elastibord, Celotex Corp.
   d. Protection Sheet, Pecora Corp.
   e. Protection Course II, Sonneborn, Degussa Building Systems.
   f. Tremboard, Tremco.

2.02 MATERIALS

A. Compatibility: Provide products which are recommended by manufacturer to be fully compatible with indicated substrates and similar proven compounding provisions.

B. Urethane-Based, One-Part Waterproofing: (Poly)urethane rubber-based liquid membrane material, self-bonding to normal substrates, compounded specifically for application method to be used (by hand or spray) and for slope of substrate, not less than 6-month shelf life in uncured state, tested by manufacturer to comply with requirements of ASTM C 836.

C. Available products for inside surfaces of containment tanks not in contact with potable water, NOT exposed to view or UV light, subject to compliance with the following requirements: Able to resist hydrogen sulfide gas, 20 percent sulfuric acid , abrasion resistance: 6 mg maximum with 1,000 revolutions with CS-17, 1,000 gm wheel, and minimum 300 percent elongation, permeance: maximum 0.05 perms.

1. CIM 1000, C.I.M. Industries.

2. Elasto-Shield 262, Tnemec Company.
3. Envirolastic AR425, Sherwin-Williams Company.

D. Available products for inside surfaces of containment tanks in contact with potable water and exposed to view or UV light. The product must be tested and certified by the NSF (National Sanitation Foundation) or UL (Underwriter's Laboratories), and approved by AWWA (American Water Works Association) for this use, available in light tan, light gray, or white color.

1. Futura-Thane 535, Futura Coatings, Inc.
2. Thoroc IC 6600-PW, Degussa Building Systems.
3. Envirolastic AR520 PW, General Polymers, a Division of Sherwin-Williams.
4. CIM 2000, C.I.M. Industries.

E. Available products for exterior surfaces NOT exposed to view or UV light. This shall be used with protection course for backfill protection.

1. HLM 5000, Sonneborn, Degussa Building Systems.
2. Perma-Gard III (No. 7401 Series), Neogard Corp.
3. Tremproof 60, Tremco.

F. The membrane shall have the ability to span 1/16-inch cracks in concrete substrate. Color shall be as selected by ENGINEER.

G. Miscellaneous Materials:

1. Primer, Filler, Sealer: As recommended by manufacturer of fluid-applied waterproofing compound and as indicated.
2. Flashings, Cant Strips, and Accessories: As recommended by manufacturer of waterproofing compound and as indicated.
3. Protection Course: Pre-molded 1/8-inch thick, semi-rigid board consisting of mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, surface-coated with asphalt and sealed to core under heat and pressure, and provided with polyethylene film facings.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Installer Qualifications: A firm which has specialized in installation of types of waterproofing required for project for not less than 3 years and which is acceptable to manufacturers of primary materials. List of at least 5 projects of a

similar nature by applicator which have been installed, identified with project name, location, date, and description.

1. Assign Work closely associated with waterproofing including, but not limited to, waterproofing accessories, flashings used in conjunction with waterproofing, expansion joints in membrane, insulation and protection course on membrane to Installer of waterproofing for undivided responsibility.

3.02 CONDITION OF SURFACES

A. Before coating Work is commenced, surface shall be inspected and treated as necessary to remove laitance, loose material on the surface, grease, oil, and other contaminants which will affect bond of the coating. Surfaces shall be left broom or vacuum clean.

B. Concrete surfaces shall be visibly dry, less than 5 percent moisture, and free of contaminants.

C. Verify that curing methods used for concrete are compatible with coating system.

D. Metal surfaces shall be dry, clean, free of grease, oil, dirt, rust, and corrosion and other coatings and contaminants which could affect bond of coating system, and without sharp edges or offsets at joints.

E. Commencement of coating installation implies acceptance of substrate area as suitable to accept coatings.

3.03 PREPARATION OF SUBSTRATE

A. Thoroughly clean all surfaces to receive coating materials in strict accordance with manufacturer's instructions and recommendations.

B. Remove oil, grease, bitumen, form release agents, paints, curing compounds, and other penetrating contaminants or film forming coatings from concrete.

1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

C. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

D. Rout or saw-cut all cracks exceeding 1/16 inch in width and fill with sealant.

E. The wall and dome system shall have sealant coves provided at all penetrations and changes of planes.

F. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.

G. Fill voids, seal joints, and apply bond breakers as recommended by prime materials manufacturer with particular attention at construction joints.

H. Repair concrete to be free of holes. Fully open bug holes before repair. Repair defects in the concrete surface, such as bug holes, air pockets, and honeycomb, by filling and smoothing off with patching material, epoxy patching compound, or grout. Abrasive blast prepared surfaces.

I. Prime substrate as recommended and (only if recommended) by prime materials manufacturer.

J. Mask off or use drop cloths on adjoining surfaces not to receive fluid-applied waterproofing to effectively prevent spillage or overspray of liquid materials outside membrane area.

K. Do not apply primer or waterproofing to concrete surface unless 2 or more moisture tests indicate moisture levels of 5 percent or less in accordance with:

1. Plastic Sheet Method, ASTM D 4263.
    a. Pass a 16-hour plastic sheet test (no condensation) prior to application of coating system. Sheet shall be taped to concrete on all edges.
2. Relative Humidity Test.
3. Calcium Chloride Test.
4. Gel Bridge Test.
5. Radio Frequency Test (as outlined in 'Drying Concrete' by Lew Harrriman, in the March 1995 issue of "The Construction Specifier Magazine").

L. Concrete surface shall have a cement paste removed to expose aggregate tops and shall have a profile of ICRI CSP 4 to 6 in accordance with ICRI 03732. Repair surface profiles greater than 1/4 inch with patching material to a profile less than 1/8 inch.

3.04 INSTALLATION

A. Comply with manufacturer's instructions except where more stringent requirements are shown or specified and except where Project conditions require extra precautions or provisions to ensure satisfactory performance of Work.

B. Start installation of waterproofing membrane only in presence and with advice of manufacturer's technical representative.

C. Apply uniform coating of waterproofing to substrate and adjoining surfaces indicated to receive membrane.

D. Apply coating either by hand or by machine spray complying with manufacturer's recommendations regarding horizontal and vertical surfaces.

E. Flashings: Provide fluid-applied integral flashings at all locations where horizontal surface abuts a vertical surface and at all deck penetrations. Fluid applied flashings shall be installed at a dry film thickness as recommended by manufacturer. Use nonflowing type coating.

F. All locations of potential high movement, such as wall/slab intersections which are not structurally and rigidly connected, provide 12-inch minimum width of pre-cured sheet flashing or reinforce coating with 1 layer of uncoated, woven fiberglass cloth. Where sheet flashings are used, they shall be free or unbonded to the substrate within 2 inches vertically and horizontally from meeting angle but shall be fully bonded for not less than 2 inches on vertical surface and 4 inches on horizontal surface. Do not use pre-cured sheet flashings over expansion joints in horizontal surfaces.

G. Primer and Detail Work:

1. Primer: Prime all concrete, masonry, and metal surfaces at manufacturer's recommended rate. Concrete primer shall be allowed to completely dry but shall not be applied more than 8 hours preceding application of coating. Metal primer may be applied up to 9 days prior to application of coating. Prime silicon carbide or silica sand.

H. Membrane System:

1. Inside surfaces of containment tanks NOT in contact with potable water and NOT exposed to view or UV light:

a. CIM 1000: One coat at 40 mils DFT (minimum of 2 passes in different directions).

b. Elasto-Shield 262: One coat at 60 mils DFT (minimum of 2 passes in different directions).
c. Envirolastic AR 425: One coat at 60 mils DFT (minimum of 2 passes in different directions).

2. Exterior surfaces NOT exposed to UV light:

a. HLM 5000 System: One coat at 55 mils DFT.
b. Perma-Guard III System: Two coats, total DFT at 55 mils.
c. Tremproof 60 System: One coat at 50 mils DFT.

I. Overcoat all previously detailed areas. Allow to cure for 36 hours before permitting foot traffic.

J. Protection Course:

1. Install protection course on exterior cured membrane (after testing, if required) without delay so that period of membrane exposure shall be minimized.
2. On vertical surfaces comply with waterproofing manufacturer's recommendations for adhesion of protection course to membrane.

K. Cleaning: Clean stains from adjacent surfaces per manufacturer's recommendations. Remove foreign matter from finished coating surfaces.

END OF SECTION

SECTION 07 18 00
TRAFFIC COATINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes traffic coatings for the following applications:

1. Pedestrian traffic.
2. Vehicular traffic.
3. Equipment-room floor.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product, including installation instructions.

B. Shop Drawings: For traffic coatings.

1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

C. Samples for Initial Selection: For each type of exposed finish and color specified.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of traffic coating.

C. Sample Warranty: For special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For traffic coatings to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.08 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F (5 deg C), when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

1.09 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.
d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Source Limitations:

1. Obtain traffic coatings from single source from single manufacturer.

2. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.

2.02 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for heavy pedestrian traffic and equipment-room floor; according to ASTM C 957.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Sika Corporation (Sikalastic 710/715 Traffic System with slip-resistant surface texture – Basis of Design)
b. Advanced Polymer Technology Corporation.
c. BASF Corporation-Construction Systems.
d. Carlisle Coatings & Waterproofing Inc.
e. Euclid Chemical Company (The); an RPM company.
f. Parex USA, Inc.
g. Pecora Corporation.
h. Sherwin-Williams Company (The).

B. Primer: Liquid primer recommended for substrate and conditions by traffic-coating manufacturer.

1. Material: Urethane.

C. Preparatory and Base Coats: Polyurethane.

1. Thicknesses: Minimum dry or wet film thickness as recommended in writing by manufacturer for substrate and service conditions indicated .

D. Intermediate Coat: Polyurethane .

1. Thicknesses: Minimum dry or wet film thickness as recommended in writing by manufacturer for substrate and service conditions indicated , measured excluding aggregate.

2. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.

E. Topcoat: Polyurethane with slip-resistant surface texture.

1. Thicknesses: Minimum dry or wet film thickness as recommended in writing by manufacturer for substrate and service conditions indicated, measured excluding aggregate.

2. Aggregate Content: As required to achieve slip-resistant finish.

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

F. Aggregate: Manufacturer's standard aggregate for each use indicated of particle sizes, shape, and minimum hardness recommended in writing by traffic-coating manufacturer.

G. Fire-Test-Response Characteristics: Provide traffic-coating materials with the fire-test-response characteristics as determined by testing identical products per test method below for deck type and slopes indicated by an independent testing and inspecting agency that is acceptable to authorities having jurisdiction.

1. Class A roof covering per ASTM E 108 or UL 790.

H. Energy Performance: Provide traffic coating with an initial Solar Reflectance Index of not less than 0.70 and emissivity of not less than 0.75 when tested according to CRRC-1.

2.03 ACCESSORY MATERIALS

A. Joint Sealants: As specified in Section 07 92 00 "Joint Sealants."

B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.

1. Thickness: Minimum 60 mils (1.5 mm).

C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

2.04 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.

1. Color: As indicated on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly dry and free of moisture.

3.02 PREPARATION

A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

D. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D 4259. Do not acid etch.

1. Remove grease, oil, paints, and other penetrating contaminants from concrete.

2. Remove concrete fins, ridges, and other projections.

3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.

4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.03 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.04 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.05 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.

B. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.

C. Start traffic-coating application in presence of manufacturer's technical representative.

D. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft..

E. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.

F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

G. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.06 PAVEMENT MARKINGS

A. Do not apply pavement-marking paint for striping and other markings until layout, colors, and placement have been verified with Architect and traffic coating has cured.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply pavement-marking paint with mechanical equipment to produce markings of dimensions indicated with uniform straight edges. Apply at manufacturer's recommended rates for a 15-mil- (0.4-mm-) minimum, wet film thickness.

3.07 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

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

END OF SECTION

SECTION 07 19 00
WATER REPELLENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of surfaces to receive water repellent as indicated on Drawings and by provisions of this Section.

B. Following applications of water repellent are required, but excluding associated areas of floors, and pavings:

1. Exterior unit masonry surfaces.

C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, apply to Work of this Section.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Submittal Procedures covering the items included under this Section. Shop Drawing submittals shall include:

1. Product Data: Manufacturer's specifications, installation instructions, and general recommendations for water repellents. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.
2. Samples: 16-inch-square samples of each substrate indicated to receive liquid water repellent, with repellent treatment as specified applied to half of each sample.

1.03 PROJECT CONDITIONS

A. Weather and Substrate Conditions: Do not proceed with application of water repellent (except with written recommendation of manufacturer), when:

1. Ambient temperature is less than 50 degrees F (10 degrees C).
2. Substrate surfaces have cured for less than a period of 2 months.
3. Rain or temperatures below 40 degrees F (4 degrees C) are predicted for a period of 24 hours or earlier than 3 days after surfaces became wet.
4. Substrate is frozen, at surface temperature of less than 40 degrees F (4 degrees C).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Silane/Siloxane Penetrating Water Repellent:

a. Enviroseal 7 for Brick; Hydrozo, a Division of Degussa Building Systems.
b. Weather Seal Siloxane PD; ProSoCo, Inc.
c. 303-C; Diedrich Technologies.

2.02 SILOXANE PENETRATING WATER REPELLENT

A. Siloxane/Silane Penetrating Water Repellent: Clear, oligomerous alkylalkoxysilanes and alkytrialkoxysilanes containing 7 percent solids with water-based carrier; VOC compliant.

PART 3 - EXECUTION

3.01 PREPARATION

A. Test Application: Prior to performance of water repellent Work, including bulk purchase/delivery of products, prepare a small application in an unobtrusive location and in a manner acceptable to ENGINEER, for purpose of demonstrating final effect (visual and physical/chemical) of planned installation. Proceed with Work only after ENGINEER's acceptance of test application or as otherwise directed.

B. Clean substrate of substances which might interfere with penetration/adhesion of water repellents. Test for moisture content in accordance with repellent manufacturer's instructions to ensure that surface is sufficiently dry.

C. Coordination with Sealants: Where feasible, delay application of water repellents until installation of sealants has been completed in joints adjoining surfaces to be coated with repellent.

D. Protect adjoining Work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass where there is possibility of water repellent being deposited on surfaces. Cover live plant materials with drop cloths. Clean water repellent from adjoining

surfaces immediately after spillage. Comply with manufacturer's recommendations for cleaning.

3.02 INSTALLATION

A. Apply a heavy saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's instructions and recommendations using airless spraying procedure, unless otherwise indicated.

B. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if printed recommendations are not applicable to Project conditions.

3.03 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

B. Remove protective coverings from adjacent surfaces. Repair damage caused by the spray or the protective covering.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Foundation edge insulation.
2. Foam-plastic board insulation.
3. Glass-fiber blanket insulation.
4. Concealed acoustical sound batt insulation.
5. Spray polyurethane foam insulation.
6. Vapor retarders.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.03 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

PART 2 - PRODUCTS

2.01 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84. For foundation edge – 2 inches thick, unless indicated otherwise.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.
   d. Pactiv Building Products.

2. Type IV, 25 psi (173 kPa), unless otherwise indicated.

2.02 POLYISOCRYANUARATE BOARD INSULATION

A. Rigid Polyisocyanurate Board Roof Insulation: 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 7.2 and 8 at 40 and 75 degrees F (4.4 and 23.9 degrees C), respectively, and as follows:

1. Surface Burning Characteristics: Maximum values for flame spread and smoke developed of 20 and 150, respectively.

B. Tapered Rigid Polyisocyanurate Board Roof Insulation: Cellular themal insulation with Polyisocyanurate closed-cell foam core and manufacturer's standard facing laminated to both sides, complying with FS HH-I-1972/2, Class 1, aged r-values of 7.2 and 8 at 40 and 75 degrees F (4.4 and 23.9 degrees C), respectively, after conditioning per RIC/TIMA Bulleting No. 281-1, and as follows:

1. Surface Burning Characteristics: Maximum values for flame spread and smoke developed of 20 and 150, respectively.

2. Thermal Resistivity: Average 14.4 at 75 degrees F (23.9 degrees kC) for 2 layers of roof insulation board.

2.03 GLASS-FIBER BLANKET INSULATION

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

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

D. For sound-attenuation insulation blankets – minimum 3 inches thick.

1. Unfaced Mineral-Fiber or Glass fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 15 and 0, respectively, and of the following properties:

2. Nominal density of 2.25 pounds per cubic foot.
   a. Thermafiber Sound Attenuation Fire Blanket by USG.
   b. Sound Attenuation Fire Batt Insulation /MW by Owens Corning
   c. Sound Attenuation Batts by Owens Corning

2.04 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Corporation.
   b. BaySystems NorthAmerica, LLC.
   c. Dow Chemical Company (The).
   d. ERSystems, Inc.
   e. Gaco Western Inc.
   f. Henry Company.
   g. NCFI; Division of Barnhardt Mfg. Co.
   h. SWD Urethane Company.
   i. Volatile Free, Inc.

2. Minimum density of 1.5 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F (43 K x m/W at 24 deg C).

2.05 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 10 mils (0.25 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

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

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.02 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation full thickness a minimum of 4'-0" from the outside edge of slab-on-grade. Cut and fit tightly around obstructions and fill voids with insulation.

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

3.03 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. 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. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.04 INSTALLATION OF ROOF INSULATION

A. Extend insulation full thickness, in 2 layers or in multiple layers, over entire surface to be insulated, cutting and fitting tightly around obstructions. Form cant strips, crickets, saddles, and tapered areas with additional material as shown and as required for proper drainage of membrane.

1. For multiple layers, stagger joints in both directions between courses with no gaps to form a complete thermal envelope.

B. Do not install more insulation each day than can be covered with membrane before end of day and before start of inclement weather.

C. Set units in adhesive applied in accordance with requirements of applicable fire and insurance ratings.

D. Secure roof insulation to substrate with mechanical anchors of type and spacing indicated, but in no case provide less than 1 anchor per 4 square feet of surface area, or less anchorage than required by FM "Loss Prevention Data Sheet 1-28."

3.05 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

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

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 - GENERAL

10.1 SUMMARY

A. Section Includes:

1. Building wrap.
2. Flexible flashing.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.01 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

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

a. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.

2. Water-Vapor Permeance: Not less than 50 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.02 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

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

a. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
c. Protecto Wrap Company; BT-25 XL.
d. Raven Industries Inc.; Fortress Flashshield.
e. Advanced Building Products Inc.; Wind-o-wrap.
f. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
g. Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
h. Fortifiber Building Systems Group; Fortiflash 25 .
i. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing .
j. MFM Building Products Corp.; Window Wrap.
k. Polyguard Products, Inc.; Polyguard JT-20 Tape .
l. Sandell Manufacturing Co., Inc.; Presto-Seal.

PART 3 - EXECUTION

3.01 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.

B. Building Paper: Apply horizontally with a 2-inch (50-mm) overlap and a 6-inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.02 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
2. Lap flashing over water-resistive barrier at bottom and sides of openings.
3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION

SECTION 07 27 13
MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes self-adhering, vapor-retarding, modified bituminous sheet air barriers.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For air-barrier assemblies.

1. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1.04 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly, 150 sq. ft. (14 sq. m) , incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

B. Low-Emitting Materials: Air barriers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.02 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.03 SELF-ADHERING SHEET AIR BARRIER

A. Modified Bituminous Sheet: 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick, cross-laminated polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Carlisle Coatings & Waterproofing Inc.; CCW-705.
   b. Grace, W. R. & Co. - Conn.; Perm-A-Barrier Wall Membrane.
   c. Henry Company; Blueskin SA or Blueskin SA LT.
   d. Meadows, W. R., Inc.; SealTight Air-Shield.
   e. Tremco Incorporated, an RPM company; ExoAir 110/110LT.

2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
   b. Tensile Strength: Minimum 250 psi (1.7 MPa) ; ASTM D 412, Die C.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
   d. Puncture Resistance: Minimum 40 lbf (180 N) ; ASTM E 154.
   e. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
   f. Vapor Permeance: Maximum 0.05 perm (2.9 ng/Pa x s x sq. m) ; ASTM E 96/E 96M, Water Method.

1.06 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier membrane.

B. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

C. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft. (24- to 32-kg/cu. m) density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

B. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

C. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

D. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

3.02 INSTALLATION

A. General: Install modified bituminous sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F (16 deg C).

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier. 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 airtight installation.

1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
2. Roll sheets firmly to enhance adhesion to substrate.

D. Seal top of through-wall flashings to air-barrier sheet.

E. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

F. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

G. Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

H. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transitions and flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

I. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier membrane with foam sealant.

J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.

L. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

M. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

1.07 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements.

C. Tests: As determined by Owner's testing agency from among the following tests:

1. Qualitative Air-Leakage Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization.
2. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.
3. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 16 lbf/sq. in. (110 kPa) according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

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

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

END OF SECTION

SECTION 07 41 13
METAL ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of metal roofing as shown on Drawings and indicated by provisions of this Section.

B. The following types of Work are specified in this Section:

1. Standing seam metal roofing.
2. Gutters and downspouts.
3. Metal fascia and soffits
4. Snowguards

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

1.02 PERFORMANCE REQUIREMENTS

A. General: Provide complete sheet metal roofing system, including, but not limited to, metal roof panels, cleats, clips, anchors and fasteners, sheet metal flashing and drainage components related to sheet metal roofing, fascia panels, trim, underlayment, and accessories as indicated and as required for a weather-tight installation.

B. Wind-Uplift Resistance: Provide portable roll-forming equipment capable of producing sheet metal roofing assemblies that comply with UL 580 for Class 90 wind-uplift resistance.

1. Maintain UL certification of portable roll-forming equipment for duration of sheet metal roofing work.

C. Thermal Movements: Provide sheet metal roofing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid sheer stress as a result of sheet metal roofing thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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

D. Water Infiltration: Provide sheet metal roofing that does not allow water infiltration to building interior, with metal flashing and connections of sheet metal roofing lapped to allow moisture to run over and off the material.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Submittal Procedures covering the items included under this Section. Shop Drawing submittals shall include:

1. Drawings showing manner of forming, joining, and securing metal roofing and pattern of seams. Show expansion joint details and waterproof connections to adjoining Work and at obstructions and penetrations.
2. Product Data: Metal manufacturer's and fabricator's specifications, installation instructions, snowguards, and general recommendations for roofing applications. Include certification or other data substantiating that materials comply with requirements.
3. Samples: 8-inch square samples of specified metal to be used as roofing with specified finishes applied.

1.04 QUALITY ASSURANCE

A. Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of Architectural Sheet Metal Manual by SMACNA. Conform to dimensions and profiles shown.

1.05 WARRANTY

A. Special Warranty: Warranty form at end of this Section in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, rupturing, cracking, or puncturing.
   b. Wrinkling or buckling.
   c. Loose parts.
   d. Failure to remain weathertight, including uncontrolled water leakage.
   e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including nonuniformity of color or finish.

f. Galvanic action between sheet metal roofing and dissimilar materials.
g. Verify available warranties and warranty periods for sheet metal roofing.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.Usually retain "Exposed Panel Finish" Subparagraph below for fluoropolymer or siliconized-polyester finishes; verify availability with manufacturer.

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

2. Finish Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Aluminum Roofing:
a. Centria Architectural Systems: 2 inches high by 16 inches wide, with SRS 0.040 aluminum panel with 2-piece sliding clip.
b. Firestone Building Products, Una-Clad UC-6 HD Double-Lock Standing Seam Metal Roofing, with SRS 0.040 aluminum panel with concealed clip.

2. Self-adhering Underlayment:
a. Ice and Water Shield, Grace Construction Products Division.
b. Polyken 640 Underlayment Membrane, Polyken Technologies.
c. Polyguard Deck Guard, Polyguard Products, Inc.
d. Ice Guard Membrane No. 108-AG, Royston Laboratories, Inc.
e. Jiffy Seal Ice and Water Guard, Protecto Wrap Co.

2.01 MATERIALS

A. Aluminum Roofing Sheet: Provide aluminum sheet of alloy and temper recommended by manufacturer for use intended and as required for type of finish indicated, but with not less than strength and durability properties specified in ASTM B 209 for 3003-H14 unless otherwise indicated.

B. Finish: Primed for paint finish by aluminum producer's standard cleaning and conversion coating method complying with Aluminum Association (AA).

C. Finish: 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.

1. Fluorocarbon Coating: Thermo-cured fluorocarbon top coating containing "Kynar 500" resin, 1.0 mil minimum dry film thickness, applied over epoxy primer. Provide strippable protective film.
2. Thickness: 0.040 inch unless otherwise indicated.
3. Color: As indicated on plans or, if not otherwise indicated, as selected by OWNER from manufacturers' full range of standard colors.

2.03 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and accessory items as recommended by sheet metal manufacturer and fabricator for metal roofing Work except as otherwise indicated.

B. Expansion Joint Sealant: For hooked-type expansion joints, which must be free to move, provide nonsetting, nonhardening, nonmigrating, heavy-bodied polyisobutylene mastic sealant.

C. Snowguards: Provide non-penetrating rib clamp type, as manufactured or recommended by panel manufacturer, secured to the clamp assembly. Snowguard material and finish to match panel.

D. Asphalt-Saturated Roofing Felt: No. 30, unperforated organic felt, complying with ASTM D 226, Type I, 36 inches wide, approximate weight 36 pounds per square.

E. Self-adhering Underlayment: Minimum 40-mil thickness of a self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting.

2.04 SHOP-FABRICATED UNITS

A. 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's 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 location 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.

2.05 SOFFIT PANELS (WHERE INDICATED)

A. Exterior soffit panel profile shall be IW-10A as manufactured by CENTRIA or approved equal. Exterior surface shall have flush pane and soffit vents with min. 12 inch of free area per square foot.

1. Exterior wall panel side laps shall have tongue and groove joinery with factory applied sealant and no exposed fasteners.
2. Exterior metal panels shall be fabricated from .040 inch aluminum.
3. Finish and color to match roof panels.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Installer's Qualifications: Firms specializing and experienced in systems installations for not less than 3 years.

3.02 ROOFING SYSTEM

A. Provide complete system comprising of standing seam roof, fascia, gutters, downspouts, vented ridge and soffits, tested and warranteed as specified.

3.03 PREPARATION

A. Coordinate metal roofing with rain drainage Work, flashing, trim, and construction of decks, parapets, walls, and other adjoining Work to provide a permanently leak-proof, secure, and noncorrosive installation.

3.04 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment and building-paper slip sheet on roof sheathing under sheet metal roofing Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under sheet metal roofing. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

1. Apply on roof from eave to ridge.
2. Apply on roof not covered by self-adhering sheet underlayment. Lap edges of self-adhering underlayment not less than 3 inches, in shingle fashion to shed water.

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

1. Roof perimeter for a distance up from eaves 24 inches beyond interior wall line.
2. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap ends of sheets not less than 6 inches.

3. Rake edges for a distance of 18 inches.
4. Hips and ridges for a distance on each side of 12 inches.

C. Install flashings to cover underlayment to comply with requirements.

D. Apply slip sheet over underlayment before installing sheet metal roofing.

3.05 INSTALLATION

A. Manufacturer's Recommendations: Except as otherwise shown or specified, comply with recommendations and instructions of manufacturer of sheet metal being fabricated and installed.

B. Separate dissimilar metals from each other by painting each metal surface in an area of contact with a bituminous coating, or by applying adhesive polyethylene underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

C. Install underlayment and paper slip sheet on substrate under metal roofing to greatest extent possible, unless otherwise recommended by manufacturer of sheet metal. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal roofing. Lap joints 2 inches minimum.

D. Coat the back side of metal roofing with bituminous coating where it will be in contact with wood, ferrous metal, or cementitious construction.

E. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown and as required for permanently leak-proof construction. Provide for thermal expansion and contraction of the work. Seal joints as shown and as required for leak-proof construction. Shop-fabricate materials to greatest extent possible.

F. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature is moderate at time of installation (40 to 70 degrees F or 4 to 21 degrees C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees F (4 degrees C). Comply with requirements of Section 07 95 00 for the handling and installation of sealants.

G. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks considering temper and reflectivity of metal. Provide

uniform, neat seams with minimum exposure of solder, welds, and sealant. Except as otherwise shown, fold back sheet metal to form a hem on concealed side of exposed edges.

H. Conceal fasteners and expansion provisions where possible in exposed work and locate so as to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

I. Rivet joints in aluminum where necessary for strength. Clean exposed surfaces of every substance which is visible or might cause corrosion of metal or deterioration of finish.

J. Snowguards: Attach snowguards to vertical ribs of standing seam metal roofing. Use nonpenetrating rib clamp type, as manufactured or recommended by the panel manufacturer, secured to the clamp assembly. Do not use fasteners that will penetrate sheet metal roofing or restrict movement of sliding clip assembly.

K. Downspouts: Fabricate rectangular downspouts. Formed from 20 gauge, G90 Steel sheet pre-painted with coil coating; in 10 –foot-long sections, complete with formed elbows and offsets. Finish downspouts to match sheet metal roofing.

L. Ridge Vent: Material, guage, and finish to match roof panels.

3.06 CLEANING AND PROTECTION

A. Remove protective film (if any) from exposed surfaces of metal roofing promptly upon installation. Strip with care to avoid damage to finishes.

B. Clean exposed metal surfaces of substances which would interfere with uniform oxidation and weathering.

C. Provide final protection in a manner acceptable to installer, which ensures metal roofing being without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 07 53 23
SINGLE-PLY MEMBRANE ROOFING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Single-ply membrane roofing (SPM) as indicated on Drawings, and is hereby defined to include non-traffic-bearing sheet membrane system intended for weather exposure as primary roofing.

1. Types of roofing systems specified in this Section utilizing flexible sheet roofing membranes include the following: Loosely laid and ballasted systems.
2. Single-Ply Membrane roofing system include the following:
   a. Ethylene propylene diene monomer (EPDM) (loose-laid ballasted and fully adhered systems).
   b. Roof insulation related to flexible sheet roofing as described in Section 07 21 00, Thermal Insulation.

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

1.02 DEFINITIONS

A. Thermal Resistance: Where thermal resistance properties of insulating materials are designated by r-values, they represent the rate of heat flow through a material of thickness indicated, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause 1 BTU to flow through 1 square foot per hour at mean temperatures indicated.

1. Combustibility Characteristics: ASTM E 136.

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Drawings showing roof configuration and ballast location, seam locations, colors (as applicable), details at perimeter, and special conditions.
   a. Indicate layout of tapered insulation materials.

2. Product Data: Specifications, installation instructions, and general recommendations from manufacturers of flexible sheet roofing system materials, for types of roofing required. Include data substantiating that materials comply with requirements.
3. Samples:
   a. 12-inch square samples of required insulation.
4. Pre-Roofing Conference: Submit copies of Pre-Roofing Conference records.

1.04 QUALITY ASSURANCE

A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.

B. Installer Qualifications: A qualified Installer who is authorized, approved, or licensed by the flexible sheet roofing manufacturer to install manufacturer's products.

C. Pre-Roofing Conference: Prior to installation of roofing and associated work, meet at Site, or other mutually agreed location, with Installer, roofing manufacturer, installers of related Work, and other entities concerned with roofing performance, including (where applicable) OWNER's insurer, test agencies, governing authorities, ENGINEER, and OWNER. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening Pre-Roofing Conference.

D. Insurance Certification: Assist OWNER in preparation and submittal of roof installation acceptance certification necessary in connection with fire and extended coverage insurance on roofing and associated Work.

E. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1.05 PROJECT CONDITIONS

A. Weather: Proceed with roofing Work when existing and forecasted weather conditions permit Work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.06 WARRANTY

A. Special Warranty: Provide written warranty, signed by manufacturer of primary roofing materials and his authorized installer, agreeing to replace/repair defective materials and workmanship as required to maintain roofing system in watertight condition.

1. Warranty period is 20 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Fully Adhered EPDM Membrane:
   a. Carlisle Syntec Systems.
   b. Firestone Building Products Co.
   c. Gen. Corp. Polymer Products.
   d. Johns Manville International, Inc.
   e. Versico, Inc.

2.02 MATERIALS

A. Performance: Provide roofing materials recognized to be of generic type indicated and tested to show compliance with indicated performances, or provide other similar materials certified in writing by manufacturer to be equal or better than specified in every significant respect and acceptable to ENGINEER.

B. Compatibility: Provide products which are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

2.03 EPDM SINGLE-PLY MEMBRANE

A. Ethylene propylene diene monomers formed into uniform, flexible sheets complying with ANSI/RMA IPR-1:

1. Thickness: 60 mils, nominal for ballasted application.
2. Specify color if exposed to view.
3. Exposed Face Color: Manufacturer's standard.

B. Loose-Laid and Ballasted EPDM Membrane: Subject to compliance with the following requirements:

Property	Test Method	Minimum Product Specification	
		Roofing	Flashing
Product Weight	---	24.5 lbs./100 sq. ft.	44.0 lbs./100 sq. ft.
Tensile Strength	ASTM D 412	1,305 psi	1,305 psi
Elongation	ASTM D 412	300%	300%
Tear Resistance Min. (Die C) LBF/N (KN/M)	ASTM D 624	150 (26.2)	125 (30)
Shore A Hardness	ASTM D 2240	60 + 10	70
Ozone Resistance (for roofing (7 days/100 MPa/104 degrees F/ 40°C/50% Ext.)	ASTM D 1149	No cracks at 7X mag. (6,000 hours, no cracks)	
Ozone Resistance (for flashing) (100 hours at 100 pphm, 100°F at 20% extension	ASTM D 1149		No cracks
Accelerated Heat Tensile strength retained Elongation retained	ASTM D 573 --- ---	(7 days at 250°F) 1,205 psi 200%	(7 days at 158°F) 1,205 psi 200%
Water Absorption (168 hrs. at 158°F)	ASTM D 471 ---	+8/-2.0% max. Volume change	+8/-2.0% Volume change
Oil Resistance (70 hrs. at 212°F ASTM Oil No. 3)	ASTM D 471 --- ---	+130% max. Volume change	+80% max. Volume change
Low Temperature Flexibility	ASTM D 746	-75°F/-59°C	-30°F
Water Vapor Transmission (Procedure BW) at 77 degrees F	ASTM E 96	2.0 perm-mils	---

C. Fully Adhered EPDM Membrane: Subject to compliance with the following requirements:

Property	Test Method	Minimum Product Specification	
		Roofing	Flashing
Product Weight	---	44.00 lbs./100 sq. ft.	44.0 lbs./100 sq. ft.
Tensile Strength	ASTM D 412	1,305 psi	1,305 psi
Elongation	ASTM D 412	300%	300%
Tear Resistance Min. (Die C) LBF/N (KN/M)	ASTM D 624	150	125
Shore A Hardness	ASTM D 2240	70	70
Ozone Resistance (for roofing (7 days/100 MPa/104 degrees F/ 40°C/50% Ext.)	ASTM D 1149	No cracks at 7X mag. (6,000 hours, no cracks)	
Ozone Resistance (for flashing) (100 hours at 100 pphm, 100 degrees F at 20% extension	ASTM 1149		No cracks
Accelerated Heat Tensile strength retained Elongation retained	ASTM D 573 --- ---	(7 days at 158°F) 1,205 psi 200%	(7 days at 158°F) 1,205 psi 200%
Water Absorption (168 hours at 158 degrees F)	ASTM D 471 ---	+8/-2.0 + 15% Volume change	+8/-2.0% Volume change
Oil Resistance (70 hours at 212 degrees F ASTM Oil No. 3)	ASTM D 471 --- ---	+80% max. Volume change	+80% max. Volume change
Low Temperature Flexibility	ASTM D 746	-30°F	-30°F
Water Vapor Transmission (Procedure BW) at 77 degrees F	ASTM E 96	2.0 perm-mils	---

2.04 AUXILIARY MATERIALS FOR SPM

A. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by manufacturer of SPM system.

B. SPM Flashing Accessories: Types recommended by manufacturer of SPM material, provided at locations indicated and at locations recommended by

manufacturer, including adhesive tapes, flashing cements, and sealants; subject to approval by ENGINEER.

C. Flashing Material: Manufacturer's standard system compatible with single-ply membrane.

D. Slip Sheet: Type recommended by manufacturer of SPM material for protection of membrane from incompatible substrates.

E. Aggregate Surface Ballast: Washed, rounded, riverbed gravel or other acceptable smooth-faced stone ranging in size from 1 inch to 2 inches in diameter (ASTM D 448, No. 3 stone), which will withstand weather exposure without significant deterioration.

F. Mechanical Fasteners: Metal plates, caps, battens, accessory components, fastening devices, and adhesives to suit substrate and as recommended by SPM membrane manufacturer.

G. Membrane Adhesive: As recommended by SPM membrane manufacturer for particular substrate and Project conditions, formulated to withstand minimum 60 pounds per square foot uplift force.

2.05 INSULATING MATERIALS

A. Provide insulating materials as approved by membrane manufacturer which comply with requirements indicated for materials and compliance with referenced standards; in sizes to fit applications indicated and as specified in Section 07 21 00 Thermal Insulation, selected from manufacturer's standard thicknesses, widths, and lengths.

2.06 AUXILIARY INSULATION MATERIALS

A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with fire resistance requirements.

B. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints and filling voids.

C. Mechanical Anchors: Corrosion resistant type as recommended by insulation manufacturer for deck type and complying with fire and insurance uplift rating requirements.

D. Provide system tested and approved for I-60 wind uplift rating.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Installer: A firm with not less than 3 years of successful experience in installation of roofing systems similar to those required for this Project and which is acceptable to or licensed by manufacturer of primary roofing materials.

1. Work associated with single-ply roofing including, but not limited to, insulation, flashing and counterflashing, expansion joints, and flexible sheet joint sealers is to be performed by installer of flexible sheet roofing.

3.02 PREPARATION OF SUBSTRATE

A. Comply with manufacturer's instructions for preparation of substrate to receive FSR system.

B. Clean substrate of dust, debris, and other substances detrimental to FSR system Work. Remove sharp projections.

C. Install cant strips, flashings, and accessory items as shown and as recommended by manufacturer, even though not shown.

D. Prevent compounds from entering and clogging drains and conductors and from spilling or migrating onto surfaces of other Work.

3.03 INSTALLATION

A. Comply with manufacturer's instructions except where more stringent requirements are indicated.

B. Slip sheets shall be installed over all treated wood nailers that come in contact with uncured neoprene membrane.

3.04 MEMBRANE INSTALLATION

A. Start installation only in presence of manufacturer's technical representative.

B. Adhesive-Adhered SPM: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer. Apply adhesive to surfaces to be bonded and roll SPM into place when adhesive has properly cured. Treat seams with special cement and apply sealant to exposed sheet edges, tapering application as recommended by manufacturer. Install mechanical fasteners, flashings and counterflashings, and accessories at locations and as recommended by manufacturer.

C. Walkway Protection:

1. Adhesive-Adhered SPM: Install adhered walkway pads at locations shown and where required for access to roof-mounted equipment.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal counter flashing and base flashing (if any).
2. Metal wall flashing and expansion joints.
3. Miscellaneous sheet metal accessories.

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

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 33 00, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Manufacturer's technical product data, installation instructions, and general recommendations for each specified sheet material and fabricated product
2. Samples of the following flashing, sheet metal, and accessory items:
   a. 8-inch square samples of specified sheet materials to be exposed as finished surfaces.
   b. 12-inch-long samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.

1.03 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.01 SHEET METAL 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 gauge) except as otherwise indicated.

B. Aluminum: ASTM B 209, Alloy 3003, temper H14, AA-C22A41 clear anodized finish, 0.032-inch thick (20 gauge) 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.

D. Minimum Gauges and Thicknesses for Flashings and Sheet Metal Work

Application	USS Gauge	Thickness in Inches
Downspouts		
Aluminum		0.032
Galvanized Steel	26	
Gutters		
Aluminum		0.032
Galvanized Steel	26	
Gutter Straps		
Aluminum		1/4 by 2
Galvanized Steel		1/4 by 1-1/2
Counter and Base Flashings		
Aluminum		0.032
Galvanized Steel	26	

E. See Standard Details on Drawings for additional information.

2.02 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): 1,200 psi.

3. Tear Resistance (ASTM D 624, Die C): 20 pounds per linear inch.
4. Ultimate elongation (ASTM D 412): 250 percent.
5. Low temperature brittleness (ASTM D 746): minus 30 degrees F (minus 35 degrees 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 degrees F (70 degrees 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 degrees F (100 degrees C).

B. Acceptable Materials:

1. Neoprene synthetic rubber sheet.
2. Butyl synthetic rubber sheet.
3. EPDM synthetic rubber sheet.

C. Miscellaneous Materials and Accessories:

1. Solder: For use with steel or copper, provide 50-50 tin/lead solder (ASTM B 32), with rosin flux.
2. Solder: For use with stainless steel, provide 60-40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.
3. Fasteners: Same metal as flashing/sheet metal or other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
4. Bituminous Coating: SSPC - Paint 12, solvent type bituminous mastic nominally free of sulfur, compounded for 15 mil dry film thickness per coat.
5. Mastic Sealant: Polyisobutylene, nonhardening, nonskinning, nondrying, nonmigrating sealant.

D. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00 "Joint Sealants".

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

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

G. Paper Slip Sheet: 5-pound rosin-sized building paper.

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

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

J. 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 gauge required for performance.

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

L. Roofing Cement: ASTM D 2822, asphaltic.

2.03 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 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.

PART 3 - EXECUTION

3.01 INSTALLATION

A. 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 which 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 manner and by methods indicated.

1. Where shown in concrete, furnish reglets to trades of concrete work for installation as Work of Division 3.
2. Where shown in masonry, furnish reglets to trades of masonry work, for installation as Work of Division 4.
3. 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.

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

2.02 CLEANING AND PROTECTION

A. Clean exposed metal surfaces removing substances which 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

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Copings.
2. Roof-edge drainage systems.

1.02 PERFORMANCE REQUIREMENTS

A. FM Approvals' Listing: Manufacture and install copings roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

B. SPRI Wind Design Standard: Manufacture and install copings and roof-edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: as per state and local code requirements.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified.

D. Product test reports.

E. Maintenance data.

F. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1.05 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 EXPOSED METALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

1. Surface: Smooth, flat finish.
2. Exposed Coil-Coated Finishes: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Two-Coat Fluoropolymer: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.02 CONCEALED METALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

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

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

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.Retain paragraph below if required for copper components. If required, insert another specific solder grade (alloy). See "Seaming and Fastening" Article in the Evaluations.

2.04 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Firestone Building Products Company
   b. Architectural Products Company.
   c. Hickman Company, W. P.
   d. Metal-Era, Inc.
   e. MM Systems Corporation.

2. Coping-Cap Material: Zinc-coated steel, nominal thickness as required to meet performance requirements.
   a. Finish: Three-coat fluoropolymer.
3. Color: To match metal wall panels. Corners: Factory mitered and soldered.
4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
5. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

2.05 ROOF-EDGE DRAINAGE SYSTEMS

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

1. Firestone Building Product Company.
2. Architectural Products Company.
3. Hickman Company, W. P.

4. Metal-Era, Inc.
5. MM Systems Corporation.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet , with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Fabricate from the following exposed metal:
   a. Zinc-Coated Steel: Nominal 0.034-inch thickness.
2. Gutter Profile: As indicated according to SMACNA's "Architectural Sheet Metal Manual."
3. Corners: Factory mitered and soldered.
4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.

C. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Zinc-Coated Steel: Nominal 0.034-inch thickness.

D. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.

1. Fabricate from the following exposed metal:
   a. Zinc-Coated Steel: Nominal 0.028-inch thickness.

E. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim.

1. Fabricate from the following exposed metal:
   a. Zinc-Coated Steel: Nominal 0.028-inch thickness.

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

1. Color: Match metal wall panels.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and

structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance. Seal joints with sealant as required by roofing-specialty manufacturer.

E. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.02 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings to meet performance requirements.

3.03 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and solder to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

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

E. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.04 CLEANING AND PROTECTION

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

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

C. Remove temporary protective coverings and strippable films as roof specialties are installed.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.
3. Roof hatches.
4. Safety Railing System

1.02 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: For roof accessories.

C. Samples: For each exposed product and for each color and texture specified.

D. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items.

E. Operation and maintenance data.

F. Warranty: Sample of special warranty.

1.03 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.

2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil .
3. Exposed Coil-Coated Finish: Two-coat fluoropolymer finish; AAMA 621; system consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
4. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.

1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
2. Exposed Coil-Coated Finish: Two-coat fluoropolymer finish; AAMA 621; system consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight
3. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat.

C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.
2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
3. Clear Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.
4. Color Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.
5. Exposed Coil-Coated Finish: Two-coat fluoropolymer finish; AAMA 620; system consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
6. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils.

D. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

E. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

F. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

2.02 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, manufacturer's standard, Type UVA (formulated with UV absorber), Finish 1 (smooth or polished).

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

E. Sealants: As recommended by roof accessory manufacturer for installation indicated.

2.03 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AES Industries, Inc.
   b. Custom Solution Roof and Metal Products.
   c. LM Curbs.
   d. Roof Products, Inc.
   e. Vent Products Co., Inc.

B. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch thick.
1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

C. Material: Aluminum sheet, 0.090 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

D. Construction:

1. Insulation: Factory insulated with 1-1/2-inch thick cellulosic or glass-fiber board insulation.
2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
3. Factory-installed wood nailer at top of curb, continuous around curb perimeter.
4. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
5. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.
6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.
7. Security Grille: Provide where indicated.

2.04 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings :

B. Type and Size: Single-leaf lid, 30 by 36 inches.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Zinc-coated (galvanized) or Aluminum-zinc alloy-coated steel sheet, 0.079 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

E. Hatch Material: Aluminum sheet, 0.090 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

F. Construction:

1. Insulation: Cellulosic-fiber or Glass-fiber or Polyisocyanurate board.
2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
3. Hatch Lid: Glazed, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
6. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.
7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

G. Hardware: Galvanized-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

1. Provide two-point latch on lids larger than 84 inches.
2. Provide remote-control operation.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder. Post locks in place on full extension; release mechanism returns post to closed position.

2.05 SAFETY RAILING SYSTEM

A. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, all accessories required for a complete installation, and complying with 29 CFR 1910.23 requirements.

1. Height: 42 inches above finished roof deck.
2. Pipe or Tube: 1-1/4-inch ID galvanized pipe or 1-5/8-inch OD galvanized tube.
3. Flat Bar: 2-inch- high by 3/8-inch- thick galvanized steel.
4. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
5. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
7. Fabricate joints that will be exposed to weather in a watertight manner.

8. Close exposed ends of handrail and railing members with prefabricated end fittings.
9. Fasteners: Manufacturer's standard.

B. Basis of Design: "Bil-Guard" Hatch Railing System by The Bilco Company.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Verify dimensions of roof openings for roof accessories. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.

C. Security Grilles: Weld bar intersections and, using tamper-resistant bolts, attach the ends of bars to structural frame or primary curb walls.

D. Seal joints with sealant as required by roof accessory manufacturer.

3.02 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.

C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.

1.02 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers eight samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.03 SUBMITTALS

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

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

D. Product test reports.

E. Preconstruction compatibility and adhesion test reports.

F. Preconstruction field-adhesion test reports.

G. Field-adhesion test reports.

H. Warranties.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

B. Preinstallation Conference: Conduct conference at Project site.

1.05 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.02 SILICONE JOINT SEALANTS

A. Mildew-Resistant Neutral-Curing Silicone Joint Sealant: ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems.
   b. Dow Corning Corporation.
   c. GE Advanced Materials - Silicones.
   d. May National Associates, Inc.
   e. Pecora Corporation.
   f. Sika Corporation; Construction Products Division.
   g. Tremco Incorporated.
2. Type: Single component (S) or multicomponent (M).
3. Grade: Pourable (P) or nonsag (NS).
4. Class: 100/50.
5. Uses Related to Exposure: Nontraffic (NT).

2.03 URETHANE JOINT SEALANTS

A. Urethane Joint Sealant: ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems.
   b. Bostik, Inc.
   c. Lymtal, International, Inc.
   d. May National Associates, Inc.
   e. Pacific Polymers International, Inc.
   f. Pecora Corporation.
   g. Sika Corporation; Construction Products Division.
   h. Tremco Incorporated.
2. Type: Single component (S) or multicomponent (M).
3. Grade: Pourable (P) or nonsag (NS).
4. Class: 100/50.
5. Uses Related to Exposure: Nontraffic (NT).

2.04 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems.
   b. Bostik, Inc.
   c. May National Associates, Inc.
   d. Pecora Corporation.
   e. Schnee-Morehead, Inc.
   f. Tremco Incorporated.

2.05 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dayton Superior Specialty Chemicals.
   b. EMSEAL Joint Systems, Ltd.
   c. Sandell Manufacturing Co.
   d. Schul International, Inc.
   e. Willseal USA, LLC.

2.06 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation.
   b. USG Corporation.

2.07 JOINT SEALANT BACKING

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

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.08 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.

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

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate 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 recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer 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.

3.02 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

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

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

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

3.03 FIELD QUALITY CONTROL

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

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

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

3.04 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces

1. Joint Locations:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Tile control and expansion joints.
   c. Joints between different materials listed above.
2. Joint Sealant: Silicone.
3. Joint Sealant: Urethane.
4. Joint Sealant: Preformed foam.
5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
   a. Construction joints in cast-in-place concrete.
   b. Control and expansion joints in unit masonry.
   c. Joints between metal panels.
   d. Joints between different materials listed above.
   e. Perimeter joints between materials listed above and frames of doors, windows and louvers.
   f. Control and expansion joints in ceilings and other overhead surfaces.
2. Joint Sealant: Silicone.
3. Joint Sealant: Urethane.
4. Joint Sealant: Preformed foam.

5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:
   a. Isolation joints in cast-in-place concrete slabs.
   b. Control and expansion joints in tile flooring.
2. Joint Sealant: Silicone.
3. Joint Sealant: Urethane.
4. Joint Sealant: Preformed foam.
5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Tile control and expansion joints.
   c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
   d. Perimeter joints between interior wall surfaces and frames of interior doors.
2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
   c. Joint Sealant: Silicone. Other joints as indicated.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:
   a. Acoustical joints where indicated.
2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: white.

END OF SECTION

SECTION 07 95 00
EXPANSION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior expansion control systems.
2. Exterior wall expansion control systems.

1.02 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams.

B. Samples: For each exposed expansion control system and for each color and texture specified.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

B. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Component Importance Factor is 1.5.

2.03 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

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

1. Balco, Inc.
2. Construction Specialties, Inc.
3. EMSEAL Corporation.
4. MM Systems Corporation.

B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

C. Wall Corner:

1. Design Criteria:
   a. Nominal Joint Width: 3".
   b. Minimum Joint Width: 2"
   c. Maximum Joint Width: 4"
   d. Movement Capability: As indicated on Drawings -25 percent/+75 percent.
   e. Type of Movement: Thermal.
   f. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.
2. Type: Cover plate.
   a. Metal: Aluminum.
      i. Finish: Manufacturer's standard.
3. Type: Flat seal.
   a. Metal: Aluminum.
   b. Seal Material: Manufacturer's standard.
      i. Color: As selected by Architect from manufacturer's full range.
   c. Pantograph Mechanism: Manufacturer's standard pantographic wind-load support mechanism with stainless-steel fasteners.

4. Type: Preformed cellular foam.
   a. Foam Material: Manufacturer's standard.
      i. Color: Manufacturer's standard.

2.04 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary cover. Equip moisture barrier with drain tubes and seals to direct collected moisture to exterior-wall expansion control system.

2.05 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.

D. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

E. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.

F. Fire Barriers: Any material or material combination to meet performance criteria for required fire-resistance rating.

G. Moisture Barrier: Flexible elastomeric material.

H. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M.

I. Accessories: Manufacturer's standard anchors, clips, fasteners, and other accessories as indicated or required for complete installations.

2.06 ALUMINUM FINISHES

A. Mill finish.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems.

C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Repair or grout block-out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
5. Install frames in continuous contact with adjacent surfaces.

a. Shimming is not permitted.

6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.

2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Foam Seals: Install with adhesive recommended by manufacturer.

E. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

G. Moisture Barrier: Provide at all exterior joints and where indicated on Drawings. Provide drainage fittings at a maximum of 50 feet or where indicated on Drawings.

3.03 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete.

B. Protect the installation from damage by work of other Sections.

END OF SECTION