SECTION 077129 - MANUFACTURED ROOF EXPANSION JOINTS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Flanged bellows-type roof expansion joints.

Extruded bellows roof expansion joints.

Aluminum roof expansion joints.

Preformed foam sealant-type roof expansion joints.

Refer to sections listed below for cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections. Sections listed below are for spec editor’s and design team coordination and are to remain as Editor’s Notes. Remove referenced specification sections within the body of the specification if not applicable to the project.

Section 061000 "Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.

Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.

Section 077200 "Roof Accessories" for manufactured and prefabricated metal roof curbs.

* + - 1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at **[Project site]**.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

Include manufacturer’s installation instructions.

* + - * 1. Sustainable Design Submittals:
				2. Shop Drawings: For roof expansion joints.

Include plans, elevations, sections, and attachment details.

Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.

Provide isometric drawings of intersections, terminations, changes in joint direction or planes, and transition to other expansion joint systems depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

* + - * 1. Samples: For each exposed product and for each color specified, 6 inches in size.
				2. Quality Control Submittals:

Qualification Data: For Installer.

Retain "Product Test Reports" paragraph below if roof expansion joint must have a fire-resistance rating.

Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

Sample Warranties: For special warranties.

* + - 1. QUALITY ASSURANCE

Retain "Installer Qualifications" paragraph below if roofing-membrane manufacturer requires use of its own bellows-type roof expansion joints to obtain roofing system warranty.

* + - * 1. Installer Qualifications: Installer of roofing membrane.
			1. WARRANTY

When warranties are required, verify with Director’s Representative that warranties stated in this article are not less than remedies available to the Facility under prevailing local laws. Coordinate warranty requirements if roofing membrane specified in Division 07 roofing section requires a total systems warranty.

* + - * 1. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.

Verify available warranties and warranty periods for manufactured roof expansion joints.

Warranty Period: **[Two] <Insert number>** years from date of Substantial Completion.

Retain "Special Warranty on Painted Finishes" paragraph below for factory-coated metal, if included. Delete if metal is left uncoated or field finished. Coordinate with finishes retained in Part 2.

* + - * 1. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints that show evidence of deterioration of factory-applied finishes within specified warranty period.

Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

Color fading more than 5 Delta E units when tested according to ASTM D2244.

Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

Cracking, checking, peeling, or failure of paint to adhere to bare metal.

Verify available warranties and warranty periods for finishes with manufacturers listed in Part 2 articles. 20-year period is generally available for fluoropolymer finishes.

Warranty Period: **[10] [20] <Insert number>** years from date of Substantial Completion.

1. PRODUCTS
	* + 1. PERFORMANCE REQUIREMENTS
				1. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.

Differential values in "Temperature Change" subparagraph below (for aluminum in particular) are suitable for most of the U.S.

Temperature Change: **[120 deg F, ambient; 180 deg F] <Insert temperature change>**, material surfaces.

Retain "Fire-Resistance Rating" paragraph below if the roof expansion joint is installed in a roof assembly with a fire-resistance rating.

* + - * 1. Fire-Resistance Rating: Comply with ASTM E1966 or UL 2079; testing by a qualified testing agency to resist the spread of fire and to accommodate building thermal **[and seismic]** movements without impairing its ability to resist the passage of fire and hot gases. Identify products with appropriate markings of applicable testing agency.

Rating: Not less than **[1-hour] [2-hour] [fire-resistance rating of the roof assembly] <Insert rating>**.

Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

* + - 1. FLANGED BELLOWS-TYPE ROOF EXPANSION JOINTS **<Insert drawing designation>**
				1. Flanged Bellows-Type Roof Expansion Joint: Factory-fabricated, continuous, waterproof, joint cover consisting of exposed membrane bellows laminated to flexible, closed-cell support foam, and secured along each edge to 3- to 4-inch wide metal flange.

Generally, retain "Source Limitations" subparagraph below if using a flanged bellows-type roof expansion joint. Roofing manufacturers that produce roof expansion joints generally require use of their own roof expansion joints, or those from an approved list of manufacturers, for roofs under warranty. Coordinate with roofing-membrane warranty in applicable Section.

Source Limitations: Obtain flanged bellows-type roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.

Revise "Joint Movement Capability" subparagraph below if required expansion and contraction capabilities are not equal percentages and are not indicated on Drawings. "50 percent of joint size" option below is most common for flanged bellows-type roof expansion joints.

Joint Movement Capability: Plus and minus **[25 percent of joint size] [50 percent of joint size] [As indicated on Drawings] <Insert dimension or percentage>**.

Bellows: **[EPDM] [Neoprene] [PVC] <Insert material> flexible membrane, nominal [60 mils] <Insert thickness>** thick.

Flanges: **[Galvanized steel, 0.022 inch thick] [Copper, 16 oz./sq. ft. thick] [Stainless steel, 0.0188 inch thick] [Aluminum, 0.032 inch thick] <Insert requirement>**.

Configuration: **[Flat to fit cants] [Angle formed to fit curbs] <Insert requirement>** as indicated on Drawings.

Generally, retain "Corner, Intersection, and Transition Units" subparagraph below to assure watertight joints and limit field work to splices in straight runs.

Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints.

Retain "Cover Membrane" subparagraph below if a membrane that overlies the bellows, flanges, and curbs is required. Verify availability with manufacturers; some manufacturers offer other materials.

Cover Membrane: **[EPDM] [Neoprene] [PVC] <Insert material>** flexible membrane, factory laminated to bellows and covering entire joint assembly and curbs.

"Black" option in "Color" subparagraph below is standard; neoprene is available in black only. Consult manufacturers for availability of other colors.

Color: **[Black] [White] <Insert color>**.

Accessories: Provide splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation.

Retain "Secondary Seal" subparagraph below if required. Consult manufacturers for availability. Manufacturers generally consider a secondary seal optional, and their products vary. Consult manufacturers for the effect a secondary seal may have on the compressibility of joint assembly from nominal joint width.

Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary bellows assembly.

Generally, retain either "Drain-Tube Assemblies" or "Thermal Insulation" subparagraph below.

Retain "Drain-Tube Assemblies" subparagraph below if required. Consult manufacturers for availability and compatibility with thermal insulation or fire barrier if required.

Drain-Tube Assemblies: Equip secondary seal with drain tubes and seals to direct collected moisture **[to drain] [to exterior-wall expansion joint cover] [as indicated on Drawings] <Insert requirement>**.

Retain "Thermal Insulation" subparagraph below if required; thermal insulation may obstruct drain-tube assemblies. Johns Manville and perhaps other manufacturers offer second option below.

Thermal Insulation: Fill space above secondary seal with **[mineral-fiber blanket] [manufacturer's standard, factory-installed mineral-fiber] <Insert requirement>** insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84.

Retain "Fire Barrier" subparagraph below if fire-rated roof expansion joint is required.

Fire Barrier: Manufacturer's standard fire barrier for fire-resistance-rated expansion joint system.

* + - * 1. Materials:

Galvanized-Steel Sheet: ASTM A653, hot-dip zinc-coating designation G90.

Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

Type 304 stainless steel is standard in the industry. Revise "Stainless Steel Sheet" subparagraph below if Type 316 stainless steel is required; verify availability with manufacturers retained.

Stainless Steel Sheet: ASTM A240 or ASTM A666, Type 304.

Aluminum Sheet: ASTM B209, mill finish, with temper to suit forming operations and performance required.

Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.

EPDM Membrane: ASTM D4637, type standard with manufacturer for application.

Neoprene Membrane: Neoprene sheet recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil; and as standard with roof-expansion-joint manufacturer for application.

PVC Membrane: ASTM D4434, type standard with manufacturer for application.

* + - 1. EXTRUDED BELLOWS ROOF EXPANSION JOINTS
				1. Extruded Bellows Roof Expansion Joint: Manufactured, continuous, waterproof, joint cover assembly; consisting of primary and secondary, single-layered, elastomeric seals; secured along each edge with extruded-aluminum retainers for fastening to substrate.

Revise "Joint Movement Capability" subparagraph below if required expansion and contraction capabilities are not equal percentages and are not indicated on Drawings.

Joint Movement Capability: Plus and minus **[25 percent of joint size] [50 percent of joint size] [As indicated on Drawings] <Insert dimension or percentage>**.

Primary Seal: Silicone extrusion; color: **[Black] [White] [Bronze] [Sandstone] [Gray] [As selected by Director’s Representative from manufacturer's full range] <Insert color>**.

Secondary Seal: EPDM, or manufacturer's standard elastomeric seal.

Retain "Drain-Tube Assemblies" subparagraph below if required. Consult manufacturers for availability.

Drain-Tube Assemblies: Equip secondary seal with drain tubes and seals to direct collected moisture **[to drain] [to exterior-wall expansion joint cover] [as indicated on Drawings] <Insert requirement>**.

Generally, retain "Corner, Intersection, and Transition Units" subparagraph below to assure watertight joints and limit field work to splices in straight runs.

Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints.

* + - * 1. Materials:

Aluminum: ASTM B221 for extrusions; mill finish, with temper to suit forming operations and performance required.

Apply manufacturer's standard protective coating on aluminum surfaces in contact with cementitious or preservative-treated wood materials.

Silicone Extrusions: ASTM D2000, UV stabilized, and that does not propagate flame.

EPDM Membrane: ASTM D4637, type standard with manufacturer for application.

Insert subparagraph for thermal insulation or fire barrier if required; verify availability with manufacturers and compatibility with drain-tube assemblies if required.

* + - 1. ALUMINUM ROOF EXPANSION JOINTS
				1. Aluminum Roof Expansion Joint: Factory-fabricated, continuous, waterproof, joint cover; consisting of a formed or extruded metal cover secured to extruded aluminum frames, with water-resistant gasketing between cover and frames, and with provision for securing assembly to substrate and sealing assembly to roofing membrane or flashing.

Revise "Joint Movement Capability" subparagraph below if required expansion and contraction capabilities are not equal percentages and are not indicated on Drawings.

Joint Movement Capability: Plus and minus **[25 percent of joint size] [50 percent of joint size] [As indicated on Drawings] <Insert dimension or percentage>**.

Confirm configuration offered by manufacturers in "Frame Members" subparagraph below; third option is offered by fewer manufacturers.

Frame Members: Extruded aluminum configured **[for curbs] [for sloped cants] [with integral aluminum curb] <Insert requirement> as indicated; with exposed finish [matching cover] [as selected by Director’s Representative from manufacturer's full range] <Insert requirement>**.

Cover thickness in "Cover" subparagraph below will vary with material and joint width. Comply with manufacturers' written recommendations for minimum cover thickness. Some manufacturers offer covers fabricated of other metals.

Cover: **[Formed aluminum] [Extruded aluminum] [Formed or extruded aluminum] [Stainless steel] <Insert material>; thickness [as recommended by manufacturer] <Insert thickness>**.

Centering Devices: **[Centering bars] [Snap-on spring clips attached to the cover] <Insert item>**.

Generally, retain "Corner, Intersection, and Transition Units" subparagraph below to assure watertight joints and limit field work to splices in straight runs.

Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints.

Accessories: Provide splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation.

Retain "Secondary Seal" subparagraph below if required. Consult manufacturers for availability. Manufacturers generally offer a secondary seal with aluminum roof expansion joints; products vary.

Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the cover.

Retain "Drain-Tube Assemblies" subparagraph below if required. Consult manufacturers for availability and compatibility with thermal insulation or fire barrier if required.

Drain-Tube Assemblies: Equip secondary seal with drain tubes and seals to direct collected moisture **[to drain] [to exterior-wall expansion joint cover] [as indicated on Drawings] <Insert requirement>**.

Retain "Thermal Insulation" subparagraph below if required; thermal insulation may obstruct drain-tube assemblies.

Thermal Insulation: Fill space above secondary seal with **[mineral-fiber blanket] <Insert requirement>** insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84.

Retain "Fire Barrier" subparagraph below if fire-rated roof expansion joints are required.

Fire Barrier: Manufacturer's standard fire barrier for fire-resistance-rated expansion joint system.

* + - * 1. Materials:

Aluminum: ASTM B209 for sheet and plate, ASTM B221 for extrusions; alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.

Retain finishes in first six subparagraphs below to suit Project. If retaining more than one, indicate location of each on Drawings or by inserts. Most common finish offering is mill; many manufacturers also offer Class II clear anodic, Class I color anodic, and two-coat fluoropolymer finishes as standard. Verify availability of finishes with manufacturers retained.

Mill Finish: As manufactured.

Class II, Clear Anodic Finish: Architectural Class II, clear coating 0.010 mm or thicker, complying with AAMA 611.

Class I, Clear Anodic Finish: Architectural Class I, clear coating 0.018 mm or thicker, complying with AAMA 611.

Class I, Color Anodic Finish: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker, complying with AAMA 611.

High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Retain one or both of first two subparagraphs below. If retaining both, indicate location of each on Drawings or by inserts. To obtain a proprietary finish system, insert names of coating manufacturers and products.

Two-Coat Fluoropolymer: System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

Three-Coat Fluoropolymer: System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent PVDF resin by weight.

Aluminum Finish Color: **[Light bronze] [Medium bronze] [Dark bronze] [As indicated by manufacturer's designations] [As selected by Director’s Representative from manufacturer's full range] <Insert requirement>**.

Retain "Stainless Steel Sheet" subparagraph below if stainless steel joint cover is required. Type 304 stainless steel is standard in the industry. Revise "Stainless Steel Sheet" subparagraph below if Type 316 stainless steel is required; verify availability with manufacturers retained.

Stainless Steel Sheet: ASTM A240 or ASTM A666, Type 304; finish ASTM A480 No. 2B.

* + - 1. PREFORMED FOAM SEALANT-TYPE ROOF EXPANSION JOINT **<Insert drawing designation>**

Preformed foam sealant-type expansion joints are typically tested in accordance with UL 2079 for fire resistance, but do not often carry UL ratings for roofing applications. Willseal's products currently carry UL ratings for floor-to-floor and walls only.

* + - * 1. Preformed Sealant-Type Roof Expansion Joint: Factory-fabricated, continuous, waterproof, UV stable expansion joint consisting of exposed silicone cap laminated to each side of **[fire-retardant-impregnated]** polyurethane foam sealant.

Generally, retain "Source Limitations" subparagraph below if using a preformed sealant-type roof expansion joint. Roofing manufacturers that produce roof expansion joints generally require use of their own roof expansion joints, or those from an approved list of manufacturers, for roofs under warranty. Coordinate with roofing-membrane warranty in applicable Section.

Source Limitations: Obtain preformed sealant-type roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.

Revise "Joint Movement Capability" subparagraph below if required expansion and contraction capabilities are not equal percentages and are not indicated on Drawings.

Joint Movement Capability: Plus and minus **[25 percent of joint size] [50 percent of joint size] [As indicated on Drawings] <Insert dimension or percentage>**.

Generally, retain "Corner, Intersection, and Transition Units" subparagraph below to assure watertight joints and limit field work to splices in straight runs.

Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions, including those to other building expansion joints.

Products can be unfaced if used as a secondary seal only. Silicone facing is usually available in Dow 790 and Pecora 896 silicone colors. Consult manufacturer for availability of colors.

Facing: **[Uncoated] [Coated on one side] [Coated on both sides]**.

Color: **<Insert color>**.

Accessories: Provide adhesives and other components as recommended by roof-expansion-joint manufacturer for complete installation.

Preformed foam expansion joints consist of a primary seal at the foam core, and the silicone facing serves as the secondary seal. Retain "Edge and Splice Sealant" subparagraph below if an additional bead of sealant is desired along the edges where appropriate to provide a uniform seal with the substrate.

Edge and Splice Sealant: Manufacturer's standard silicone sealant for finishing edges and splice seams.

* + - * 1. Materials:

Foam: Polyurethane foam impregnated with fire-retardant acrylic polymers.

Silicone Facings: ASTM C920, ultra-low-modulus, one-part, neutral-cure silicone sealant, UV stabilized, and that does not propagate flame.

* + - 1. MISCELLANEOUS MATERIALS
				1. Adhesives: As recommended by roof-expansion-joint manufacturer.
				2. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.

Revise "Exposed Fasteners" subparagraph below to suit Project.

Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.

* + - * 1. Mineral-Fiber Blanket: ASTM C665.
				2. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine joint openings, substrates, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION, GENERAL
				1. Comply with manufacturer's written instructions for handling and installing roof expansion joints.

Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.

Install roof expansion joints true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.

Provide for linear thermal expansion of roof-expansion-joint materials.

Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.

Provide uniform, neat seams.

Install roof expansion joints to fit substrates and to result in watertight performance.

Retain "Directional Changes" paragraph below if factory-fabricated units in "Corner, Intersection, and Transition Units" subparagraph have been retained in Part 2.

* + - * 1. Directional Changes: Install factory-fabricated units at directional changes to provide continuous, uninterrupted, and watertight joints.
				2. Splices: Splice roof expansion joints to provide continuous, uninterrupted, and waterproof joints.

Retain subparagraph below if secondary seal is required.

Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.

Retain "Fire Barrier" paragraph below if fire-rated roof expansion joint is required.

* + - * 1. Fire Barrier: Install fire barrier as required by manufacturer to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.

Retain "Metal Protection" paragraph below if required.

* + - * 1. 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.

END OF SECTION 077129