SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

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:

Packless expansion joints.

Grooved-joint expansion joints.

Alignment guides and anchors.

* + - 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.

Retain "Delegated-Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, reviewed by the Consultant Designer responsible for their preparation.

Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections. Calculations should be based on piping layout of contractor created shop drawings.

Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.

Alignment Guide Details: Detail field assembly and attachment to building structure.

Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

* + - 1. INFORMATIONAL SUBMITTALS

Retain "Welding certificates" paragraph below if retaining "Welding Qualifications" paragraph in "Quality Assurance" Article.

* + - * 1. Welding certificates.
			1. CLOSEOUT SUBMITTALS
				1. Maintenance Data: For expansion joints to include in maintenance manuals.
			2. QUALITY ASSURANCE

Retain "Welding Qualifications" paragraph below if shop or field welding is required. If retaining, also retain "Welding certificates" paragraph in "Informational Submittals" Article.

* + - * 1. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
				2. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS
				1. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
				2. Capability: Products to absorb 200 percent of maximum axial movement between anchors.
			2. PACKLESS EXPANSION JOINTS
				1. Rubber Union Connector Expansion Joints:

Material: Twin reinforced-rubber sphereswith external restraining cables.

Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.

End Connections for 2 inch and Smaller: Threaded.

* + - * 1. Flexible-Hose Packless Expansion Joints:

Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.

Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.

Expansion Joints for Copper Tubing 2 inch and Smaller: Copper-alloy fittings with solder-joint end connections.

Retain one or both of first two subparagraphs below to suit pressure and temperature requirements of systems in which these devices are installed. If retaining both, indicate location of each on Drawings.

Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.

Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F and 500 psig at 450 deg F ratings.

Expansion Joints for Copper Tubing 2-1/2 inch to 4 inch: Copper-alloy fittings with threaded end connections.

Retain one or both of first two subparagraphs below to suit pressure and temperature requirements of systems in which these devices are installed. If retaining both, indicate location of each on Drawings.

Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.

Stainless-steel hoses and double-braid, stainless-steel sheaths with 420 psig at 70 deg F and 315 psig at 450 deg F ratings.

Expansion Joints for Steel Piping 2 inch and Smaller: Carbon-steel fittings with threaded end connections.

Retain one or both of first two subparagraphs below to suit pressure and temperature requirements of systems in which these devices are installed. If retaining both, indicate location of each on Drawings.

Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.

Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F and 515 psig at 600 deg F ratings.

Expansion Joints for Steel Piping 2-1/2 inch to 6 inch: Carbon-steel fittings with flanged or welded end connections.

Retain one or both of first two subparagraphs below to suit pressure and temperature requirements of systems in which these devices are installed. If retaining both, indicate location of each on Drawings.

Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.

Stainless-steel hoses and double-braid, stainless-steel sheaths with 275 psig at 70 deg F and 200 psig at 600 deg F ratings.

Expansion Joints for Steel Piping 8 inch to 12 inch: Carbon-steel fittings with flanged or welded end connections.

Retain one or both of first two subparagraphs below to suit pressure and temperature requirements of systems in which these devices are installed. If retaining both, indicate location of each on Drawings.

Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F and 90 psig at 600 deg F ratings.

Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.

Expansion Joints for Steel Piping 14 inch and Larger: Carbon-steel fittings with flanged or welded end connections.

Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.

* + - * 1. Metal-Bellows Packless Expansion Joints:

Standards: ASTM F1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

Type: Circular, corrugated bellows with external tie rods.

Minimum Pressure Rating: 200 psig, unless otherwise indicated.

Configuration: Single joint, Single joint with base, and double joint with base class(es), unless otherwise indicated.

Expansion Joints for Copper Tubing: multi-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

End Connections for Copper Tubing 2 inch and Smaller: Solder joint or threaded. Use threaded joints at equipment connections.

End Connections for Copper Tubing 2-1/2 to 4 inch: Solder joint or threaded. Use threaded joints at equipment connections.

End Connections for Copper Tubing 5 inch and Larger: Flanged.

Expansion Joints for Steel Piping: **Multi-**ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.

End Connections for Steel Pipe 2 inch and Smaller: Threaded.

End Connections for Steel Pipe 2-1/2 inch and Larger: Welded or flanged. Use flanged joints at equipment connections.

* + - * 1. Externally Pressurized Metal-Bellows Packless Expansion Joints:

Minimum Pressure Rating: [**150 psig**] [**200 psig**] [**300 psig**] <**Insert value**>, unless otherwise indicated.

Description:

Totally enclosed, externally pressurized, multi-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve.

Carbon-steel housing.

Drain plugs and lifting lug for 3 inch and larger.

First two subparagraphs below are optional features.

Bellows shall have operating clearance between the internal pipe sleeves and the external shrouds.

Joints shall be supplied with a built-in scale to confirm the starting position and operating movement.

Joint Axial Movement: [**4 inches**] [**6 inches**] [**8 inches**] <**Insert compression limit**> of compression and [**0.75 inch**] [**1 inch**] [**2 inches**] <**Insert extension limit**> of extension.

Retain "Permanent Locking Bolts" subparagraph below if using carbon steel. Locking bolts can also be used to set pre-compression or pre-extension, if required, and to lock the position of the connector for easy removal and reinstallation, if required for system maintenance.

Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.

The floating flange ensures that joint will not be over stressed during installation.

End Connection Configuration: Flanged; one raised, fixed and one floating flange.

* + - * 1. Rubber Packless Expansion Joints [**REJ-01**] <**Insert drawing designation**>:

Standards: ASTM F1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors.”

Material: Fabric-reinforced rubber complying with FSA-PSJ-703.

Retain one or both of first two subparagraphs below. If retaining both, indicate location of each on Drawings.

Arch Type: [**Single**] [**or**] [**multiple**] arches[**with external control rods**].

Spherical Type: [**Single**] [**or**] [**multiple**] spheres[**with external control rods**].

Pressure and temperature ratings in first subparagraph below are generally minimum values. Consult manufacturers' literature for available options.

Minimum Pressure Rating for 1-1/2 inch to 12 inch: [**225 psig at 170 deg F**] <**Insert pressure and temperature values**>.

Retain only those materials in first three subparagraphs below that are required. If retaining more than one, indicate location of each on Drawings. See "Packless Expansion Joints" Article in Evaluations for discussion of rubber materials.

Material for Fluids Containing Acids, Alkalis, or Chemicals: [**Butyl rubber**] [**Chlorosulfonyl-polyethylene rubber**] [**Ethylene-propylene-diene terpolymer rubber**] <**Insert material**>.

Material for Fluids Containing Gas, Hydrocarbons, or Oil: [**Buna-N**] [**Chlorosulfonated polyethylene synthetic rubber**] <**Insert material**>.

Material for Water: [**Butyl rubber**] [**Buna-N**] [**Chlorosulfonated polyethylene synthetic rubber**] [**Chlorosulfonyl-polyethylene rubber**] [**Ethylene-propylene-diene terpolymer rubber**] [**Natural rubber**].

End Connections: Full-faced, integral steel flanges with steel retaining rings.

* + - 1. GROOVED-JOINT EXPANSION JOINTS

Indicate on Drawings the number of couplings or amount of expansion required.

* + - * 1. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
				2. Standard: AWWA C606, for grooved joints.
				3. Nipples: [**Galvanized,**]ASTM A53, Schedule 40, Type E or S, steel pipe with grooved ends.
				4. Couplings: [**Five**] [**Seven**] [**10**] [**12**] <**Insert number**>, flexible type for steel-pipe dimensions. Include ferrous housing sections, [**Buna-N gasket suitable for diluted acid, alkaline fluids, and cold and hot water**] [**ethylene-propylene-diene terpolymer rubber gasket suitable for cold and hot water**], and bolts and nuts.
			1. ALIGNMENT GUIDES AND ANCHORS
				1. Alignment Guides [**AG-01**] <**Insert drawing designation**>:

Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

Indicate alignment-guide length and maximum slider travel on Drawings.

* + - * 1. Anchor Materials:

Steel Shapes and Plates: ASTM A36.

Bolts and Nuts: ASME B18.10 or ASTM A183, steel hex head.

Washers: ASTM F844, steel, plain, flat washers.

Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

Stainless-steel studs are available.

Stud: Threaded, zinc-coated carbon steel.

Expansion Plug: Zinc-coated steel.

Washer and Nut: Zinc-coated steel.

Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

Bonding Material: ASTM C881, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.

Stainless-steel studs are available.

Stud: ASTM A307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.

Washer and Nut: Zinc-coated steel.

1. EXECUTION

Install joints and guides in complete accordance with the manufacturer’s printed instructions.

* + - 1. INSTALLATION OF EXPANSION JOINTS
				1. Install expansion joints of sizes matching sizes of piping in which they are installed.
				2. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
				3. Install rubber packless expansion joints according to FSA-PSJ-703.
				4. Install grooved-joint expansion joints to grooved-end steel piping.
			2. INSTALLATION OF PIPE LOOP AND SWING CONNECTIONS

Ch. 46, "Pipes, Tubes, and Fittings," in the 2012 ASHRAE Handbook - "HVAC Systems and Equipment," states that cold springing is not recommended for most HVAC piping. If retaining first paragraph below, indicate dimensions of loops and swing connections and locations of guides and anchors on Drawings.

* + - * 1. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
				2. Connect risers and branch connections to mains with at least [**five**] <**Insert number**> pipe fittings, including tee in main.
				3. Connect risers and branch connections to terminal units with at least [**four**] <**Insert number**> pipe fittings, including tee in riser.
				4. Connect mains and branch connections to terminal units with at least [**four**] <**Insert number**> pipe fittings, including tee in main.
			1. INSTALLATION OF ALIGNMENT-GUIDES AND ANCHORS
				1. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

Indicate locations and number of guides on Drawings.

* + - * 1. Install [**one**] [**two**] guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than [**four**] <**Insert number**> pipe diameters from expansion joint.

Coordinate first paragraph below with structural Drawings if welding is included in structural work.

* + - * 1. Attach guides to pipe, and secure guides to building structure.
				2. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
				3. Anchor Attachments:

Coordinate "Anchor Attachment to Steel Pipe" subparagraph below with structural Drawings if welding is included in structural work.

Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.

Coordinate first paragraph below with structural Drawings if welding is included in structural work.

* + - * 1. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1.

Anchor Attachment to Steel Structural Members: Attach by welding.

Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

* + - * 1. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516