SECTION 23 05 16

EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this and other Sections of Division 23.

1.2 SUMMARY

A. Flexible-hose packless expansion joints.

B. Rubber packless expansion joints.

C. Grooved-joint expansion joints.

D. Alignment guides and anchors.

E. Pipe loops and swing connections.

1.3 SUBMITTALS

A. Compliance Review: In addition to the submittal requirements of this section, preorder bidders shall provide a Compliance Review of the Specifications and Addenda. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications with the following information, “C”, “D,” or “E” marked in the margin of the original Specifications and any subsequent Addenda.

1. “C”: Comply with no exceptions.
2. “D”: Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
3. “E”: Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives.
4. The notes associated with “D” and “E” responses shall be typewritten and submitted alongside the compliance review for review by the Design Professional.
5. Unless a deviation or exception is specifically noted in the Compliance Review, it is assumed that the Bidder is in complete compliance with the plans and Specifications. Deviations or exceptions taken in cover letters, subsidiary documents, by omission or by contradiction do not release the Bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review submitted with the Bid.

B. Product Data: For each type of product.

C. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their installation of equipment.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of expansion joint, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints

1. Acceptable Manufacturers:
   a. Mason Industries, Inc

b. Metraflex Company

2. 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.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.
   a. Bronze hoses and single-braid bronze sheaths with 300 psig at 70 deg F and 500 psig at 450 deg F ratings.
5. Expansion Joints for Steel Piping NPS 2 and Smaller: Carbon-steel fittings with threaded end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.
6. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.
7. Expansion Joints for Steel Piping NPS 8 to NPS 12: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.
8. Expansion Joints for Steel Piping NPS 14 and Larger: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F (1130 kPa at 21 deg C) and 120 psig at 600 deg F (830 kPa at 315 deg C) ratings.

B. Rubber Packless Expansion Joints:
1. Acceptable Manufacturers: Or approved equivalent
   a. Amber/Booth Company, Inc.
   b. Flexicraft Industries.
   c. Garlock Sealing Technologies.
   d. General Rubber Corporation.
   e. Mason Industries, Inc; Mercer Rubber Co.
   f. Metraflex Company (The).
   g. Proco Products, Inc.
2. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
3. Material: Fabric-reinforced rubber complying with FSA-PSJ-703.
4. Spherical Type: multiple spheres with external control rods.
5. Pressure and temperature ratings in the first three subparagraphs below are generally minimum values. Consult manufacturers' literature for available options.
6. Minimum Pressure Rating: 150 psig at 220 deg F.
7. Material for Water: Butyl rubber.

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

2.3 GROOVED-JOINT EXPANSION JOINTS

A. Acceptable Manufacturers:
   1. Victaulic Company

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

C. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

D. Standard: AWWA C606, for grooved joints.

E. Nipples: ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.

F. Couplings: flexible type for steel-pipe dimensions. Include ferrous housing sections, EPDM gasket suitable for cold and hot water, and bolts and nuts.

2.4 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides
   1. Acceptable Manufacturers: Or approved equivalent
      a. Adsco Manufacturing LLC.
      b. Advanced Thermal Systems, Inc.
      c. Flexicraft Industries.
      d. Mason Industries, Inc.
      e. Metraflex Company
   2. Indicate alignment-guide length and maximum slider travel on Drawings.
   3. 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.

B. Anchor Materials:
   1. Steel Shapes and Plates: ASTM A 36/A 36M.
   2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
   3. Washers: ASTM F 844, steel, plain, flat washers.
   4. 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.
      a. Stainless-steel studs are available.
      b. Stud: Threaded, zinc-coated carbon steel.
      c. Expansion Plug: Zinc-coated steel.
      d. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
   a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
   b. Stainless-steel studs are available.
   c. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
   d. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install rubber packless expansion joints according to FSA-PSJ-703.

C. Install grooved-joint expansion joints to grooved-end steel piping. The grooved fittings may only be installed for expansion joints.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Chapter 46, "Pipes, Tubes, and Fittings," in the 2020 ASHRAE HANDBOOK - "HVAC Systems and Equipment," states that cold springing is not recommended for most HVAC piping.

B. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

C. Connect risers and branch connections to mains with at least five pipe fittings, including tee in the main.

D. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in the riser.

E. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in the main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Indicate locations and number of guides on Drawings.

C. Install one or two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

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

E. Attach guides to pipe, and secure guides to building structure.

F. 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.

G. Anchor Attachments:

1. Coordinate first subparagraph below with structural Drawings if welding is included in structural work.
2. 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."
3. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.

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

I. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

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

J. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION