This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F1123 – 87 (Reapproved 2019)

An American National Standard

Standard Specification for Non-Metallic Expansion Joints[1]

This standard is issued under the fixed designation F1123; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification provides the minimum requirements for construction, materials, performance, and dimensional requirements of arch-type non-metallic expansion joints.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 The following safety hazards caveat pertains only to the test method described in this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A395/A395M Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures

D1418 Practice for Rubber and Rubber Latices—Nomenclature

2.2 *Federal Standard:*[3]

Code of Federal Regulations, Title 30, Chapter I, Mine Safety and Health Administration

2.3 *ASME Standards:*[4]

B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250

B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard

B16.24 Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500, and 2500

3. Terminology

3.1 *Definitions:*

3.1.1 *floating metallic flange type, n*—expansion joint having the tube, fabric plies, and cover brought up from the joint body to form a bead.

3.1.1.1 *Discussion*—This bead is molded into a groove in the metallic flange. Retaining rings are not required with this design.

3.1.2 *integral rubber flange type, n*—expansion joint having the tube, fabric plies, and cover brought up from the joint body to form a rubber flange.

3.1.2.1 *Discussion*—Additional plies or other reinforcement may be used in the flange to meet service conditions. Retaining rings must be used with this design.

3.1.3 *maximum allowable working pressure (MAWP), n*—manufacturer's recommended maximum continuous operating pressure (lb/in.^{2} (Pa)).

3.1.4 *non-metallic flanged expansion joint, n*—flexible connector fabricated from natural or synthetic rubber and fabrics, usually with metal reinforcement, to isolate vibration and noise

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, http://www.access.gpo.gov.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

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and provide stress relief in piping systems caused by thermal changes and other system movements.

4. Ordering Information

4.1 Orders for products under this specification shall include the following information:

4.1.1 Inside diameter of connecting pipes (joint ID).

4.1.2 Face-to-face dimension that is the flange-to-flange dimension into which the expansion joint is to be installed.

4.1.3 Maximum and minimum operating pressure in pounds-force per square inch gage (pascals).

4.1.4 Maximum and minimum operating temperature in °F (°C).

4.1.5 Flange drilling in accordance with the appendix titled "Common Flange Dimension/Drilling Chart" of the *Technical Handbook on Rubber Expansion Joints and Flexible Pipe Connectors*[5] (herein referred to as the *Technical Handbook*) or in accordance with special customer requirements.

4.1.6 Fluid to be handled.

4.1.7 This ASTM specification designation.

4.1.8 Movement data requirements (including shock or vibratory excursions if applicable).

4.1.9 Design certification burst test if required (see 9.1).

4.1.10 Hydrostatic or special tests if required (see 9.2).

4.1.11 Certification of expansion joint if required (see Section 12).

4.1.12 Certified detailed drawing of the expansion joint if required (see 12.2).

5. Materials and Manufacture

5.1 Expansion joints shall be fabricated with an elastomeric tube reinforced with multiple plies of woven cloth or tire cord covered with synthetic rubber. The inner tube shall be a natural rubber, synthetic rubber, or blend of synthetic rubber that meets the requirements of this specification. The woven cloth or tire cord shall be nylon, polyester, fiberglass, or aramid. Cotton is not acceptable. The reinforcing fabric shall be impregnated with a compatible friction stock. Additional reinforcement to the fabric may be provided in the body of the expansion joint and may be solid metal rings or wire imbedded in the synthetic rubber. Tensile properties of the wire, if used, shall be as given in 5.2. Body rings, if used, must be welded before being installed in the expansion joint body. Welds must be 100 % penetration.

5.1.1 The list of elastomers used in expansion joints and rubber pipe in accordance with the *Technical Handbook*[5] lists acceptable natural rubber and synthetic elastomers for construction of non-metallic expansion joints.

5.2 Reinforcing wire shall have properties that allow the expansion joints to meet the requirements of this specification.

5.3 All expansion joints shall be manufactured with a cover of Hypalon or Neoprene (Chloroprene), in accordance with Practice D1418. This cover material must consist of 100 % Hypalon or Chloroprene (not blended with any other elastomer) plus normal additives to provide for curing and a durometer between 50 and 75 on the Shore A Scale. Neoprene and Hypalon are selected as the best fire-retardant elastomer of the common types used for expansion joints. This material shall be certified flame resistant as outlined in 10.3.

5.4 *Integral Flanges*—The tube, fabric plies, and cover shall be brought up from the joint body to form an intregal flange. This rubber flange shall extend beyond the bolt holes of the retaining ring.

5.5 *Floating Metallic Flanges*—The metal flanges shall have a groove to accept the molded bead in the body at each end of the expansion joint bellows.

5.6 *Arches*—Arches may be either straight sided or long radius depending on the manufacturer's standard construction. The arch size and shape determine the movement capability of the joint. Minimum movement capability of single arch joints shall be in accordance with the *Technical Handbook*[5] table titled "Expansion Joint Movement Force/Spring Rate Capability." Movement capability information for multiple arch designs shall be available from the manufacturer.

5.7 *Metallic Flanges:*

5.7.1 Flanges shall be drilled in accordance with the *Technical Handbook*[5] appendix titled "Common Flange Dimension/Drilling Chart" or in accordance with the customer order as required, to match the mating flanges.

5.7.2 Metallic flanges shall meet the material requirements and pressure-temperature ratings in accordance with ASME B16.1, B16.5, or B16.24.

5.8 *Retaining Rings*—Retaining rings for the integral flange type are installed behind the flanges and are drilled to match the flange drilling. The sections supplied for each flange should be split at the bolt holes to ensure a proper seal at all points when the bolts are tightened. The edge next to the rubber flange shall be broken or bevelled to prevent cutting the rubber flanges. Retaining rings must be a minimum thickness of ⅜ in. (9.5 mm) and shall be made of steel or ductile iron. Carbon steel shall be galvanized. Ductile iron shall be in accordance with Specification A395/A395M.

6. Other Requirements

6.1 All expansion joints shall be designed for a minimum burst pressure of four times the maximum allowable working pressure. The design shall be based on analytical or experimental test of expansion joints of similar construction, class, type, and size. The design shall be certified by tests if ordered (see 4.1.9).

6.2 *Performance Requirements*—Single arch expansion joint movement shall not exceed the limits of the *Technical Handbook*[5] table referred to in 5.6 unless the manufacturer certifies that a proposed design can exceed the listed minimum movement capability to meet a special requirement greater than the minimum listed. Multiple arch-joint movement shall be of the manufacturer's certified design.

6.3 *Pressure Rating*—Expansion joints shall be limited to the pressures listed in the table "Pressure Characteristics of Rubber Expansion Joints" of the *Technical Handbook*.[5]

[5] The *Technical Handbook on Rubber Expansion Joints and Flexible Pipe Connections* is available from Fluid Sealing Association, 2017 Walnut St., Philadelphia, PA 19103.

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