



Designation: C425 – 21

Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings¹

This standard is issued under the fixed designation C425; 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 covers materials and test requirements for compression joints for vitrified clay pipe and fittings. See Specification C700 for pipe specifications. The test requirements are applicable to pipe joint assemblies prior to field installation of pipe.

NOTE 1—Install pipe in accordance with Practice C12.

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 precautionary caveat pertains only to the Test Requirements portion, Section 7, of this standard. *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

A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip (Withdrawn 2014)³

¹ This specification is under the jurisdiction of ASTM Committee C04 on Vitrified Clay Pipe and is the direct responsibility of Subcommittee C04.20 on Methods of Test and Specifications.

Current edition approved April 1, 2021. Published April 2021. Originally approved in 1958. Last previous edition approved in 2018 as C425 – 04(2018). DOI: 10.1520/C0425-21.

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 The last approved version of this historical standard is referenced on www.astm.org.

A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
C12 Practice for Installing Vitrified Clay Pipe Lines
C700 Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
C896 Terminology Relating to Clay Products
D395 Test Methods for Rubber Property—Compression Set
D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
D471 Test Method for Rubber Property—Effect of Liquids
D518 Test Method for Rubber Deterioration—Surface Cracking (Withdrawn 2007)³
D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents
D573 Test Method for Rubber—Deterioration in an Air Oven
D583 Methods of Test for Water Resistance of Textile Fabrics (Withdrawn 1971)³
D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
D1566 Terminology Relating to Rubber
D2240 Test Method for Rubber Property—Durometer Hardness

3. Terminology

3.1 *Definitions*—Terms relating to plastics and rubber shall be as defined in Terminologies D583 and D1566, respectively.

3.2 Terminology C896 can be used for clarification of terminology in this specification.

4. Principles of Joint Design

4.1 Sealing elements shall be compressed between bearing surfaces to assure watertight integrity as required in Section 7.

4.2 Sealing elements shall either be bonded to bearing surfaces or be independent elements.

5. Materials and Manufacture

5.1 Rubber ring-sealing elements shall conform to the requirements of Table 1.

5.2 Rubber for other than ring-sealing elements shall conform to the requirements of Table 2.

TABLE 1 Tests for Rubber—Ring-Sealing Elements

NOTE 1—Except for the water absorption test (Test Method D471), the tests shall be run on specimens cut from rubber test slabs representative of the finished product.

| Test | Test Requirement | ASTM Standard |
|--|---|---|
| Chemical resistance: 1N sulfuric acid 1N hydrochloric acid | no weight loss no weight loss | D543 (48 h at 23 ± 2°C) |
| Tensile strength | 1500 psi (10.4 MPa) min; 500 % min elongation at break | D412 |
| Hardness | Shore A durometer 35 min to 50 max | D2240 |
| Compression set | 16 % max of original deflection | D395, Method B (22 h at 70 ± 2°C) |
| Water absorption | 5 % max | D471—Immerse a 2-in. (51-mm) long section cut from a rubber-sealing element in distilled water for 7 days at 70 ± 2°C |
| Ozone resistance | no visible cracking under 2× specimen magnification using D518, Procedure B, stretched 20 % and exposed to ozone concentrations of 0.5 ppm for 24 h at 40 ± 1°C | D1149 |
| Accelerated oven aging | 80 % min of original tensile strength 75 % min of original elongation | D573 (7 days at 70 ± 2°C) |

TABLE 2 Tests for Rubber—Other than Ring-Sealing Elements

NOTE 1—Except for the water absorption test (Test Method D471), the tests shall be run on specimens cut from rubber test slabs representative of the finished product.

| Test | Test Requirements | ASTM Standard |
|--|--|--|
| Chemical resistance: 1N sulfuric acid 1N hydrochloric acid | no weight loss no weight loss | D543 (48 h at 23 ± 2°C) |
| Tensile strength | 1000 psi (6.9 MPa) min; 250 % min elongation at break | D412 |
| Hardness | Shore A durometer 55 min to 70 max | D2240 |
| Compression set | 20 % max of original deflection | D395, Method B (22 h at 70 ± 2°C) |
| Water absorption | 5 % max | D471—Immerse a 2-in. (51-mm) long section cut from a rubber coupling in distilled water for 7 days at 70 ± 2°C |
| Ozone resistance | no visible cracking under 2× specimen magnification, using D518, Procedure B, stretched 20 % and exposed to ozone concentrations of 0.5 ppm for 24 h at 40 ± 1°C | D1149 |
| Accelerated oven aging | 85 % min of original tensile strength 85 % min of original elongation | D573 (7 days at 70 ± 2°C) |

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5.3 Plastic components shall conform to the requirements of **Table 3**.

5.4 Metallic components shall be of corrosion-resistant metal conforming to Specifications **A167** and **A240/A240M**.

5.5 If any of the test specimens fail to meet the chemical resistance requirements, the manufacturer will be allowed a retest of two additional specimens, representative of the original material tested, for each one that failed. The jointing material will be acceptable if all retest specimens meet the test requirements.

5.6 Joints complying with this standard are suitable for most domestic and commercial applications. However, attention is called to the fact that industrial effluents vary in content, concentration, duration of discharge and temperature; and

specific evaluations of joint performance in such environments are necessary. In those instances, consult the manufacturer.

6. Joint Specimen Preparation

6.1 When required, assembled joints representative of the pipe and joints to be used, shall be selected from the supplier's stock by the purchaser or his representative.

6.2 Specimens selected for the test shall be up to 0.25 % of the number of joints to be furnished. No fewer than two assembled joints shall be tested for each diameter of pipe furnished.

6.3 Test specimens shall not be taken from damaged joints or pipe.

7. Test Requirements for Joints

7.1 Joints shall meet the requirements of **7.1.1** and **7.1.2** or **7.1.1** and **7.1.3**, when subjected to an internal 10-ft (3.1-m) head of water pressure (4.3 psi (30 kPa)), for a total test period of 1 h. The recommended temperature of the water, pipe, and atmosphere is 60 to 75°F (16 to 24°C).

7.1.1 Joints shall not leak when tested in the straight position and when deflected to amounts shown in **Table 4**. The

TABLE 3 Tests for Plastic Materials

| Test | Test Requirements | ASTM Standard |
|-----------------------|-------------------|-------------------------|
| Chemical resistance: | | D543 (48 h at 23 ± 2°C) |
| 1 N sulfuric acid | no weight loss | |
| 1 N hydrochloric acid | no weight loss | |

TABLE 4 Joint Deflection from Straight Alignment

| Nominal Diameter, in. (mm) | Angular Deflection per Joint, degrees | Deviation from Straight Alignment, in./linear ft (mm/linear m) |
|-----------------------------|---------------------------------------|--|
| 3 to 12 (76 to 305), incl | 2.4 | $\frac{1}{2}$ (42) |
| 15 to 24 (380 to 610), incl | 1.8 | $\frac{3}{8}$ (31) |
| 27 to 36 (685 to 915), incl | 1.2 | $\frac{1}{4}$ (21) |
| 39 and 42 (990 and 1065) | 0.9 | $\frac{3}{16}$ (16) |
| 48 (1220) | | $\frac{1}{8}$ (10) |

ends of the test line shall only be restrained the amount that is necessary to prevent longitudinal movement. The joint deflection from straight alignment shall be determined by measuring the distance the free end of one pipe moves away from the center line in any direction while the other pipe remains fixed (Fig. 1).

7.1.2 Assembled joints shall not leak when subjected to shear. The shear load shall be a force of 150 lbf/in. (26 kN/m) of nominal diameter uniformly applied over an arc of not less than 120° (2.1 rad) along a longitudinal distance of not more than 12 in. (305 mm) at the spigot end of one pipe. The load is applied immediately adjacent to the assembled joint with the other pipe adequately secured and supported on blocks placed immediately adjacent to the joint.

7.1.3 Joints shall not leak when the jointed ends are displaced relative to one another in any direction perpendicular to the pipe axis a distance of 0.04 in./in. (0.04 mm/mm) of pipe diameter.

8. Keywords

8.1 angular joint; bell; chemical resistance; clay pipe; compression joints; corrosion resistance; couplings; deflection; joints; sealing elements; shear; testing

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