



# Standard Test Method for Water Infiltration Resistance of Plastic Underground Conduit Joints Which Use Flexible Elastomeric Seals<sup>1</sup>

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## 1. Scope

1.1 This test method covers the determination of the water infiltration resistance of gasketed plastic underground conduit joints using a pressurized water bladder apparatus.

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 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

D618 Practice for Conditioning Plastics for Testing

D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

F512 Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation

### 2.2 Underwriter's Laboratories (UL) Standard:

UL 651 Schedule 40 and 80 Rigid PVC Conduit<sup>3</sup>

### 2.3 National Electrical Manufacturers Association (NEMA)

Standards:

TC-2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)<sup>4</sup>

TC-6 PVC and ABS Plastic Utilities Duct for Underground Installation<sup>4</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.40 on Test Methods.

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<sup>2</sup> 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.

<sup>3</sup> Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, http://www.ul.com.

<sup>4</sup> Available from National Electrical Manufacturers Association (NEMA), 1300 N. 17th St., Suite 1752, Rosslyn, VA 22209, http://www.nema.org.

TC-8 Extra-Strength PVC Plastic Utilities Duct for Underground Installation<sup>4</sup>

## 3. Significance and Use

3.1 Underground electrical and communication conduit should be impervious to groundwater in order to prevent damage to conductors and utility vaults. The bladder test described in this test method may be used to qualify potential gasketed conduit systems by indicating whether the joint system will prevent water infiltration.

3.2 This test method can be used to qualify joints for plastic underground conduits using flexible elastomeric seals. However, it should not be assumed that a joint system that passes this test method will be able to seal under cases of misinstallation or abuse, or both.

3.3 This test method covers all of the following gasketed conduit types: encased burial (EB) excluding EB20, direct burial (DB), telecommunications, cable television, and Schedule 40 conduit and Schedule 80 conduit. Trade sizes covered are 2-in. nominal size and larger. (See UL 651; NEMA TC-2, TC-6, and TC 8; and Specification F512.)

3.4 This test method also covers fittings that are intended for use with the conduit types described in 3.3 and which use flexible elastomeric seals.

## 4. Apparatus

4.1 *General*—One type of bladder joint tester is shown in Fig. 1.

### 4.2 Bladder:

4.2.1 The bladder shall be similar to that shown in Fig. 1. The bladder shall be comprised of a reinforced elastomeric tube that is capable of providing a watertight capsule around the subject joint specimen.

4.2.2 The bladder shall be able to safely contain an internal water pressure of at least 11.0 psi (75 kPa).

4.2.3 The bladder shall have plumbing connections that allow the bladder to be pressurized with water and that allow trapped air to be bled out of the bladder.

4.2.4 The bladder shall have a pressure gage that indicates pressure in the bladder. This gage shall be capable of measuring 11 psi (75 kPa) (gage) with an accuracy of  $\pm 0.5$  psi ( $\pm 3.5$  kPa) (gage).

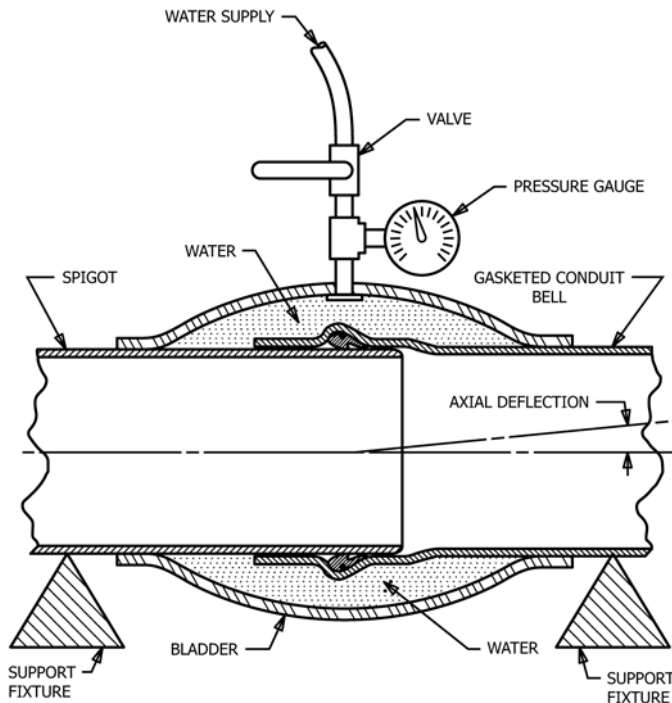


FIG. 1 Bladder Test Apparatus

4.3 Support Fixture:

- 4.3.1 The support fixture shall constrain movement of the test specimen and bladder during testing.
- 4.3.2 The support fixture shall be capable of axially deflecting the joint specimen about the joint to the maximum deflection angle recommended by the joint manufacturer.

NOTE 1—Axial deflection of a gasketed pipe joint will also induce diametric deformation of the bell and spigot if the angle of axial deflection is large enough. This can be beneficial when evaluating the sealing ability of a gasketed pipe joint.

5. Test Specimens

- 5.1 The gasketed joint specimen shall be comprised of a gasketed bell and a spigot with a chamfer on the outside diameter edge. Both the bell and spigot shall be of sufficient length to extend out beyond the bladder enough to provide a means by which to attach the specimen/bladder assembly to the support fixture.
- 5.2 Bell specifications and spigot chamfer specifications shall be determined by the manufacturer, but the specimens shall be representative of normal and customary production by the manufacturer. (See Test Method D2122.)
- 5.3 Three specimens shall be tested for each size of gasketed conduit.

6. Conditioning

- 6.1 Condition specimens for at least 2 h in air at a temperature of  $73.4 \pm 3.6^\circ\text{F}$  ( $23 \pm 2^\circ\text{C}$ ) and conduct the test in a room maintained at the same temperature. (See Practice D618.)

7. Procedure

- 7.1 Select and condition three sets of gasketed bells and spigots of the same nominal size according to Sections 5 and 6 of this test method.
- 7.2 Mark the specimens with consecutive numbers, starting with “1” and ending with “3.”
- 7.3 Select a bell/spigot pair and apply a joint lubricant recommended by the conduit manufacturer to both the bell and spigot according to the lubricant manufacturer’s directions.
- 7.4 Insert the spigot into the bell until the insertion line on the spigot is flush with the bell lip.
- 7.5 Slide the bladder over the assembled conduit joint and center the bladder over the joint seam. Seal the ends of the bladder to the spigot and bell.

NOTE 2—The type of clamps used to seal the bladder to the specimen and the location of the clamps on the specimen may influence the amount of bell and spigot deformation when the joint is deflected axially.

- 7.6 Attach all plumbing in accordance with 4.2.3 and 4.2.4 to the bladder assembly.
- 7.7 Attach the bladder/specimen assembly to the test fixture in a horizontal, axially straight position.
- 7.8 Fill the bladder with water and bleed off trapped air. Do not allow the bladder to pressurize past 5 psi (34 kPa) during the filling and air bleeding of the bladder.

- 7.9 After all air is bled from the bladder, pressurize the bladder to 11 psi (75 kPa) and allow the bladder pressure to stabilize for 5 min.
- 7.10 After the stabilization period, make the necessary adjustments to the bladder pressure to return it to  $11.0 \pm 0.5$  psi ( $75 \pm 3.5$  kPa).

- 7.11 Check for water leakage inside specimen. Leakage at this point constitutes failure of the test.

- 7.12 Visually check for leakage of the joint at 5, 10, and 15-min intervals. If leakage is detected at any interval, discontinue the test. Any leakage constitutes a failure of the test.

- 7.13 If no leakage has occurred to this point, repeat 7.12 after axially misaligning the same joint to the maximum amount allowed by the joint manufacturer.

- 7.14 Any leakage during any part of the test constitutes failure of the test and the test may be suspended at that point.

- 7.15 Repeat 7.3 through 7.14 for the remaining joints.

- 7.16 If other sizes of conduit are to be tested, repeat 7.1 through 7.15.

8. Report

- 8.1 Each test of a nominal size of conduit (three specimens) shall generate a test report.
- 8.2 The test report shall include the following:
  - 8.2.1 Identification of the bell and spigot specimens used in the test, including nominal size, type of conduit, material of manufacture, type and source of gasket, and the name of the joint manufacturer.

8.2.2 Whether the joint passed or failed the test. If the joint failed, state at what point in the test failure occurred.

8.2.3 Date(s) of testing.

8.2.4 Location of testing.

8.2.5 Name(s) of personnel conducting test.

8.2.6 Comments, if appropriate.

## **9. Precision and Bias**

9.1 No statement is made about either the precision or bias of this test method for determining water infiltration resistance

since the result merely states whether there is conformance to the criteria for success specified in the procedure.

## **10. Keywords**

10.1 bladder; gasketed conduit; underground conduit; water infiltration

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