AMERICAN NATIONAL STANDARD ANSI/ASTM D 2680 - 76[ε]

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## Standard Specification for
# ACRYLONITRILE-BUTADIENE-STYRENE (ABS) COMPOSITE SEWER PIPING[1]

This Standard is issued under the fixed designation D 2680; 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.

[ε] NOTE—A new note 2 was added editorially in October 1977.

### 1. Scope

1.1 This specification covers ABS composite pipe, joints and fittings for use in gravity, non-pressure sanitary and storm sewers, and drainage installations. Recommended installation practices are referenced in Appendix X1.

NOTE 1—The values stated in U.S. customary units are to be regarded as the standard.

### 2. Applicable Documents

2.1 *ASTM Standards:*

C 443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets[2]

D 648 Test for Deflection Temperature of Plastics Under Flexural Load[3]

D 883 Definitions of Terms Relating to Plastics[3, 4]

D 1600 Abbreviations of Terms Relating to Plastics[3]

D 1788 Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Plastics[4]

D 2122 Determining Dimensions of Thermoplastic Pipe and Fittings[4]

D 2321 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe[4]

### 3. Classification

3.1 Two basic types of joints are covered in this specification as follows:

3.1.1 Type SC is a solvent-cemented joint in which pipe solvent cements into a coupling socket to form the joint closure.

3.1.2 Type OR is a mechanical-seal joint in which a gasket is compressed between pipe and a belled coupling to form the joint closure.

### 4. Definitions

4.1 *General*—Definitions are in accordance with Definitions D 883 and Abbreviations are in accordance with Abbreviations D 1600 unless otherwise indicated. The abbreviation for acrylonitrile-butadiene-styrene is ABS.

4.2 *ABS composite pipe*—two concentric thermoplastic tubes integrally braced across the annulus, and with resultant annular space filled to provide continuous support between inner and outer tubes.

4.3 *acrylonitrile-butadiene-styrene (ABS) plastics*—plastics containing polymers or blends of polymers or both in which the minimum butadiene content is 6 percent; the minimum acrylonitrile content is 15 percent; the minimum styrene or substituted styrene content or both is 15 percent; and the maximum content of all other monomers is not more than 5 percent, plus lubricants, stabilizers and colorants.

4.4 Fittings are defined as tee or wye connections suitable for assembly to house or building sewers.

### 5. Materials and Manufacture

5.1 The pipe shall be extruded from ABS material and combined with the other component(s) which contribute to the internal brac-

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[2] *Annual Book of ASTM Standards*, Part 16.
[3] *Annual Book of ASTM Standards*, Part 35.
[4] *Annual Book of ASTM Standards*, Part 34.

ing of the double walls.

5.2 Joints and fittings, as shown in Figs. 1 and 2, shall be molded or fabricated from materials described in Section 6. Joints and fittings may be factory-attached to pipe or furnished loose at the option of the purchaser.

## 6. Composition

6.1 The thermoplastic material shall be a virgin rigid ABS plastic and shall conform to the requirements of Specification D 1788 for cell classification 2-2-3. Clean, rework ABS, generated from the manufacturer's own pipe extrusion, joints, and fittings, may be used by the same manufacturer, provided that the pipe produced meets all the requirements of this specification.

6.2 The other component shall be Portland Cement Perlite Concrete or other inert filler material exhibiting the same degree of performance, which essentially fills the truss annulus to form a composite pipe which meets the requirements of this specification.

6.3 Gaskets shall conform to Section 3 of Specification C 443.

6.4 Primer for priming solvent cemented joints shall be MEK (methyl ethyl ketone) and the cement shall be MEK containing a minimum of 20 weight percent of dissolved ABS as described in 6.1. The cement viscosity, when measured in accordance with Method D of Method D 1084 at 21 to 23°C (70 to 75°F) with a No. 5 Zahn cup, shall fall within a range from 60 to 80 s. The solids content of the cement shall be measured in accordance with Method D 2235.

## 7. Physical Requirements

7.1 *Stiffness and Deflection*—Pipe tested in accordance with 10.3 shall deflect at least 7.5 % without rupture of either inner or outer wall. The computed pipe stiffness at 5 % vertical deflection shall equal or exceed 1.38 MPa (200 psi) for each diameter.

NOTE 2—The 5 % deflection criterion, which was arbitrarily selected for testing convenience, should not be considered as a limitation with respect to in-use deflection. The engineer is responsible for establishing the acceptable deflection limit.

7.2 *Acid Conditioning*—Pipe shall meet the requirements of 7.1 after conditioning in acid in accordance with 10.4

NOTE 3—The test in 7.2 is not for use as simulated service or quality control test.

7.3 Pipe joints, Type SC or OR, and fittings attached to pipe, shall show no signs of leakage when tested in accordance with 10.5.

NOTE 4—This test is intended only for use as a quality control test, not for use as a simulated service test

## 8. Dimensions

8.1 *Diameters and Thickness*—The pipe shall conform to the dimensions and tolerances shown in Table 1, when measured in accordance with 10.6.1 and 10.6.2.

8.2 *Length*—Pipe shall be furnished in standard 3.82-m (12½-ft) lengths with a tolerance of −25 mm (−1 in.), when measured in accordance with 10.6.1. There is no limit for plus variation. Other lengths may be provided, if agreed upon by the purchaser and the seller.

8.3 *Straightness*—Pipe intended to be straight shall have a maximum deviation from straightness of 4.85 mm/m (3/16 in./ft) of length, when measured in accordance with 10.6.1.

8.4 *End Squareness*—Pipe ends shall be cut square to the longitudinal axis as provided in Table 2, when measured in accordance with 10.6.1.

8.5 Joint couplings shall conform to the dimensions shown in Table 3 when measured in accordance with 10.6.1.

8.6 Fittings, as illustrated in Fig. 2, shall have spur socket dimensions conforming to Table 4 when measured in accordance with 10.6.1. The spur socket shall be suitable for attaching to Solid Wall ABS house or building sewer pipe or adaptors for other pipe types.

## 9. Workmanship

9.1 The inner and outer surfaces of the pipe, joints and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe, joints and fittings shall be as uniform as commercially practicable in other physical properties.

## 10. Test Methods

10.1 *Conditioning*—Condition the test specimens at 23 ± 2 C (73.4 ± 3.6 F) and 50 ± 5 percent relative humidity for not less than 40

h prior to test in accordance with Procedure A of Methods D 618 for those tests where conditioning is required. In cases of disagreement, the tolerances shall be ± 1 C (± 1.8 F) and ± 2 percent relative humidity.

10.2 *Test Conditions*—Conduct tests in the Standard Laboratory Atmosphere of 23 ± 2 C (73.4 ± 3.6 F) and 50 ± 5 percent relative humidity, unless otherwise specified in the test methods or in this specification. In cases of disagreement, the tolerances shall be ± 1 C (± 1.8 F) and ± 2 percent relative humidity.

10.3 *Stiffness and Deflection:*

10.3.1 Test three 150-mm (6-in.) long specimens cut from each sample using the apparatus described in Method D 2412. Compress the specimen to record the load at 5 percent vertical deflection and to record the vertical deflection at rupture of either wall.

10.3.2 Calculate the percentage vertical deflection as follows:

$$\text{Vertical deflection, percent} = (\Delta y / \text{Nominal ID}) \times 100$$

where $\Delta y$ = vertical deflection of the inside diameter.

Both ID and $\Delta y$ must be in the same units.

10.3.3 Calculate the pipe stiffness at 5 percent deflection as follows:

$$\text{Pipe stiffness (PS)} = F/\Delta y$$

where $F$ = load recorded at 5 percent deflection.

NOTE 5—If $F$ is expressed in newtons metre, and $\Delta y$ is in metres, then PS is given in N/m²; if $F$ is expressed in pounds-force/inch, and $\Delta y$ is in inches, then PS is given in psi.

10.4 *Acid Conditioning*—Completely immerse three 150-mm (6-in.) long specimens cut from each sample in a suitable vat containing a 5 percent solution by weight of sulfuric acid. Allow the specimen to remain submerged for 24 h. After removal from the acid, wash the specimen with running water, wipe with a clean, dry cloth, condition for 2 h and then test in accordance with 10.3 within 30 min.

10.5 *Joint and Fitting Tightness*—Assemble Type SC joints by first applying a coat of primer to the inside of the socket and to the outside of the spigot end of pipe. Without delay, apply a coating of cement to the same surfaces in sufficient quantity that when the spigot is fully inserted into the socket, a bead of excess cement will form around the complete circumference of the outside juncture of the spigot and socket. Remove the excess cement and allow the assembly to cure for 24 h. Assemble Type OR joints by any convenient means so that the joint components are located as shown in Fig. 1. It is recommended that a lubricant, such as soap and water, be used. Seal all open ends by any convenient method and apply an internal hydrostatic head of 70 kPa (10 psi) to the assembly for 1 h. Observe evidence of any leakage. Leakage through the inert filler shall not be considered reason for rejection.

10.6 *Dimensions:*

10.6.1 *Dimensions*—Measure the average outside diameter by use of a circumferential wrap tape, out-of-roundness for maximum diameter, inside diameter, length, straightness, coupling thickness, and socket inside diameter in accordance with Method D 2122.

10.6.2 *Concentric Tube Thickness*—Measure the minimum average inner and outer concentric thermoplastic tube thickness in accordance with Section 4 of Method D 2122. Remove the other component prior to measurement in a manner so as to obtain clean surfaces.

10.6.3 *End Squareness*—Determine the pipe end squareness by placing a right angle square against the pipe outside at the pipe end and determine to the nearest 0.25 mm (0.01 in.) the maximum gap to the inside edge of the tool arm.

## 11. Inspection

11.1 Inspection of the material shall be made as agreed upon by the purchaser and the seller as part of the purchase contract.

## 12. Retest and Rejection

12.1 If any failure occurs, the materials may be retested to establish conformity in accordance with agreement between the purchaser and the seller.

## 13. Certification

13.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification,

together with a report of the test results, shall be furnished at the time of shipment.

## 14. Marking

14.1 Pipe shall be marked on the barrel at intervals not exceeding 1.5 m (5 ft) in letters not less than 9.5 mm (3/8 in.) in height and of bold type style. The marking shall indicate the name of the manufacturer or principal supplier, ASTM designation, ABS, and the nominal diameter. Lettering shall be legible and permanent under normal conditions of handling and storage.

14.2 Couplings and fittings shall be marke to indicate the name of the manufacturer o principal supplier, ASTM designation, and nominal diameter. Lettering shall be legible and permanent under normal conditions of handling and storage.

**TABLE 1 Pipe Dimensions**

| Nominal Size, in | Outside Diameter | | | Average Inside Diameter | Average Concentric Tube Thickness | |
|---|---|---|---|---|---|---|
| | Average | Tolerance | Max | Min | Min Inner | Min Outer |
| | | | Millimetres | | | |
| 8 | 239 | +1.0 −0.5 | 242 | 197 | 1.52 | 0.90 |
| 10 | 298 | +1.2 −1.0 | 302 | 248 | 1.73 | 0.96 |
| 12 | 357 | +1.5 −1.2 | 361 | 298 | 2.01 | 1.22 |
| 15 | 447 | +1.8 −1.5 | 452 | 375 | 2.44 | 1.50 |
| | | | Inches | | | |
| 8 | 9.41 | +0.04 −0.02 | 9.51 | 7.75 | 0.060 | 0.035 |
| 10 | 11.75 | +0.04 −0.04 | 11.87 | 9.75 | 0.068 | 0.038 |
| 12 | 14.07 | +0.06 −0.05 | 14.22 | 11.75 | 0.079 | 0.048 |
| 15 | 17.62 | +0.07 −0.07 | 17.80 | 14.75 | 0.096 | 0.059 |

TABLE 2 End Squareness

| Nominal Size, in | Maximum Allowable Gap | |
|---|---|---|
| | mm | in. |
| 8 | 6.4 | 0.25 |
| 10 | 8.4 | 0.33 |
| 12 | 10.4 | 0.41 |
| 15 | 12.8 | 0.50 |

TABLE 3 Coupling and Fitting Socket Dimensions-Type SC

| Nominal Size, in | Nominal Length | | Minimum Inside Socket Diameter | | Minimum Thickness at Socket Stop | |
|---|---|---|---|---|---|---|
| | mm | in. | mm | in | mm | in |
| 4[A] | . | | 107 | 4.20 | 4.19 | 0.165 |
| 6[A] | . | | 159 | 6.26 | 4.95 | 0.195 |
| 8 | 140 | 5½ | 238 | 9.36 | . | . |
| 10 | 152 | 6 | 297 | 11.69 | 4.83 | 0.190 |
| 12 | 172 | 6¾ | 356 | 14.00 | 5.59 | 0.220 |
| 15 | 200 | 8 | 446 | 17.54 | 6.48 | 0.225 |

[A] Saddle stubs

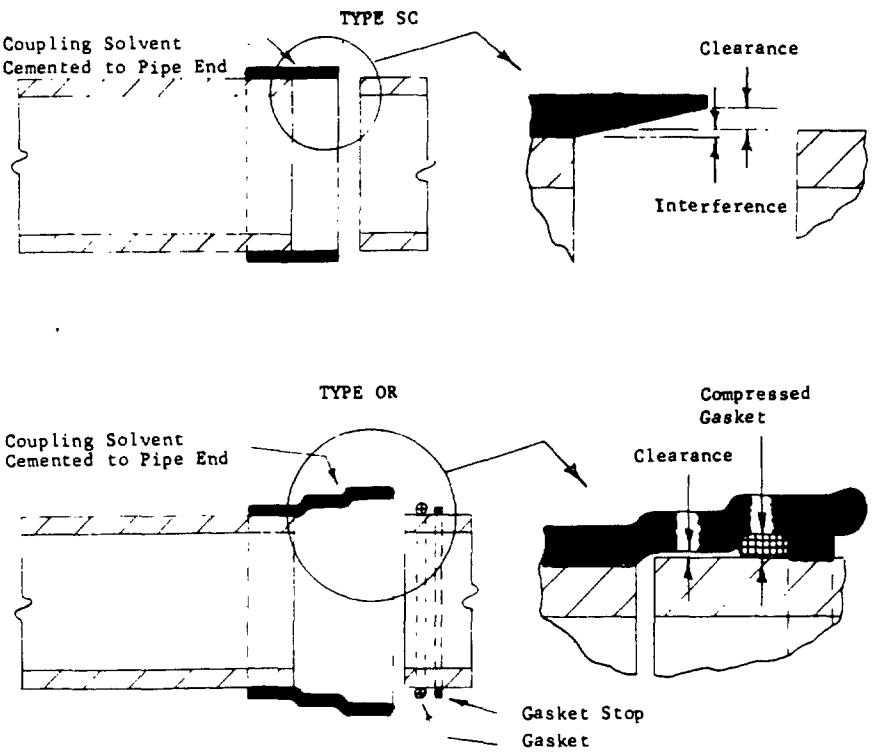


FIG. 1 Assembly of Joints, Types SC and OR.

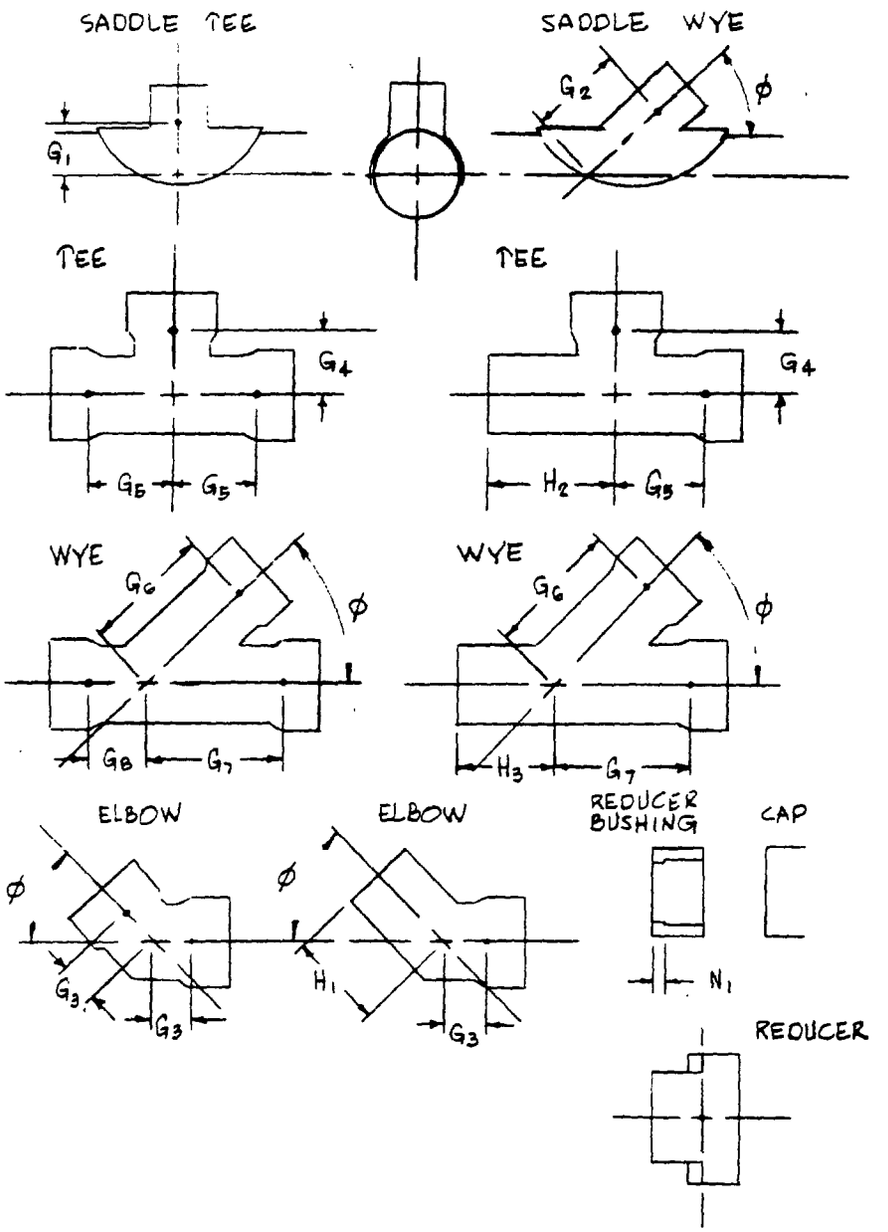


FIG. 2 Fittings (see key on following page).

**Minimum Laying Length Dimensions, mm (in.)**

| | in. | deg | 8 in | 10 in. | 12 in | 15 in |
|---|---|---|---|---|---|---|
| $G_1$ | 4 stub | 90 | 123(4 7/8) | ... | ... | |
| | 6 stub | 90 | 106(4 3/16) | 142(5 5/8) | 160(6 5/16) | 211(8 5/16) |
| $G_2$ | 4 stub | 45 | 244(9 5/8) | ... | ... | ... |
| | 6 stub | 45 | 225(8 7/8) | 296(11 11/16) | 339(13 3/8) | 404(15 15/16) |
| $G_3$ | | 3 | 9(3/8) | 3(1/8) | 4(3/16) | 6(1/4) |
| | | 45 | 57(2 1/4) | 304(12) | 304(12) | 304(12) |
| | | 90 | (a) | 412(16 1/4) | 412(16 1/4) | 519(20 7/16) |
| $G_4$ | | 90 | 155(6 1/8) | 330(13) | 355(14) | 406(16) |
| $G_4$ | 6 stub | 90 | 123(4 7/8) | ... | ... | ... |
| $G_5$ | | 90 | 103(4 1/16) | 330(13) | 355(14) | 406(16) |
| $G_5$ | 6 stub | 90 | 79(3 1/8) | ... | ... | ... |
| $G_6$ | | 45 | 292(11 1/2) | 533(21) | 581(22 7/8) | 596(23 1/2) |
| $G_6$ | 6 stub | 45 | 225(8 7/8) | ... | ... | ... |
| $G_7$ | | 45 | 292(11 1/2) | 533(21) | 581(22 7/8) | 723(28 1/2) |
| $G_7$ | 6 stub | 45 | 263(10 3/8) | ... | ... | ... |
| $G_8$ | | 45 | 31(1 1/4) | ... | ... | ... |
| $G_8$ | 6 stub | 45 | 9(3/8) | ... | ... | ... |
| $H_1$ | | 45 | 228(9) | 304(12) | 304(12) | 304(12) |
| $H_1$ | | 90 | 336(13 1/4) | 412(16 1/4) | 412(16 1/4) | 519(20 7/16) |
| $H_2$ | | 90 | ... | 330(13) | 355(14) | 406(16) |
| $H_3$ | | 45 | ... | 228(9) | 276(10 7/8) | 318(12 1/2) |
| $N_1$ | (b) | ... | 6(1/4) | ... | ... | ... |

(a) Two 45 deg combined with a nipple make up a 90-deg 8-in. elbow.

(b) Reducing bushing for 8 in. to 6 in. Reducers for other reductions from 15 in.

## APPENDIX

### X1. UNDERGROUND INSTALLATION

X1.1 Recommended Practice D 2321 is recommended as a guide for installing this pipe. The maximum size of particles used in the materials around the pipe may be 40 mm (1 1/2 in.) without impairing the effectiveness of the installation. Soil containing frozen earth, debris, or rocks larger than 1 1/2 in. diameter and soils identified in the Unified Soil Classification System as MH, CH, OL, OH, and PT should not be used as bedding, haunching, or initial backfill. Soil types ML and CL require care in placement to ensure full pipe peripheral contact.

X1.2 The procedures for placing and compacting the bedding, haunching and initial backfill materials shall be as described in the specification, except when using the allowable soils in Classes II, III, and IV. The haunching and initial backfilling for these soils shall be placed completely under the pipe haunches and up each side in uniform layers not exceeding 152 mm (6 in.) in depth, with each layer carefully and uniformly tamped. The minimum cover for wheel or hydrohammer loads is 610 mm (24 in.).