



Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping¹

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. 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 Department of Defense.

1. Scope

1.1 This specification covers thermoplastic composite pipe, fittings and a joining system for use in gravity flow, nonpressure sanitary sewer, and storm drain installations. The pipe and fittings are made of ABS or PVC plastic material. Recommended installation practices are referenced in Appendix XI.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.3 The following safety hazards caveat pertains only to the test method portion, Section 10, of this specification: *This standard does not purport to address all of the safety problems, 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.* Specific precautionary information is given in Note 6.

2. Referenced Documents

2.1 ASTM Standards:

- D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing²
- D 1084 Test Methods for Viscosity of Adhesives³
- D 1600 Terminology for Abbreviated Terms Relating to Plastics²
- D 1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds²
- D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings⁴
- D 2152 Test Method for Degree of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion⁴
- D 2235 Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings⁴
- D 2321 Practice for Underground Installation of Thermo-

plastic Pipe for Sewers and Other Gravity-Flow Applications⁴

D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading⁴

D 2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems⁴

D 3138 Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components⁴

D 3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals⁴

D 3965 Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Compounds for Pipe and Fittings⁴

D 4396 Specification for Rigid Poly(Vinyl Chloride)(PVC) and Related Plastic Compounds for Nonpressure Piping Products⁴

F 402 Practice for Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings⁴

F 412 Terminology Relating to Plastic Piping Systems⁴

F 477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe⁴

F 913 Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe⁴

2.2 Federal Standard:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)⁵

2.3 Military Standard:

MIL-STD-129 Marking for Shipment and Storage⁵

3. Terminology

3.1 Definitions:

3.1.1 *General*—Definitions are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600, unless otherwise specified. The abbreviation for acrylonitrile-butadiene-styrene is ABS and the abbreviation for poly(vinyl chloride) is PVC.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acrylonitrile-butadiene-styrene (ABS)*—plastics containing polymers or blends of polymers, or both, in which the minimum butadiene content is 6 %; the minimum acrylonitrile

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 15.06.

⁴ *Annual Book of ASTM Standards*, Vol 08.04.

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

content is 15 %; the minimum styrene or substituted styrene content, or both, is 15 %; and the maximum content of all other monomers is not more than 5 %, plus lubricants, stabilizers, and colorants.

3.2.2 *poly (vinyl chloride) (PVC)*—plastic compounds containing poly(vinyl chloride) homopolymer, and such additives as stabilizers, lubricants, processing aids, impact improvers, and colorants as needed to provide the required processing and toughness characteristics.

4. Classification

4.1 Pipe produced in accordance with this specification shall be classified as ABS composite pipe or PVC composite pipe based on plastic materials used in manufacture.

5. Materials and Manufacture

5.1 ABS composite pipe or PVC composite pipe shall consist of two concentric thermoplastic tubes integrally braced across the annulus. The resultant annular space is filled to provide continuous support between the inner and outer tubes.

5.2 *Compounds*—The ABS and PVC composite pipe and fittings shall be produced from the following compounds:

5.2.1 *ABS*—The pipe shall be made from a rigid ABS plastic and shall meet or exceed the requirements of Specification D 3965 for a minimum cell classification of 1-0-2-2-3. The fittings shall be made from ABS plastic and shall meet or exceed the requirements of Specification D 3965 for cell classifications of 1-0-2-2-3 or 4-2-2-2-2. Clean rework ABS, generated from the manufacturer’s own pipe extrusion and fittings may be used by the same manufacturer, provided that the pipe and fittings produced meet all the requirements of this specification.

5.2.2 *PVC*—The thermoplastic material shall be a rigid PVC plastic and shall meet or exceed the requirements of Specification D 1784, for a minimum cell classification of 12454B or 12454C or of Specification D 4396, for a minimum cell classification of 11432. Homopolymer PVC compounds that have higher cell classifications, because one or more properties are superior to those of the specified compounds, are also acceptable. Clean rework PVC, generated from the manufacturer’s own pipe and fittings production may be used by the same manufacturer provided that the pipe and fittings produced meet all the requirements of this specification.

5.3 The other component shall be portland cement-perlite concrete or other inert filler material exhibiting the same degree of performance, that essentially fills the truss annulus to form a composite pipe that meets the requirements of this specification.

5.4 *Gaskets*—Elastomeric seals (gaskets) shall comply with requirements described in Specifications F 477 and F 913.

NOTE 1—Gasket joints manufactured for PVC composite pipe only.

5.5 *Lubricants*—The lubricant used for the assembly of gasket joints shall have no detrimental effect on the gasket or on the pipe.

6. Performance Requirements

6.1 *Pipe Stiffness*—Pipe tested in accordance with 10.2 shall have a minimum pipe stiffness of 200 lb/in./in. (1380 kPa) at 5% deflection.

6.2 *Pipe Deflection*—Pipe tested in accordance with 10.2 shall deflect a minimum of 7.5 % without rupture of inner or outer wall.

NOTE 2—The purpose of the quality control tests in 6.1 and 6.2 is to furnish test results for a consumer only upon his request at the time of order and prior to shipment from the point of manufacture.

6.3 *Acid Conditioning*—Pipe tested in accordance with 10.3 shall meet the requirements of 6.1 and 6.2.

NOTE 3—This test is intended only for use as a qualification test, not for use as a simulated service test nor a quality control test.

6.4 *Joint Tightness:*

6.4.1 *Solvent Cement Joints*—Pipe and fittings attached to the pipe shall show no signs of leakage when tested in accordance with 10.4.1 (See Note 3).

6.4.2 *Gasket Joints for PVC Composite Pipe*—Joints shall show no signs of leakage when tested in accordance with 10.4.2 (See Note 3).

6.5 *Extrusion Quality*—When tested in accordance with 10.5, PVC extruded pipe tubes shall not flake or disintegrate.

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

7. Other Requirements

7.1 *Joints and Fittings* as shown in Fig. 1 and Fig. 2, shall be molded or fabricated from materials described in Section 5. Joints and fittings may be factory-attached to the pipe or furnished loose, at the option of the purchaser.

7.2 *Solvent Cement Joints:*

7.2.1 *Solvent Cement Joint*—In the solvent cement joint, the pipe spigot wedges into the tapered socket and the surfaces fuse together.

7.2.2 *ABS Solvent Cement Joints*—Primer for priming solvent cemented joints shall be MEK (methyl ethyl ketone) and the cement shall be MEK containing a minimum of 20 % by weight of dissolved ABS as described in 5.2.1. The cement

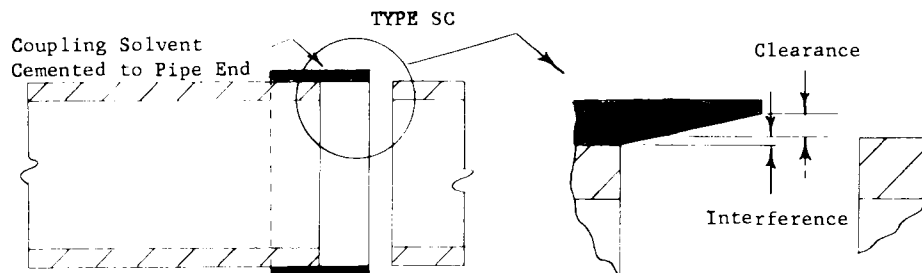


FIG. 1 Assembly of Joints

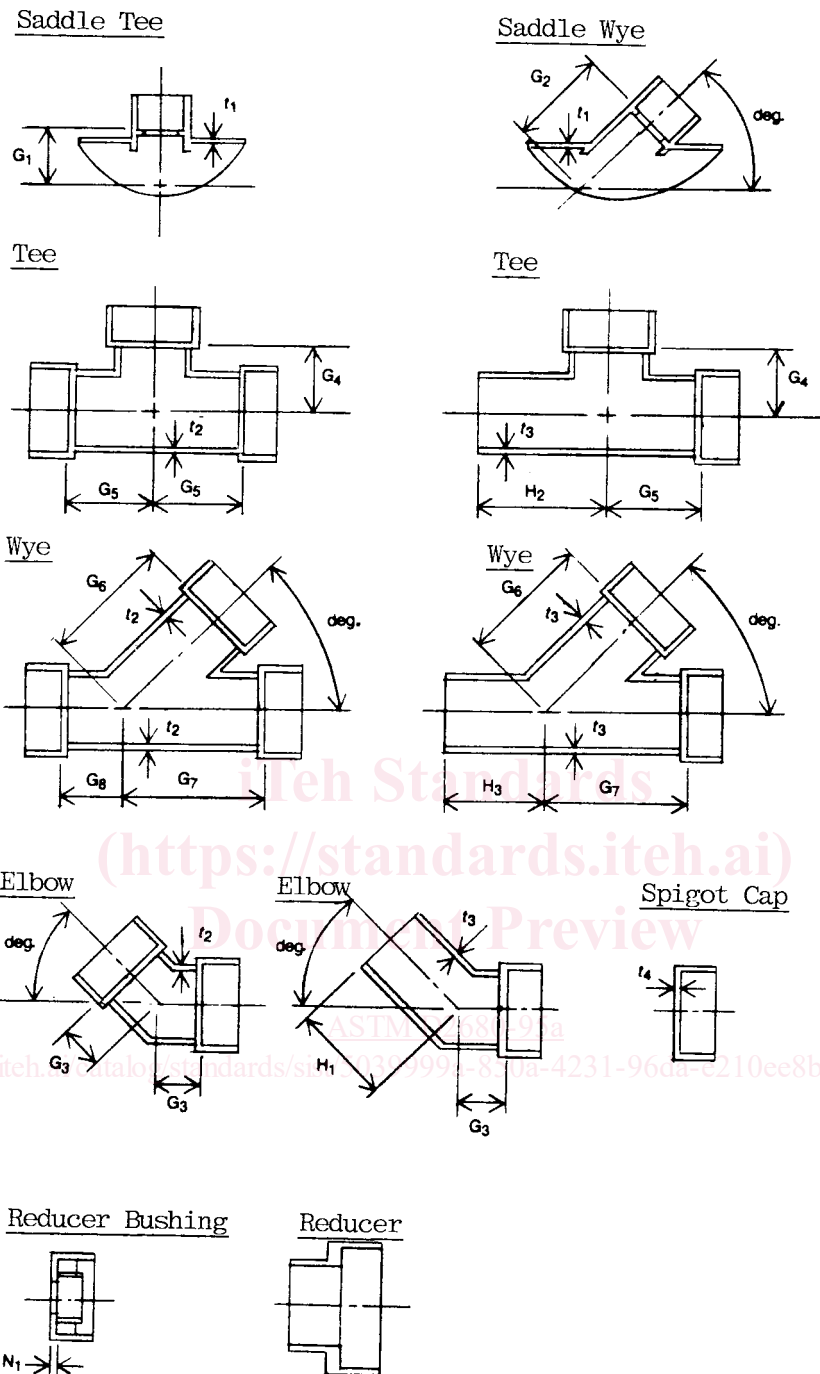


FIG. 2 Fittings (see Tables 5 and 6 for dimensions)

viscosity when measured in accordance with Method D of Test Method D 1084 at 70 to 75° F (21 to 23°C) with a No. 5 Zahn Cup, shall fall within a range of 60 to 80 s. The solids content of the cement shall be measured in accordance with Specification D 2235.

7.2.3 *PVC Solvent Cement Joints*—The cement shall comply with Specification D 2564, with the exception that the minimum resin content shall be 16 % and minimum viscosity shall be 3500 cP (3500 mPa·s).

7.2.4 *Transition Joints (ABS to PVC)*—Whenever a transition joint is to be assembled, the cement shall comply with Specification D 3138.

NOTE 5—Unless otherwise specified, it is permissible to use transition joints in accordance with this specification and Specification D 3138.

NOTE 6—**Warning:** Solvent cements for plastic pipe are made from flammable liquids and should be kept away from all sources of ignition. *Precaution*—Good ventilation should be maintained to reduce fire hazard and to minimize breathing of solvent vapors. Avoid contact of cement with skin and eyes. Refer to Practice F 402 for additional information.

7.3 *Elastomeric (Gasket) Joints for PVC Composite Pipe:*

7.3.1 Elastomeric joints shall be designed so that when assembled, the gasket will be compressed in the joint to form a positive seal.

7.3.2 The joint shall be designed to avoid displacement of

the gasket when assembled in accordance with the manufacturers' recommendation.

7.3.3 The assembly of joints shall be in accordance with the manufacturers' recommendation.

8. Dimensions

8.1 *Diameters and Thickness*—The pipe shall conform to the dimensions and tolerances shown in Table 1 for ABS composite pipe, and Table 2 for PVC composite pipe, when measured in accordance with 10.6.1 and 10.6.2.

8.2 *Laying Length*—Pipe shall be furnished in standard 12½ ft (3.82 m) lengths with a tolerance of -1 in. (-25 mm) when measured in accordance 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 ¼in./ft (4.85 mm/m) 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 3, when measured in accordance with 10.6.3.

8.5 *Joint Couplings*, shall conform to the dimensions shown in Table 4, when measured in accordance with 10.6.1.

8.6 *Fittings:*

8.6.1 *Molded Fittings*—The wall thickness of the water way shall be no less than the respective minimum thickness listed in Table 5. The socket dimensions and respective wall thickness shall conform to Table 4. The dimensions and wall thicknesses shall be determined in accordance with 10.6.1.

8.6.2 *Fabricated Fittings*—Fabricated fittings shall be considered satisfactory if made from pipe and molded fittings meeting the requirements of this specification.

8.6.3 The spur (lateral) socket shall be suitable for attaching the respective ABS or PVC solid wall pipe or adapters shall be furnished for attaching other types of pipes.

9. Workmanship

9.1 The inner and outer surfaces of the pipe, joints, and

fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, and other injurious defects. The pipe, joints, and fittings shall be as uniform as commercially practicable in other physical properties. Table 6

10. Test Methods

10.1 *Conditioning:*

10.1.1 *Referee Testing*—When conditioning is required for referee tests, condition the specimens in accordance with Procedure A of Methods D 618 at 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity for not less than 40 h prior to test. Conduct tests under the same conditions of temperature and humidity, unless otherwise specified.

10.1.2 *Quality Control Testing*—Condition specimens for a minimum of 4 h in air or 1 h in water at 73.4 ± 3°F (23 ± 2°C). Test the specimens at 73.4 ± 3°F without regard to relative humidity.

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

10.2 *Stiffness and Deflection:*

10.2.1 Test three specimens in accordance with Test Method D 2412. Determine the pipe stiffness at 5 % deflection and verify that pipe will deflect to 7.5 % without wall rupture.

10.2.2 Calculate the percent vertical deflection as follows:

$$\text{Vertical deflection, \%} = (\Delta y / \text{Nominal ID}) \times 100 \quad (1)$$

where:

Δy = vertical deflection of the inside diameter as measured by the plate travel of the apparatus. Both ID and Δy must be in the same units.

10.2.3 Calculate the pipe stiffness at 5 % deflection as follows:

$$\text{Pipe stiffness (PS)} = F / \Delta y \quad (2)$$

TABLE 1 Pipe Dimensions for ABS Composite Pipe

Nominal Size, in.	Outside Diameter			Average Inside Diameter		Average Concentric Tube Thickness	
	Average	Tolerance	max	min	max	Inner, min	Outer, min
Inches							
8	9.41	+0.04 -0.03	9.51	7.75	7.90	0.060	0.035
10	11.75	+0.04 -0.04	11.87	9.75	9.88	0.068	0.038
12	14.07	+0.06 -0.05	14.22	11.75	11.83	0.079	0.048
15	17.62	+0.07 -0.07	17.80	14.75	14.80	0.096	0.059
Millimetres							
8	239	+1.0 -0.8	242	197	201	1.52	0.90
10	298	+1.2 -1.0	302	248	251	1.73	0.96
12	357	+1.5 -1.2	361	298	301	2.01	1.22
15	447	+1.8 -1.5	452	375	376	2.44	1.50