Designation: F2806 – 10ε1

StandardSpecification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (Metric SDR-PR)[1]

This standard is issued under the fixed designation F2806; 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.

ε[1] NOTE—3.2.4 was editorially revised in March 2011.

1. Scope

1.1 This specification covers acrylonitrile-butadiene-styrene (ABS) pipe produced by single extrusion in standard thermoplastic pipe dimension ratios and pressure rated for water (see Appendix X1). Included are criteria for classifying ABS plastic pipe materials and ABS plastic pipe, a system of nomenclature for ABS plastic pipe, and requirements and test methods for materials, workmanship, dimensions, sustained pressure, burst pressure, and extrusion quality. Methods of marking are also given.

1.2 The products covered by this specification are intended for use with the distribution of pressurized liquids, which are chemically compatible with the piping materials. Consult with the manufacturer and local building codes before use in other applications. Due to inherent hazards associated with testing components and systems with compressed air or other compressed gases some manufacturers do not allow pneumatic testing of their products. Consult with specific product/component manufacturers for their specific testing procedures prior to pneumatic testing.

NOTE 1—Pressurized (compressed) air or other compressed gases contain large amounts of stored energy, which present serious safety hazards should a system fail for any reason.

NOTE 2—This specification addresses only pipe for use in above ground service. For buried service consult the manufacturer and local building codes.

NOTE 3—Exposure to ultraviolet radiation over a long period of time may affect the physical properties of ABS pipe. Consult the manufacturer for recommendations for handling, storage, and installations that are not protected by insulation.

1.3 Pipe meeting the requirements of this standard are not compatible with IPS sized DWV fittings. The ABS pipe covered in this standard is intended for pressure service and it shall be joined to pressure fittings. Non-pressure fittings, such as DWV fittings from any material (ABS, PVC, CPVC, etc.), are not acceptable for pressure applications.

1.4 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 The text of this specification references notes, footnotes, and appendixes, which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.6 *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:*[2]

D618 Practice for Conditioning Plastics for Testing

D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D1600 Terminology for Abbreviated Terms Relating to Plastics

D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

D3965 Classification System and Basis for Specifications for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings

F412 Terminology Relating to Plastic Piping Systems

2.2 *Federal Standard:*[3]

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

2.3 *Military Standard:*[3]

MIL-STD-129 Marking for Shipment and Storage

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.61 on Water.

Current edition approved June 1, 2010. Published July 2010. DOI: 10.1520/F2806–10E01.

[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 Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://dodssp.daps.dla.mil.

2.4 *NSF/ANSI Standard:*[4]
Standard No. 14 for Plastic Piping Components and Related Materials
Standard No. 61 Drinking Water System Components - Health Effects
2.5 *ISO Standard:*[5]
ISO 1167 Thermoplastic pipes, fittings and assemblies for the conveyance of fluids—Determination of the resistance to internal pressure—Part 1: General method
ISO 3127 Thermoplastic pipes—Determination of resistance to external blows—Round-the-clock method

3. Terminology

3.1 *General*—Definitions are in accordance with Terminology F412. Abbreviations are in accordance with Terminology D1600, unless otherwise indicated. The abbreviation for acrylonitrile-butadiene-styrene plastic is ABS.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *acrylonitrile-butadiene-styrene (ABS) pipe and fitting plastics* —plastics containing polymers or blends of polymers, or both, in which the minimum butadiene content is 6 %, the minimum acrylonitrile 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 %, and lubricants, stabilizers, and colorants.

3.2.2 *mominal outside diameter (d_n)*—specified outside diameter of a component, which is identical to the minimum mean outside diameter, in millimeters

3.2.3 *pressure rating (PR)*—numerical designation used for reference purposes and related to the mechanical characteristics of the components of a piping system.

3.2.4 *relation between standard dimension ratio, hydrostatic design stress (HDS), and pressure rating (PR)*—the following expression is used in this specification to relate standard dimension ratio, hydrostatic design stress, and pressure rating:

$$PR = 2\ HDS/(SDR - 1)\ or\ PR = 2\ HDS/((D_O/t) - 1) \quad (1)$$

where:

HDS = Hydrostatic design stress, MPa
PR = Pressure rating, MPa
DO = average outside diameter, mm
t = minimum wall thickness mm, and
SDR = standard dimension ratio (D_O/t)

4. Materials

4.1 *General*—Acrylonitrile-butadiene-styrene plastics used to make pipe meeting the requirements of this specification are categorized by means of two criteria namely *(1)* short-term tests and *(2)* long-term strength tests.

4.2 *Basic Materials*—The material properties of the grade of ABS plastic are characterized using short-term tests as defined in Specification D3965.

4.3 *Hydrostatic Design Basis (HDB)*—This specification covers pipe made from material, which has been evaluated in accordance with Test Method D2837 where a pressure testing is carried out in accordance with Test Method D1598 to find the HDB value. The HDB shall be a minimum of 17.2 MPa.

4.4 *Compound*—The ABS plastic extrusion compound shall meet the requirements of ABS Classes 42222, 20643, or 30444 as described in Specification D3965.

4.5 *Rework Material*—The manufacturers shall use only their own clean rework pipe material and the pipe produced shall meet all the requirements of this specification.

5. Pipe Classification

5.1 *General*—This specification covers ABS pipe produced by single extrusion.

5.2 *Standard Dimension Ratios (SDR)*—This specification covers ABS pipe in eight standard dimension ratios. These are SDR 9, 11, 13.5, 17, 21, 26, 32.5, and SDR 41. The pressure rating is uniform for all nominal pipe sizes for a given ABS pipe material and SDR.

6. Requirements

6.1 *Workmanship*—The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects. The pipe shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

6.2 *Dimensions and Tolerances:*

6.2.1 *Outside Diameters*—The outside diameters and tolerances and out-of-roundness shall be as shown in Table 1 when measured in accordance with 7.4 and 7.4.1.

6.2.2 *Wall Thickness*—The wall thicknesses and tolerances shall be as shown in Table 2 when measured in accordance with 7.4 and 7.4.2.

6.3 *Sustained Pressure*—The pipe shall not fail, balloon, burst, or weep as defined in ISO 1167 at the test pressures given in Table 3 when tested in accordance with 7.5.

6.4 *Burst Pressure*—The minimum burst pressures for ABS plastic pipe shall be the pressure rating (PR) multiplied by a factor of 3.2, when determined in accordance with 7.6.

6.5 *Impact*—The pipe shall meet the impact requirements when tested in accordance with 7.7.

7. Test Methods

7.1 *Conditioning*—Condition the test specimens at 23 ± 2°C and 50 ± 5 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D618 for those tests where conditioning is required.

[4] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.
[5] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

TABLE 1 Outside Diameters and Tolerances for Metric ABS Plastic Pipe

Nominal Pipe Size (NPS)	Average Outside Diameter, D_O(mm)	Tolerances (mm)	
		Average	For Max and Min (Out-of-Roundness)
12	12.0	+0.2	+0.5
16	16.0	+0.2	+0.5
20	20.0	+0.2	+0.5
25	25.0	+0.2	+0.5
32	32.0	+0.2	+0.5
40	40.0	+0.2	+0.5
50	50.0	+0.2	+0.6
63	63.0	+0.3	+0.8
75	75.0	+0.3	+0.9
90	90.0	+0.3	+1.1
110	110.0	+0.4	+1.4
125	125.0	+0.4	+1.5
140	140.0	+0.5	+1.7
160	160.0	+0.5	+2.0
180	180.0	+0.6	+2.2
200	200.0	+0.6	+2.4
225	225.0	+0.7	+2.7
250	250.0	+0.8	+3.0
280	280.0	+0.9	+3.4
315	315.0	+1.0	+3.8

TABLE 2 Wall Thicknesses and Tolerances for Metric ABS Plastic Pipe

Nominal Pipe Size	Wall thicknesses (t) and tolerances for ABS plastic pipe (mm)															
	SDR 41		SDR 32.5		SDR 26		SDR 21		SDR 17		SDR 13.5		SDR 11		SDR 9	
(NPS)	min.	tol	min.	tol	min.	tol	min.	tol	min.	tol	min.	tol	min.	tol	min.	tol.
12	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	1.5	+0.4	1.5	+0.4
16	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	1.5	+0.4	1.5	+0.4	1.8	+0.4
20	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	1.5	+0.4	1.9	+0.4	2.3	+0.5
25	[A]	[A]	[A]	[A]	[A]	[A]	[A]	[A]	0.4	+0.4	1.9	+0.4	2.3	+0.5	2.8	+0.5
32	[A]	[A]	[A]	[A]	[A]	[A]	1.6	+0.4	0.4	+0.4	2.4	+0.5	2.9	+0.5	3.6	+0.6
40	[A]	[A]	[A]	[A]	1.6	+0.4	1.9	+0.4	0.5	+0.5	3	+5.0	3.7	+0.6	4.5	+0.7
50	[A]	[A]	1.6	0.4	2	+0.4	2.4	+0.5	0.5	+0.5	3.7	+0.6	4.6	+0.7	5.6	+0.8
63	1.6	+0.4	2	+0.4	2.5	+0.5	3	+0.5	0.6	+0.6	4.7	+0.7	5.8	+0.8	7.1	+1.0
75	1.9	+0.4	2.3	+0.5	2.9	+0.5	3.6	+0.6	0.7	+0.7	5.6	+0.8	6.8	+0.9	8.4	+1.1
90	2.2	+0.5	2.8	+0.5	3.5	+0.6	4.3	+0.7	0.8	+0.8	6.7	+0.9	8.2	+1.1	10.1	+1.3
110	2.7	+0.5	3.4	+0.6	4.2	+0.7	5.3	+0.8	0.9	+0.9	8.1	+1.1	10	+1.2	12.3	+1.5
125	3.1	+0.6	3.9	+0.6	4.8	+0.7	6	+0.8	1.0	+1	9.2	+1.2	11.4	+1.4	14	+1.6
140	3.5	+0.6	4.3	+0.7	5.4	+0.8	6.7	+0.9	1.1	+1.1	10.3	+1.3	12.7	+1.5	15.7	+1.8
160	4	+0.6	4.9	+0.7	6.2	+0.9	7.7	+1	1.2	+1.2	11.8	+1.4	14.6	+1.7	17.9	+2.0
180	4.4	+0.7	5.5	+0.8	6.9	+0.9	8.6	+1.1	1.3	+1.3	13.3	+0.6	16.4	+1.9	20.1	+2.3
200	4.9	+0.7	6.2	+0.9	7.7	+1.0	9.6	+1.2	1.4	+1.4	14.7	+1.7	18.2	+2.1	22.4	+2.5
225	5.5	+0.8	6.9	+0.9	8.6	+1.1	10.8	+1.3	1.6	+1.6	16.6	+1.9	20.5	+2.3	25.2	+2.8
250	6.2	+0.9	7.7	+1	9.6	+1.2	11.9	+1.4	1.7	+1.7	18.4	+2.1	22.7	+2.5	27.9	+3.0
280	6.9	+0.9	8.6	+1.1	10.7	+1.3	13.4	+1.6	1.9	+1.9	20.6	+2.3	25.4	+2.8	31.3	+3.4
315	7.7	+1.0	9.7	+1.2	12.1	+1.5	15	+1.7	2.1	+2.1	23.2	+2.6	28.6	+3.1	35.2	+3.8

[A]This size and thickness is not practical to manufacture.

TABLE 3 Sustained Pressure Test Conditions for Water at 20°C for ABS Plastic Pipe (Conditioned per 7.1)

NOTE 1—The following test conditions shall be used: Type A end caps as specified in ISO 1167. Orientation, not specified, 1 hr conditioning, water-in-water or water-in-air testing.

Characteristic	Requirement	Hydrostatic (hoop) stress, MPa	Time, h	Test Method
Resistance to Internal Pressure	No failure during test period	25.0 or σLCL at 20°C and 1 hr, whichever is greater	>1	ISO 1167
Resistance to Internal Pressure	No failure during test period	20.6 or σLCL at 20°C and 100 hr, whichever is greater	>100	ISO 1167
Resistance to Internal Pressure at 60°C	No failure during test period	7.0 or σLCL at 60°C and 1000 hr, whichever is greater	>1000	ISO 1167

7.2 *Test Conditions*—Conduct the tests in the Standard Laboratory Atmosphere of 23 ± 2°C and 50 ± 5 % relative humidity, unless otherwise specified in the test methods or in this specification.