



Standard Specification 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.

1. Scope*

1.1 This specification covers acrylonitrile-butadiene-styrene (ABS) pipe produced by single extrusion in standard thermo-plastic 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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

- 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

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.

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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.

*A Summary of Changes section appears at the end of this standard

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

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 *nominal 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:

$$PR = 2 HDS / (SDR - 1) \text{ or } PR = 2 HDS / ((D_o/t) - 1) \quad (1)$$

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)

³ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁴ Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48105, <http://www.nsf.org>.

⁵ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

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 Classification **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 2500 psi (17.2 MPa) at 73 °F (23 °C).

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

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 (NPS)	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	
	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 σ_{LCL} at 20 °C and 1 hr, whichever is greater	>1	ISO 1167
Resistance to Internal Pressure	No failure during test period	20.6 or σ_{LCL} 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 σ_{LCL} at 60 °C and 1000 hr, whichever is greater	>1000	ISO 1167

prior to test in accordance with Procedure A of Practice D618 for those tests where conditioning is required.

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.

7.3 Test Specimens—Not less than 50 % of the test specimens required for any pressure test shall have at least a part of the marking in their central sections. The central section is that portion of pipe, which is at least one pipe diameter away from an end closure.

7.4 Dimensions and Tolerances—Use any length of pipe to determine the dimensions. Measure in accordance with Test Method **D2122**.

7.4.1 Outside Diameter—Measure the outside diameter and out-of-roundness of the pipe in accordance with Test Method **D2122**. The average outside diameter is the arithmetic average of the maximum and minimum diameters at any cross section on the length of the pipe. The tolerances for out-of-roundness shall apply only on pipe before shipment.

7.4.2 Wall Thickness—Make micrometer measurements of the wall thickness in accordance with Test Method **D2122** to determine the maximum and minimum values. Measure the wall thickness to the nearest 0.02 mm.

7.5 Sustained Pressure Test—Select the test specimens at random. Test individually with water at the stress levels, temperatures, and times given in **Table 3**, each specimen shall be at least ten times the nominal diameter in length, but not less than 250 mm or more than 920 mm between end closures and shall bear the permanent marking on the pipe. Hold the pressure as closely as possible, but within ± 70 kPa. Condition the specimens at the test temperature to within ± 2 °C. Maintain the test temperature at 20 ± 2 °C. Test in accordance with ISO 1167.

7.6 Burst Pressure—For each diameter, determine the minimum burst pressure with at least five specimens in accordance with ISO 1167. The time of testing each specimen shall be between 60 and 70 s. The average minimum burst pressure shall not be less than 3.2 times the pressure rating, PR.

7.7 Impact Resistance—When tested in accordance with ISO 3127 at 0 °C, pipe shall have a true impact rate (TIR) of not more than 10 % when using the weights and heights given in **Table 4**.

8. Retest and Rejection

8.1 If the results of any test(s) do not meet the requirements of this specification, the test(s) shall be conducted again only by agreement between the purchaser and the seller. Under such agreement, minimum requirements shall not be lowered, changed, or modified, nor shall specification limits be changed.

TABLE 4 Impact Test Weights and Heights

d_p	Mass of falling weight (kg)	Drop Height (m)
20	0.5	2.0
25	1.5	2.0
32	1.6	2.0
40	2.0	2.0
50	2.5	2.0
63	4.0	2.0
75	4.0	2.0
90	5.0	2.0
110	6.0	2.0
125	6.0	2.0
140	6.0	2.0
160	7.0	2.0
180	7.0	2.0
200	8.0	2.0
>225	9.0	2.0

If upon retest, failure occurs, the quantity of product represented by the test(s) does not meet the requirements of this specification.

9. Marking

9.1 Quality of Marking—The marking shall be applied to the pipe in such a manner that it remains legible (easily read) after installation and inspection.

9.2 Marking on the pipe shall include the following, spaced at intervals of not more than 2 m:

9.2.1 Nominal pipe size (for example, NPS 110).

9.2.2 Standard pipe dimension ratio in accordance with **5.2** (for example, SDR 17),

9.2.3 The pressure rating in MPa for water at 23°C (shown as the number followed by MPa), followed by the pressure rating in PSI in parentheses - for example 1.38 MPa at 23 °C.

9.2.4 This designation “ASTM F2806,” with which the pipe complies.

9.2.5 Manufacturer’s name (or trade mark) and lot code information (for example, date of manufacture).

9.2.6 Pipe intended for the transport of potable water shall also include the seal or mark of the laboratory making the evaluation for this purpose, spaced at intervals specified by the laboratory.

10. Quality Assurance

10.1 When the product is marked with this designation, F2806, the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with this specification and has been found to meet the requirements of this specification.

11. Keywords

11.1 ABS; HDB; plastic pipe; pressure piping; SDR