Designation: D 1527 – 99 (Reapproved 2005)

An American National Standard

Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80[1]

This standard is issued under the fixed designation D 1527; 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 acrylonitrile-butadienestyrene (ABS) pipe produced by single extrusion or simultaneous multiple coextrusion, in Schedule 40 and 80 sizes and pressure-rated for water (see Appendix). 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 only, which are chemically compatible with the piping materials. 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 saftey hazards should a system fail for any reason.

1.3 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.

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

1.5 The following safety hazards caveat pertains only to the test method portion, Section 7, of this specification. *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]

D 618 Practice for Conditioning Plastics for Testing

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D 1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

D 1600 Terminology for Abbreviated Terms Relating to Plastics

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D 2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

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

F 412 Terminology Relating to Plastic Piping Systems

2.2 *Federal Standard:*

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)[3]

2.3 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[3]

2.4 *NSF Standards:*

Standard No. 14 for Plastic Piping Components and Related Materials[4]

Standard No. 61 for Drinking Water System Components—Health Effects[4]

3. Terminology

3.1 Definitions—Definitions are in accordance with Terminology F 412. Abbreviations are in accordance with Terminology D 1600, unless otherwise indicated. The abbreviation for acrylonitrile-butadiene-styrene plastic is ABS.

[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 August 1, 2005. Published August 2005. Originally approved in 1958. Last previous edition approved in 1999 as D 1527 – 99$^{\epsilon 1}$.

[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, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[4] Available from the National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106.

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 *hydrostatic design stress*—the estimated maximum tensile stress the material is capable of withstanding continuously with a high degree of certainty that failure of the pipe will not occur. This stress is circumferential when internal hydrostatic water pressure is applied.

3.2.3 *pressure rating (PR)*—the estimated maximum water pressure the pipe is capable of withstanding continuously with a high degree of certainty that failure of the pipe will not occur.

3.2.4 *relation between dimensions, hydrostatic design stress, and pressure rating*—the following expression is used in this specification to relate dimensions, hydrostatic design stress, and pressure rating:

$$2\,S/P = (D_O/t) - 1 \quad (1)$$

where:

S = hydrostatic design stress, psi (or MPa),
P = pressure rating, psi (or MPa),
D_O = average outside diameter, in. (or mm), and
t = minimum wall thickness, in. (or mm).

3.2.5 *standard thermoplastic pipe materials designation code*—the pipe materials designation code shall consist of the abbreviation ABS for the type of plastic, followed by the ASTM type and grade (see Table X1.1) and the hydrostatic design stress in units of 100 psi with any decimal figures dropped. When the design stress code contains less than two figures, a cipher shall be used before the number. Thus a complete material code shall consist of three letters and four figures for ABS plastic pipe materials (see 6.3).

4. Pipe Classification

4.1 *General*—This specification covers ABS pipe, produced by single extrusion or simultaneous multiple coextrusion from three ABS plastic pipe materials in Schedule 40 and 80 sizes. Pipe produced by simultaneous multiple coextrusion shall be classified "CoeX."

5. Requirements

5.1 *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.

5.2 *Dimensions and Tolerances*:

5.2.1 *Outside Diameters*—The outside diameters and tolerances shall be as shown in Table 1 when measured in accordance with 7.4 and 7.4.1.

5.2.2 *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.

TABLE 1 Outside Diameters and Tolerances for ABS Plastic Pipe Schedules 40 and 80, in.

Nominal Pipe Size	Average Outside Diameter	Tolerances		
		For Average Diameter	For Max and Min Diameter (Out-of-Roundness)	
			Schedule 40 sizes 3½ in. and over, Schedule 80 sizes 8 in. and over	Schedule 40 sizes 3 in. and less, Schedule 80 sizes 6 in. and less
⅛	0.405	±0.004	±0.015	±0.008
¼	0.540	±0.004	±0.015	±0.008
⅜	0.675	±0.004	±0.015	±0.008
½	0.840	±0.004	±0.015	±0.008
¾	1.050	±0.004	±0.015	±0.010
1	1.315	±0.005	±0.015	±0.010
1¼	1.660	±0.005	±0.015	±0.012
1½	1.900	±0.006	±0.030	±0.012
2	2.375	±0.006	±0.030	±0.012
2½	2.875	±0.007	±0.030	±0.015
3	3.500	±0.008	±0.030	±0.015
3½	4.000	±0.008	±0.050	±0.015
4	4.500	±0.009	±0.050	±0.015
5	5.563	±0.010	±0.050	±0.030
6	6.625	±0.011	±0.050	±0.035
8	8.625	±0.015	±0.075	±0.045
10	10.750	±0.015	±0.075	±0.050
12	12.750	±0.015	±0.075	±0.060

TABLE 2 Wall Thicknesses and Tolerances for ABS Plastic Pipe Schedules 40 and 80, in.

Nominal Pipe Size	Wall Thickness[A]			
	Schedule 40		Schedule 80	
	Min	Tolerance	Min	Tolerance
⅛	0.068	+0.020	0.095	+0.020
¼	0.088	+0.020	0.119	+0.020
⅜	0.091	+0.020	0.126	+0.020
½	0.109	+0.020	0.147	+0.020
¾	0.113	+0.020	0.154	+0.020
1	0.133	+0.020	0.179	+0.021
1¼	0.140	+0.020	0.191	+0.023
1½	0.145	+0.020	0.200	+0.024
2	0.154	+0.020	0.218	+0.026
2½	0.203	+0.024	0.276	+0.033
3	0.216	+0.026	0.300	+0.036
3½	0.226	+0.027	0.318	+0.038
4	0.237	+0.028	0.337	+0.040
5	0.258	+0.031	0.375	+0.045
6	0.280	+0.034	0.432	+0.052
8	0.322	+0.039	0.500	+0.060
10	0.365	+0.044	0.593	+0.071
12	0.406	+0.049	0.687	+0.082

[A] The minimum is the lowest wall thickness of the pipe at any cross section. The maximum permitted wall thickness, at any cross section, is the minimum wall thickness plus the stated tolerance. All tolerances are on the plus side of the minimum requirement.

5.2.3 *Thickness of Outer Layer*—For pipe produced by simultaneous multiple coextrusion, that is, pipe containing two or more concentric layers, the outer layer shall be at least 0.020 in. (0.50 mm) thick.

5.2.4 *Wall Thickness Range*—The wall thickness range shall be within 12 % when measured in accordance with 7.4 and 7.4.3.

5.3 *Bond*—For pipe produced by simultaneous multiple coextrusion, the bond between the layers shall be strong and

uniform, it shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate clearly at any point, nor shall separation of bond occur, between layers, during testing performed under the requirements of this specification.

5.4 *Sustained Pressure*—The pipe shall not fail, balloon, burst, or weep as defined in Test Method D 1598 at the test pressures given in Table 3 and Table 4 when tested in accordance with 7.5.

5.5 *Burst Pressure*—The minimum burst pressures for ABS plastic pipe shall be as given in Table 5 and Table 6, when determined in accordance with 7.6.

TABLE 3 Sustained Pressure Test-Conditions for Water at 73°F (23°C) for ABS Plastic Pipe, Schedule 40

Inch-pound Units			
Nominal Pipe Size, in.	Pressure[A] Required for Test, psi		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	860	1290	1090
¼	830	1250	1050
⅜	670	1000	840
½	640	950	810
¾	520	770	650
1	480	720	610
1¼	390	590	500
1½	350	530	450
2	300	440	370
2½	330	490	410
3	280	420	360
3½	260	380	320
4	240	360	300
5	210	310	260
6	190	280	240
8	170	250	210
10	150	220	190
12	140	210	180
SI Units			
Nominal Pipe Size, in.	Pressure[A] Required for Test, MPa		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	5.95	8.90	7.50
¼	5.70	8.60	7.25
⅜	4.60	6.90	5.80
½	4.40	6.55	5.60
¾	3.60	5.30	4.50
1	3.30	4.95	4.20
1¼	2.70	4.05	3.45
1½	2.40	3.65	3.10
2	2.05	3.05	2.55
2½	2.30	3.40	2.85
3	1.95	2.90	2.50
3½	1.80	2.60	2.20
4	1.65	2.50	2.05
5	1.45	2.15	1.80
6	1.30	1.95	1.65
8	1.15	1.70	1.45
10	1.05	1.50	1.30
12	0.95	1.45	1.25

[A]The fiber stresses used to derive these test pressures are as follows:

ABS1208 ABS1210	2140 psi (14.75 MPa)
ABS1316	3200 psi (22.06 MPa)
ABS2112	2700 psi (18.62 MPa)

TABLE 4 Sustained Pressure Test Conditions for Water at 73°F (23°C) for ABS Plastic Pipe, Schedule 80

Inch-pound Units			
Nominal Pipe Size, in.	Pressure[A] Required for Test, psi		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	. . .	1960	. . .
¼	. . .	1810	. . .
⅜	. . .	1470	. . .
½	910	1360	1150
¾	740	1100	930
1	670	1010	850
1¼	560	830	700
1½	500	750	640
2	430	650	550
2½	450	680	570
3	400	600	510
3½	370	550	470
4	350	520	440
5	310	460	390
6	300	450	380
8	260	390	330
10	250	370	320
12	240	360	310
SI Units			
Nominal Pipe Size, in.	Pressure[A] Required for Test, MPa		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	. . .	13.50	. . .
¼	. . .	12.50	. . .
⅜	. . .	10.10	. . .
½	6.25	9.40	7.95
¾	5.10	7.60	6.40
1	4.60	6.95	5.85
1¼	3.85	5.70	4.85
1½	3.45	5.15	4.40
2	2.95	4.50	3.80
2½	3.10	4.70	3.95
3	2.75	4.15	3.50
3½	2.55	3.80	3.25
4	2.40	3.60	3.05
5	2.15	3.15	2.70
6	2.05	3.10	2.60
8	1.80	2.70	2.30
10	1.70	2.55	2.20
12	1.65	2.50	2.15

[A]The fiber stresses used to derive these tests pressures are as follows:

ABS1208 ABS1210	2140 psi (14.75 MPa)
ABS1316	3200 psi (22.06 MPa)
ABS2112	2700 psi (18.62 MPa)

6. Materials

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

6.2 *Basic Materials*—This specification covers ABS pipe made from three ABS plastics as defined in Specification D 3965, in which the requirements are based on short-term tests. These are ABS Classes 42222, 20643, and 30444.

6.3 *Hydrostatic Design Stresses*—This specification covers ABS pipe made from three ABS plastics as defined by four hydrostatic design stresses developed on the basis of long-term tests (see X1.3).

TABLE 5 Burst Pressure Requirements for Water at 73°F (23°C) for ABS Plastic Pipe, Schedule 40

Inch-pound Units

Nominal Pipe Size, in.	Minimum Burst Pressure,[A] psi		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	2110	2420	2660
¼	2040	2340	2570
⅜	1630	1870	2060
½	1560	1790	1970
¾	1260	1450	1590
1	1180	1350	1490
1¼	970	1110	1220
1½	870	990	1090
2	730	830	920
2½	800	910	1000
3	690	790	870
3½	630	720	790
4	580	670	730
5	510	580	640
6	460	530	580
8	410	470	510
10	370	420	460
12	340	390	430

SI Units

Nominal Pipe Size, in.	Minimum Burst Pressures,[A] MPa		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	14.6	16.7	18.3
¼	14.1	16.1	17.7
⅜	11.2	12.9	14.2
½	10.8	12.3	13.6
¾	8.70	10.0	11.0
1	8.15	9.30	10.3
1¼	6.70	7.65	8.40
1½	6.00	6.85	7.50
2	5.05	5.70	6.35
2½	5.50	6.25	6.90
3	4.75	5.45	6.00
3½	4.35	4.95	5.45
4	4.00	4.60	5.05
5	3.50	4.00	4.40
6	3.15	3.65	4.00
8	2.85	3.25	3.50
10	2.55	2.90	3.15
12	2.35	2.70	2.95

[A]The fiber stresses used to derive these test pressures are as follows:

ABS1208 ABS 1210	5240 psi (36.12 MPa)
ABS1316	6000 psi (41.36 MPa)
ABS 2112	6600 psi (45.50 MPa)

TABLE 6 Burst Pressure Requirements for Water at 73°F (23°C) for ABS Plastic Pipe, Schedule 80

Inch-pound Units

Nominal Pipe Size, in.	Minimum Burst Pressures,[A] psi		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	. . .	3680	. . .
¼	. . .	3390	. . .
⅜	. . .	2750	. . .
½	2220	2550	2800
¾	1800	2060	2270
1	1650	1890	2080
1¼	1360	1560	1720
1½	1230	1410	1550
2	1060	1210	1330
2½	1110	1270	1400
3	980	1120	1240
3½	910	1020	1140
4	850	970	1070
5	760	870	950
6	730	840	920
8	640	740	810
10	610	700	770
12	600	680	750

SI Units

Nominal Pipe Size, in.	Minimum Burst Pressures,[A] MPa		
	ABS1208 ABS1210	ABS1316	ABS2112
⅛	. . .	25.4	. . .
¼	. . .	23.4	. . .
⅜	. . .	19.0	. . .
½	15.3	17.6	19.3
¾	12.4	14.2	15.6
1	11.4	13.0	14.3
1¼	9.40	10.8	11.9
1½	8.50	9.70	10.7
2	7.30	8.35	9.15
2½	7.65	8.75	9.65
3	6.75	7.70	8.55
3½	6.25	7.05	7.85
4	5.85	6.70	7.40
5	5.25	6.00	6.55
6	5.05	5.80	6.35
8	4.40	5.10	5.60
10	4.20	4.85	5.30
12	4.15	4.70	5.15

[A]The fiber stresses used to derive these test pressures are as follows:

ABS1208 ABS1210	5240 psi (36.12 MPa)
ABS1316	6000 psi (41.36 MPa)
ABS2112	6600 psi (45.50 MPa)

6.4 *Compound*—The ABS plastic extrusion compound shall meet the requirements of ABS Classes 42222, 20643, or 30444 as described in Specification D 3965. For pipe produced by simultaneous multiple coextrusion, all layers shall be of the same formulation.

6.5 *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.

7. Test Methods

7.1 *Conditioning*—Condition the test specimens at 73 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D 618 for those tests where conditioning is required.

7.2 *Test Conditions*— Conduct test 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 *Sampling*— The selection of the sample or samples of pipe shall be as agreed upon between the purchaser and the seller. In case of no prior agreement, any sample selected by the testing laboratory shall be deemed adequate.

7.3.1 *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 D 2122.

7.4.1 *Outside Diameter*— Measure the outside diameter of the pipe in accordance with Test Method D 2122. 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 prior to shipment.

7.4.2 *Wall Thickness*— Make micrometer measurements of the wall thickness in accordance with Test Method D 2122, to determine the maximum and minimum values. Measure the wall thickness at both ends of the pipe to the nearest 0.001 in. (0.02 mm).

7.4.3 *Wall Thickness Range*— Measure in a manner such that the maximum, A, and the minimum, B, wall thicknesses of each cross section measured are obtained. Calculate the wall thickness range, E, in percent, for each cross section as follows:

$$E = [(A - B)/A] \times 100 \quad (2)$$

The wall thickness range shall not exceed 12 % for any cross section measured.

7.5 *Sustained Pressure Test*— Select the test specimens at random. Test individually with water at the internal pressures given in Table 3 and Table 4, six specimens of pipe, each specimen at least ten times the nominal diameter in length, but not less than 10 in. (250 mm) or more than 3 ft (1 m) between end closures and bearing the permanent marking on the pipe. Maintain the specimens at the pressure indicated for a period of 1000 h. Hold the pressure as closely as possible, but within ± 10 psi (0.07 MPa). Condition the specimens at the test temperature of 23°C to within ±2°C. Test in accordance with Test Method D 1598, except maintain the pressure at the values given in Table 3 and Table 4 for 1000 h. Evidence of failure of the pipe shall be as defined in Test Method D 1598.

7.6 *Burst Pressure*— Determine the minimum burst pressure with at least five specimens in accordance with Test Method D 1599. The time of testing each specimen shall be between 60 and 70 s.

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. 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 markings shall be applied to the pipe in such a manner that they remain legible (easily read) after installation and inspection.

9.2 *Content of Marking*—Marking on the pipe shall include the following, spaced at intervals of not more than 5 ft (1.5 m).

9.2.1 Nominal pipe size (for example, 2 in).

9.2.2 Type of plastic pipe material in accordance with the designation code prescribed in 3.2.4 (for example, ABS1210).

9.2.3 Schedule 40 or 80, whichever is applicable, and the pressure rating in pounds per square inch for water at 73°F (23°C), shown as the number followed by psi (for example, 125 psi). When the indicated pressure rating is lower than that calculated in accordance with 3.2.4 (see Appendix), this shall be indicated by placing a star after the pressure rating.

9.2.4 This designation "ASTM D 1527," with which the pipe complies.

9.2.5 Manufacturer's name (or trade mark) and code (Note 1).

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.

9.2.7 Pipe produced by simultaneous multiple coextrusion shall be marked "CoeX" in accordance with 4.1.

10. Quality Assurance

10.1 When the product is marked with this designation, D 1527, 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; plastic pipe; schedule 40; schedule 80

SUPPLEMENTARY REQUIREMENTS

GOVERNMENT/MILITARY PROCUREMENT

These requirements apply *only* to Federal/Military procurement, not domestic sales or transfers.

S1. *Responsibility for Inspection*—Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless the purchaser disapproves. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that material conforms to prescribed requirements.

NOTE S1—In U.S. Federal contracts, the contractor is responsible for inspection

S2. *Packaging and Marking for U.S. Government Procurement:*

S2.1 *Packaging*—Unless otherwise specified in the contract, the materials shall be packaged in accordance with the supplier's standard practice in a manner ensuring arrival at destination in satisfactory condition and which will be acceptable to the carrier at lowest rates. Containers and packing shall comply with Uniform Freight Classification rules or National Motor Freight Classification rules.

S2.2 *Marking*—Marking for shipment shall be in accordance with Fed. Std. No. 123 for civil agencies and MIL-STD-129 for military agencies.

NOTE S2—The inclusion of U.S. Government procurement requirements should not be construed as an indication that the U.S. Government uses or endorses the products described in this document.

Potable Water Requirement

This requirement applies whenever a Regulatory Authority or user calls for product to be used to convey or to be in contact with potable water.

S3. *Potable Water Requirement*—Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard No. 61 or the health effects portion of Standard No. 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.

APPENDIX

(Nonmandatory Information)

X1. SOURCE OF HYDROSTATIC DESIGN STRESSES

X1.1 The hydrostatic design stresses recommended by the Plastics Pipe Institute are used to pressure rate ABS plastic pipe. These hydrostatic design stresses are 800 psi (5.5 MPa),1000 psi (6.9 MPa), 1250 psi (8.6 MPa), and 1600 psi (11.0 MPa) for water at 73°F (23°C). These hydrostatic design stresses apply only to pipe meeting all the requirements of this specification.

X1.2 Four ABS pipe materials are included based on the requirements of Specification D 3965 and the PPI-recommended hydrostatic design stresses as follows: (see Table X1.1)

X1.2.1 Type 1, Grade 2, with a hydrostatic design stress of 800 psi (5.5 MPa) for water at 73°F (23°C), designated as ABS1208.

X1.2.2 Type 1, Grade 2, with a hydrostatic design stress of 1000 psi (6.9 MPa) for water at 73°F (23°C), designated as ABS1210.

TABLE X1.1 Type and Grade Designations

Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Material Designation
2	0	2	1	1	Type 1, Grade 1
4	2	2	2	2	Type 1, Grade 2
2	0	6	4	3	Type 1, Grade 3
3	0	4	4	4	Type 2, Grade 1

X1.2.3 Type 2, Grade 1, with a hydrostatic design stress of 1250 psi (8.6 MPa) for water at 73°F (23°C), designated as ABS2112.

X1.2.4 Type 1, Grade 3, with a hydrostatic design stress of 1600 psi (11.0 MPa) for water at 73°F (23°C), designated as ABS1316.

X1.3 Information regarding the method of test and other criteria used in developing these hydrostatic design stresses may be obtained from the Plastics Pipe Institute, a division of

The Society of the Plastics Industry, 355 Lexington Ave., New York, NY 10017 (Note X1.1). These hydrostatic design stresses may not be suitable for materials that show a wide departure from a straight-line plot of log stress versus log time to failure. All the data available to date on ABS pipe materials made in the United States exhibit a straight-line plot under these plotting conditions.

NOTE X1.1—Refer also to Test Method D 2837.

X1.4 The pipe is rated for use with water at 73°F (23°C) at the maximum internal pressures shown in Table X1.2 and Table X1.3. Lower pressure ratings than those calculated in accordance with 3.2.4 may be recommended, at the option of the pipe manufacturer, in which case the SDR shall be included in the marking. Experience of the industry indicates that ABS plastic pipe meeting the requirements of this standard gives satisfactory service under normal conditions for a long period at these pressure ratings. The sustained pressure requirements (5.4) are related to these ratings through the slopes of the strength-time plots of these materials in pipe form.

X1.5 The hydrostatic design stresses recommended by the Plastics Pipe Institute are based on tests made in pipe varying in size from ½ to 2 in.

TABLE X1.2 Water Pressure Ratings at 73°F (23°C) for Schedule 40 ABS Plastic Pipe

Inch-pound Units

Nominal Pipe Size, in.	Pressure Ratings, psi[A]			
	ABS 1208[B]	ABS 1210[B]	ABS 1316[B]	ABS 2112[B]
⅛	320	400	650	500
¼	310	390	620	490
⅜	250	310	500	390
½	240	300	480	370
¾	190	240	390	300
1	180	220	360	280
1¼	150	180	290	230
1½	130	170	260	210
2	110	140	220	170
2½	120	150	240	190
3	100	130	210	160
3½	90	120	190	150
4	90	110	180	140
5	80	100	160	120
6	70	90	140	110
8	60	80	120	100
10	60	70	110	90
12	50	70	110	80

SI Units

Nominal Pipe Size, in.	Pressure Ratings, MPa[A]			
	ABS 1208[B]	ABS 1210[B]	ABS 1316[B]	ABS 2112[B]
⅛	2.21	2.76	4.48	3.45
¼	2.14	2.69	4.27	3.38
⅜	1.72	2.14	3.45	2.69
½	1.65	2.07	3.31	2.55
¾	1.31	1.65	2.69	2.07
1	1.24	1.52	2.48	1.93
1¼	1.03	1.24	2.00	1.59
1½	0.90	1.17	1.79	1.45
2	0.76	0.97	1.52	1.17
2½	0.83	1.03	1.65	1.31
3	0.69	0.90	1.45	1.10
3½	0.62	0.83	1.31	1.03
4	0.62	0.76	1.24	0.97
5	0.55	0.69	1.10	0.83
6	0.48	0.62	0.97	0.76
8	0.41	0.55	0.83	0.69
10	0.41	0.48	0.76	0.62
12	0.34	0.48	0.76	0.55

[A] These pressure ratings are for unthreaded pipe. The industry does not recommend threading ABS plastic pipe in Schedule 40 dimensions. All pressure ratings are calculated from hydrostatic design stresses based on test data obtained in tests made on ½ to 2-in. pipe.

[B] See 3.2.4 and Appendix for code designation.

TABLE X1.3 Water Pressure Ratings at 73°F (23°C) for Schedule 80 ABS Plastic Pipe

Inch-PoundUnits

Nominal Pipe Size, in.	Pressure Ratings, psi							
	ABS1208		ABS1210		ABS1316		ABS2112	
	Unthreaded	Threaded	Unthreaded	Threaded	Unthreaded	Threaded	Unthreaded	Threaded
⅛	...	...	...	...	980	490	...	...
¼	...	...	...	...	900	450	...	...
⅜	...	...	...	...	730	370	...	...
½	340	170	420	210	680	340	530	260
¾	280	140	340	170	550	280	430	210
1	250	130	320	160	500	250	390	200
1¼	210	100	260	130	420	210	330	160
1½	190	90	240	120	380	190	290	150
2	160	80	200	100	320	160	250	130
2½	170	80	210	110	340	170	270	130
3	150	70	190	90	300	150	230	120
3½	140	70	170	90	280	140	220	110
4	130	60	160	80	260	130	200	100
5	120	60	140	70	230	120	180	90
6	110	60	140	70	220	110	170	90
8	100	50	120	60	200	100	150	80
10	90	50	120	60	190	90	150	70
12	90	50	110	60	180	90	140	70

SI Units

Nominal Pipe Size, in.	Pressure Ratings, MPa							
	ABS1208		ABS1210		ABS1316		ABS2112	
	Unthreaded	Threaded	Unthreaded	Threaded	Unthreaded	Threaded	Unthreaded	Threaded
⅛	...	...	...	...	6.76	3.38	...	...
¼	...	...	...	...	6.21	3.10	...	...
⅜	...	...	...	...	5.03	2.51	...	...
½	2.34	1.17	2.90	1.45	4.69	2.34	3.65	1.82
¾	1.93	0.97	2.34	1.17	3.79	1.90	2.96	1.48
1	1.72	0.86	2.21	1.10	3.45	1.72	2.69	1.34
1¼	1.45	0.72	1.79	0.90	2.90	1.45	2.28	1.14
1½	1.31	0.65	1.65	0.83	2.62	1.31	2.00	1.00
2	1.10	0.55	1.38	0.69	2.21	1.10	1.72	0.86
2½	1.17	0.58	1.45	0.72	2.34	1.17	1.86	0.93
3	1.03	0.52	1.31	0.65	2.07	1.03	1.59	0.80
3½	0.97	0.48	1.17	0.58	1.93	0.97	1.52	0.76
4	0.90	0.45	1.10	0.55	1.79	0.90	1.38	0.69
5	0.83	0.41	0.97	0.48	1.59	0.80	1.24	0.62
6	0.76	0.38	0.97	0.48	1.52	0.76	1.17	0.58
8	0.69	0.34	0.83	0.41	1.38	0.69	1.03	0.52
10	0.62	0.31	0.83	0.41	1.31	0.65	1.03	0.52
12	0.62	0.31	0.76	0.38	1.24	0.62	0.97	0.48