



Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40¹

This standard is issued under the fixed designation D 2468; 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. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This specification covers acrylonitrile-butadienestyrene (ABS) Schedule 40 pipe fittings. Included are requirements for materials, workmanship, dimensions, and burst pressure.

1.2 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.

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

1.4 The following safety hazards caveat pertains only to the test method portion, Section 8, 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:

- D 618 Practice for Conditioning Plastics for Testing²
- D 1599 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings³
- D 1600 Terminology for Abbreviated Terms Relating to Plastics²
- D 1788 Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Plastics⁴
- D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings³
- F 412 Terminology Relating to Plastic Piping Systems³
- F 1498 Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings³

2.2 NSF Standard:

Standard No. 14 for Plastic Piping Components and Related Materials⁵

3. Terminology

3.1 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 plastics is ABS.

4. Classification

4.1 *General*—This specification covers Schedule 40 ABS pipe fittings, made from four ABS plastic compounds and intended for use with Iron Pipe Size (IPS) outside-diameter plastic pipe.

4.1.1 Fittings covered by this specification are normally molded. Inline fittings, such as couplings, unions, bushings, caps, nipples, etc., shall be molded or machined from extruded stock.

4.1.2 Fittings fabricated by welding are not included in this specification.

5. Materials

5.1 This specification covers ABS pipe fittings made from four ABS plastics as defined in Specification D 1788. These are Type I, Grade 1 (cell 322); Type I, Grade 2 (cell 522); Type I, Grade 3 (cell 355); and Type II, Grade 1 (cell 445).

5.2 *Compound*—The ABS plastic compound shall meet the requirements of Type I, Grade 1; Type I, Grade 2; Type I, Grade 3; or Type II, Grade 1, as described in Specification D 1788.

NOTE 1—Mechanical strength, heat resistance, impact strength, and chemical resistance requirements are covered in Specification D 1788.

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

6. Requirements

6.1 Dimensions and Tolerances:

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² Annual Book of ASTM Standards, Vol 08.01.

³ Annual Book of ASTM Standards, Vol 08.04.

⁴ Annual Book of ASTM Standards, Vol 08.02.

⁵ Available from the National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106.

6.1.1 Fitting sockets, inside diameters (waterways), minimum wall thicknesses, and dimensions shall be as shown in Tables 1-3 when measured in accordance with Test Method D 2122.

6.1.2 Multistep reducer bushings may be cored out. Where coring is used, the inner socket shall be reinforced from the outer wall by a minimum of three ribs extending from the top of the inner socket to the deepest extremity of the coring. The transition from D to DJ (Table 3) may be straight, tapered as shown, or radiused. A positive taper in the same direction of the taper in the socket on the outside diameter of the bushing is optional.

6.1.3 The maximum angular variation of any opening shall be not more than 1/2° off the true centerline axis.

6.1.4 The minimum wall thickness of fittings shall be 125 % of the minimum wall thickness of the corresponding size of Schedule 40 pipe for which they are designed to be used, except that for the socket, the wall thickness shall be at least equal to the minimum wall thickness of the corresponding size of Schedule 40 pipe. For any threaded fitting the minimum wall thickness of the threaded portion shall be at least equal to the thickness of material under the thread root of threaded Schedule 80 pipe of the same size.

6.1.5 The minimum inside diameter of the fittings shall be not less than the minimum specified inside diameter of the corresponding size of Schedule 40 pipe. Any fitting having a male thread shall have an internal diameter not larger than Schedule 80 pipe of the same size.

6.1.6 Minimum dimensions have zero negative tolerance.

Tolerances on other dimensions are shown in Table 1 and Table 3.

6.2 *Threads*—For all fittings having taper pipe threads, threads shall conform to Specification F 1498 and be gaged in accordance with 8.4.

6.3 *Burst Pressure*:

6.3.1 The minimum burst strength of the fittings shall be not less than that calculated for the size and wall thickness of the pipe with which it is to be used, when calculated from the following equation:

$$S = P (D_o - t)2t \quad (1)$$

where:

S = hoop stress, psi (MPa),

P = internal pressure, psi (MPa),

D = average outside diameter, in. (mm), and

t = minimum wall thickness, in. (mm).

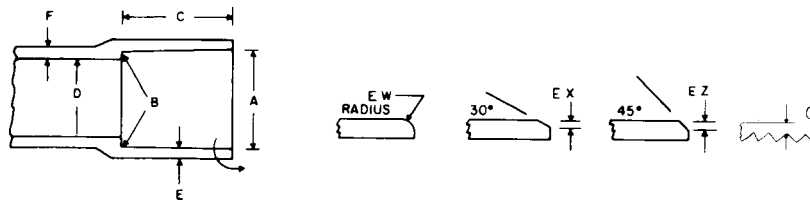
Fittings tested in accordance with 8.5 shall withstand the minimum burst pressure shown in Table 4.

6.3.2 Pressures shown are minimum burst pressures and do not imply rated working pressures. The burst pressure shall be used only as an indication of quality.

7. **Workmanship, Finish, and Appearance**

7.1 The fittings shall be homogeneous throughout and free of cracks, holes, foreign inclusions, or other defects. The fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

TABLE 1 Tapered Sockets for ABS Pipe Fittings, Schedule 40, in.^A

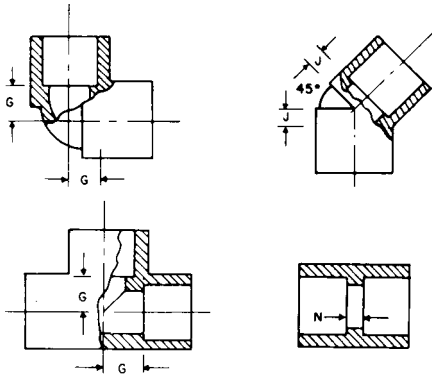


Nominal Pipe Size	A Socket Entrance Diameter			B Socket Bottom Diameter			C Socket Length, min	D ^B Inside Diameter, min	Wall Thickness, min			Entrance, min		
	Diameter	Tolerance on Diameter	Maximum Out-of-Round	Diameter	Tolerance on Diameter	Maximum Out-of-Round			E	F	G	EW	EX	EZ
1/8	0.417	±0.004	±0.008	0.401	±0.004	±0.008	0.500	0.265	0.068	0.085	0.056	1/64	1/64	1/64
1/4	0.552	±0.004	±0.008	0.536	±0.004	±0.008	0.500	0.360	0.088	0.110	0.063	1/64	1/64	1/64
3/8	0.687	±0.004	±0.008	0.671	±0.004	±0.008	0.594	0.489	0.091	0.114	0.068	1/32	1/32	1/32
1/2	0.848	±0.004	±0.008	0.836	±0.004	±0.008	0.688	0.618	0.109	0.136	0.072	1/32	1/32	1/32
3/4	1.058	±0.004	±0.010	1.046	±0.004	±0.010	0.719	0.820	0.113	0.141	0.079	1/32	1/32	1/32
1	1.325	±0.005	±0.010	1.310	±0.005	±0.010	0.875	1.044	0.133	0.166	0.087	1/16	1/16	1/16
1 1/4	1.670	±0.005	±0.012	1.655	±0.005	±0.012	0.938	1.375	0.140	0.175	0.098	1/16	1/16	1/16
1 1/2	1.912	±0.006	±0.012	1.894	±0.006	±0.012	1.094	1.604	0.145	0.181	0.106	1/16	1/16	1/16
2	2.387	±0.006	±0.012	2.369	±0.006	±0.012	1.156	2.061	0.154	0.193	0.123	1/16	1/16	1/16
2 1/2	2.889	±0.007	±0.015	2.868	±0.007	±0.015	1.750	2.462	0.203	0.254	0.139	3/32	1/8	1/8
3	3.516	±0.008	±0.015	3.492	±0.008	±0.015	1.875	3.060	0.216	0.270	0.160	3/32	1/8	1/8
3 1/2	4.016	±0.008	±0.015	3.992	±0.008	±0.015	2.000	3.540	0.226	0.283	0.183	3/32	1/8	1/8
4	4.518	±0.009	±0.015	4.491	±0.009	±0.015	2.000	4.017	0.237	0.296	0.194	3/32	1/8	1/8
5	5.583	±0.010	±0.030	5.553	±0.010	±0.030	3.000	5.037	0.258	0.323	0.228	3/32	1/8	1/8
6	6.647	±0.011	±0.030	6.614	±0.011	±0.030	3.000	6.054	0.280	0.350	0.281	1/8	3/16	3/16
8	8.655	±0.015	±0.045	8.610	±0.015	±0.045	4.000	7.966	0.322	0.403	0.341	1/8	3/16	3/16

^A The sketches and designs of fittings are illustrative only.

^B See 6.1.5.

TABLE 2 Minimum Dimension from Center to End of Sockets (Laying Length) for Couplings, Tees, 90° and 45° Elbows, ABS Socket-Type Pipe Fittings, Schedule 40, in.^A



Nominal Pipe Size	G, min	J, min	N, min
1/8	1/4	1/8	1/16
1/4	5/16	5/32	1/16
3/8	3/8	3/16	3/32
1/2	1/2	1/4	3/32
3/4	9/16	5/16	3/32
1	11/16	9/16	3/32
1 1/4	7/8	3/8	3/32
1 1/2	1	7/16	3/32
2	1 1/4	5/8	3/32
2 1/2	1 1/2	1 1/16	3/16
3	1 3/16	3/4	3/16
3 1/2	2 1/8	1	3/16
4	2 5/16	1	3/16
5	3	1 3/8	3/16
6	3 1/2	1 3/4	1/4
8	4 1/2	2	1/4

^A The sketches and designs of fittings are illustrative only.

8. Test Methods

8.1 *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.

8.2 *Test Conditions*—Conduct tests in the standard laboratory atmosphere of 73 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity, unless otherwise specified in the test methods or in this specification.

8.3 *Sampling*—A sufficient quantity of fittings as agreed upon between the seller and the purchaser shall be selected at random from each lot or shipment and tested to determine that the basic design is in conformance with this specification.

NOTE 2—For individual orders or specifications, only those tests and numbers of tests specifically agreed upon between the purchaser and the seller need be conducted.

8.4 *Threads*—All taper pipe threads shall be gaged in accordance with Specification F 1498.

8.5 *Burst Pressure*—Determine the minimum burst pressure in accordance with Test Method D 1599. The pressure shall be applied at a uniform rate such that the minimum allowable burst pressure is attained in 60 to 70 s.

NOTE 3—The time to failure may exceed 70 s.

8.5.1 *Apparatus*—Fittings shall be tested while held in a test jig constructed in such a manner as to seal the socket by means of O-rings, or gaskets but not to reinforce or support the fittings, except where contact is necessary because of the shape of the fitting to keep the fitting in the test jig. Such contact shall be held to the minimum. The socket plug portion of the test fixture must extend one third to two thirds of the socket depth. Failure of any part of the test apparatus does not constitute failure of the fittings.

8.5.1.1 Threaded fittings shall be tested by assembling them to the same size threads conforming to Specification F 1498 dimensions.

9. Retest and Rejection

9.1 If the results of any test(s) do not meet the requirements of this specification, the tests(s) shall be conducted again only by agreement between the purchaser and 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.

10. Marking

10.1 Fittings shall be marked with the following:

10.1.1 Manufacturer’s name or trademark.

10.1.2 Material designation ABS I for ABS Type I, Grade 1; ABS 12 for ABS Type I, Grade 2; ABS 13 for ABS Type I, Grade 3; and ABS II for ABS Type II, Grade 1.

10.1.3 Fittings intended for the transport of potable water shall include the seal or mark of the laboratory making the evaluation for this purpose,

10.1.4 Size, and

10.1.5 This designation number: D 2468.

10.2 Where the size of the fitting does not allow complete marking, identification marking may be omitted in the following sequence: size, material designation, manufacturer’s name or trademark.

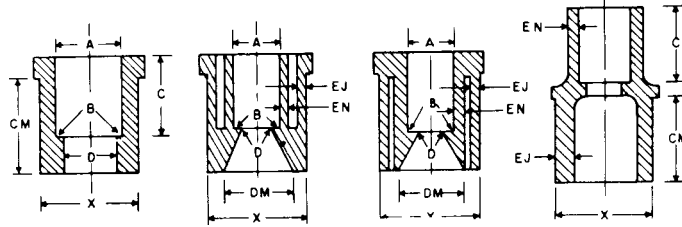
10.3 Markings or symbols shall be molded, hot-stamped, or applied to fittings by any other suitable method, such as printing.

10.4 Where recessed marking is used, care shall be taken to see that in no case marking causes cracks or reduces the wall thickness below the minimum specified.

11. Quality Assurance

11.1 When the product is marked with this designation, D 2468, 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.

TABLE 3 Dimensions of Reducer Bushings, ABS Socket-Type Pipe Fittings, Schedule 40, in.^{A,B}



Nominal Size	X, Outside Diameter	Tolerance on Outside Diameter (includes out-of-round)
1/4 by 1/8	0.540	±0.008
3/8 by 1/4, 1/8	0.675	±0.008
1/2 by 3/8, 1/4	0.840	±0.008
3/4 by 1/2, 3/8, 1/4	1.050	±0.010
1 by 1/2, 3/4	1.315	±0.010
1 1/4 by 1/2, 3/4, 1	1.660	±0.012
1 1/2 by 1/2, 3/4, 1, 1 1/4	1.900	±0.012
2 by 1/2, 3/4, 1, 1 1/4, 1 1/2	2.375	±0.012
2 1/2 by 2	2.875	±0.015
3 by 2 1/2, 2	3.500	±0.015
3 1/2 by 2 1/2, 2	4.000	±0.015
4 by 3 1/2, 3, 2 1/2, 2	4.500	±0.015
5 by 4	5.563	±0.030
6 by 5	6.625	±0.035
8 by 6	8.625	±0.045

^A The sketches and designs of fittings are illustrative only.

^B Dimensions not shown are in Table 1.

TABLE 4 Burst Pressure Requirements for Water at 73°F (23°C) for ABS Socket-Type Pipe Fittings, Schedule 40

Nominal Size, in.	Minimum Burst Strength, ^A							
	Type I, Grade 1		Type I, Grade 2		Type I, Grade 3		Type II, Grade I	
	psi	MPa	psi	MPa	psi	MPa	psi	MPa
1/8	1330	9.17	2110	14.55	2420	16.69	2660	18.34
1/4	1280	8.83	2040	14.07	2340	16.13	2570	17.72
3/8	1030	7.10	1630	11.24	1870	12.89	2060	14.20
1/2	980	6.76	1560	10.76	1790	12.34	1970	13.58
3/4	800	5.52	1260	8.69	1450	10.00	1590	10.96
1	740	5.10	1180	8.14	1350	9.31	1490	10.27
1 1/4	610	4.21	970	6.69	1110	7.65	1220	8.41
1 1/2	550	3.79	870	6.00	990	6.83	1090	7.52
2	460	3.17	730	5.03	830	5.72	920	6.34
2 1/2	500	3.45	800	5.52	910	6.27	1000	6.89
3	430	2.96	690	4.76	790	5.45	870	6.00
3 1/2	400	2.76	630	4.34	720	4.96	790	5.45
4	370	2.55	580	4.00	670	4.62	730	5.03
5	320	2.21	510	3.52	580	4.00	640	4.41
6	290	2.00	460	3.17	530	3.65	580	4.00
8	260	1.79	410	2.83	470	3.24	510	3.52

^A This table was calculated for Schedule 40 pipe using the ISO formula and the stress levels for materials as follows:

	psi	MPa
Type I, Grade 1	3300	22.8
Type I, Grade 2	5240	36.1
Type I, Grade 3	6000	41.4
Type II, Grade 1	6600	45.5

SUPPLEMENTARY REQUIREMENTS

POTABLE WATER REQUIREMENT

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

S1. Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard 61 or the health effects portion of NSF

Standard 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.

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