



# Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings<sup>1</sup>

This standard is issued under the fixed designation F409; 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 U.S. Department of Defense.*

## 1. Scope\*

1.1 This specification covers requirements and test methods for materials, dimensions and tolerances, hydrostatic pressure, joint integrity, and solvent cement for thermoplastic tube and fittings for accessible and replaceable domestic waste connections. Marking requirements are also included. Thermoplastic that does not meet the material requirements specified in Section 5 is excluded.

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 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The following safety hazards caveat pertains only to the test methods 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.*

1.5 *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.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.63 on DWV.

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## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- D618 Practice for Conditioning Plastics for Testing
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2235 Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
- D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
- D2657 Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
- D2661 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings
- D2665 Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
- D3965 Classification System and Basis for Specifications for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings
- D4101 Specification for Polypropylene Injection and Extrusion Materials
- F402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
- F412 Terminology Relating to Plastic Piping Systems
- F1498 Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings

### 2.2 Federal Standard:

- Fed. Std. No. 123 Marking for Shipment (Civil Agencies)<sup>3</sup>

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

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

**TABLE 1 Dimensions and Tolerances for Outside Diameters and Thickness of Plastic Tube**

Nominal Tube Size	Outside Diameter			Wall Thickness
	Average	Tolerance on Average	Out-of-Roundness (maximum minus minimum)	Minimum
in.	in. (mm)	in. (mm)	in. (mm)	in. (mm)
1¼	1.250 (31.75)	±0.005 (±0.127)	0.020 (0.51)	0.062 (1.575)
1½	1.500 (38.10)	±0.005 (±0.127)	0.020 (0.51)	0.062 (1.575)

2.3 *Military Standard:*  
**MIL-STD-129 Marking for Shipment and Storage**<sup>3</sup>

2.4 *ASME Standard:*  
**B1.20.1 Pipe Threads, General Purpose (Inch)**<sup>4</sup>

### 3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology **F412**, and abbreviations are in accordance with Terminology **D1600**, unless otherwise specified.

### 4. Significance and Use

4.1 The requirements of this specification are intended to provide accessible and replaceable tube and fittings to convey domestic waste from fixtures to the drain, waste, and vent (DWV) system.

### 5. Materials and Manufacture

5.1 *Tube*—The tube shall be made of one of the following materials:

5.1.1 Virgin acrylonitrile-butadiene-styrene (ABS) plastic which shall meet the requirements of Specification **D3965**, Cell Classification 4-2-2-2-2.

5.1.2 Virgin poly(vinyl chloride) (PVC) plastic which shall meet the requirements for 12454 materials in accordance with Specification **D1784**, or

5.1.3 Virgin polypropylene plastic which shall meet the requirements of Specification **D4101**, Cell Classification PP0110B55140 and PP0105G20A33350.

5.2 *Fittings and Mechanical Joint Components*—The fittings and components of mechanical joints shall be comprised of one or more of the following materials:

5.2.1 Virgin ABS plastic which shall meet the requirements of Specification **D3965**, Cell Classification 2-0-2-1-1.

5.2.2 Virgin PVC plastics which shall meet the requirements of 12454 materials as defined in Specification **D1784**, or

5.2.3 Virgin polypropylene plastic which shall meet the requirements of Specification **D4101**, Cell Classification PP0110B55140, and PP0105G20A33350.

5.3 *Rework Material*—The manufacturers shall use only their own clean rework tube and fitting material and the tube or fittings produced shall meet all the requirements of this specification. The different types of material shall not be mixed.

5.4 *Solvent Cement*—The ABS solvent cement shall meet the requirements of Specification **D2235**. The PVC solvent cement shall meet the requirements of Specification **D2564**. No solvent cement or adhesive joining of propylene plastic (PP) is permissible.

### 6. Mechanical Connections

6.1 Compression or threaded connections shall incorporate American National Straight Pipe Thread, Mechanical Joints for Fixtures (NPSM). The thread form shall be the form of American National Straight Pipe Thread and the dimensions shall be in accordance with ASME B1.20.1 (NPSM). All threads shall have a minimum three-thread engagement for fittings and plastic nuts.

6.2 *Taper Pipe Threads*—For all fittings having taper pipe threads, threads shall conform to Specification **F1498** and be gaged in accordance with **8.5**.

6.3 *Straight Pipe Threads (NPSM)*—For all fittings having straight pipe threads, threads shall conform to ASME B1.20.1 (NPSM) and be gaged in accordance with **8.6**.

6.4 All tube and fittings made from propylene plastic shall be assembled by either mechanical connections or by heat fusion, in accordance with Practice **D2657**.

### 7. Requirements

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

7.2 *Dimensions and Tolerances:*

7.2.1 *Tube:*

7.2.1.1 *Tube Dimensions*—The tube dimensions shall meet the requirements given in **Table 1** when measured in accordance with Test Method **D2122**.

7.2.1.2 *Tube Length*—The tolerance on tube lengths is ±¼ in. (±3 mm).

7.2.2 *Fittings:*

7.2.2.1 *Fitting Dimensions*—The dimensions of fittings shall meet the requirements of **Table 2** when measured in accordance with Test Method **D2122**.

7.2.2.2 *Fitting Laying Length Dimensions*—The laying lengths and other critical dimensions of fittings are shown in **Tables 3-13**.

7.2.2.3 Where applicable for assembly, refer to **Table A1.1** in Specification **D2661**, ABS Schedule 40 Fittings.

7.2.2.4 Where applicable for assembly, refer to **Table 1** in Specification **D2665**, PVC Schedule 40 Fittings.

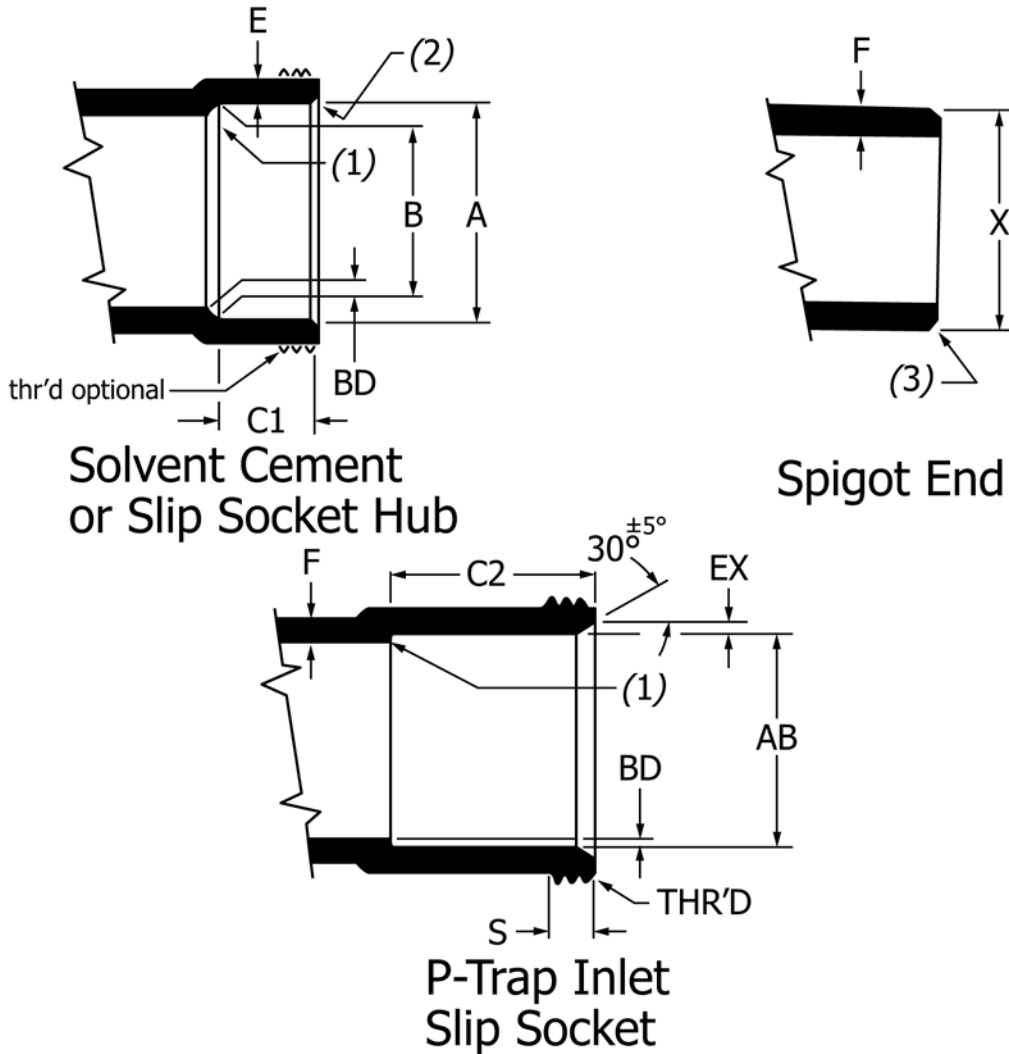
<sup>4</sup> Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

TABLE 2 Dimensions and Tolerances for Plastic Tubular Fittings

NOTE 1—Chamfer or flat, optional.

NOTE 2—Radius or 45° chamfer, optional.

NOTE 3—Radius or chamfer, optional.



Nominal Tube Size	Thread	A <sup>A</sup>	B <sup>A</sup>	C1	C2	E <sup>B</sup>
in.	in.	±0.005 in. (±0.127 mm)	±0.005 in. (±0.127 mm)	Minimum in. (mm)	Minimum in. (mm)	Minimum in. (mm)
1¼	1¼- 11½ NPSM	1.265 (32.13)	1.250 (31.75)	1¼/16 (17.46)	1¾ (34.9)	0.062 (1.58)
1½	1½- 11½ NPSM	1.515 (38.48)	1.500 (38.10)	1½/16 (17.46)	2 (50.8)	0.062 (1.58)
F <sup>B</sup>	S	X	AB	EX	BD	
Minimum in. (mm)	Minimum in. (mm)	±0.005 in. (±0.127 mm)	Minimum in. (mm)	±0.010 in. (±0.254 mm)	Minimum in. (mm)	Maximum in. (mm)
0.062 (1.58)	17/64 (6.75)	1.250 (31.75)	1.258 (31.95)	0.066 (1.68)	0.015 (0.38)	0.070 (1.78)
0.062 (1.58)	17/64 (6.75)	1.500 (38.10)	1.508 (38.30)	0.066 (1.68)	0.015 (0.38)	0.070 (1.78)

<sup>A</sup> Average diameter, the maximum plus minimum diameter divided by 2. The permissible deviation of the diameter from the measured average, often called out-of-roundness, is +0.010 to -0.010 in. (+0.254 to -0.254 mm).

<sup>B</sup> The wall thickness is a minimum value except that a ±10 % variation resulting from core shift is allowable. In such a case, the average of the two opposite wall thicknesses shall equal or exceed the value shown in the table.

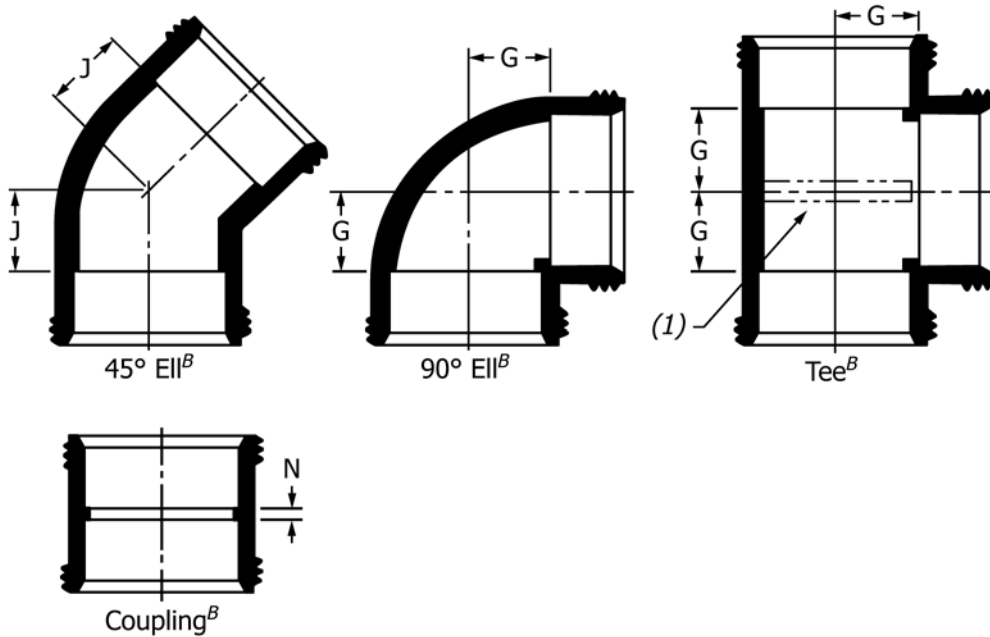
7.3 *Hydrostatic Pressure*—Tube, fittings, and assemblies shall withstand a hydrostatic pressure of 25 psi (170 kPa) when tested in accordance with 8.3.

7.4 *Axial Stress*—Threaded connections shall withstand a minimum axial load of 50 lbf (220 N) when tested in accordance with 8.4.

TABLE 3 Fittings<sup>A</sup>

NOTE 1—Baffle optional.

NOTE 2—See Table 2 for solvent cement or slip socket hub dimensions.



Nominal Tube Size	G	J	N
in.		in. (mm)	
1 1/2	1 3/16 (20.6)	1 3/16 (20.6)	1/16 (1.6) <sup>B</sup>

<sup>A</sup> All dimensions are minimum.

<sup>B</sup> See Table 2.

## 8. Test Methods

8.1 *Sampling*—Take at random a sample of the tube, fittings, or assemblies from each lot or shipment that is sufficient to determine conformance with this specification.

8.2 *Conditioning*—Unless otherwise specified, condition the specimens prior to test at 70 to 77°F (23 ± 2°C) and 50 ± 5 % relative humidity for not less than 40 h in accordance with Procedure A of Practice D618 for those tests where conditioning is required and in all cases of disagreement.

8.3 *Hydrostatic Pressure*—Subject the tube and fittings, as an assembly, to an internal hydrostatic pressure of 25 psi (170 kPa) for 1 h. The tube, fittings, and joints shall show no evidence of leaking.

8.4 *Axial Stress*—Mount threaded connections in a tension-testing machine to apply an axial load. Crosshead speed shall be 0.20 to 0.25 in. (5.0 to 6.3 mm)/min. The connection shall show no evidence of cracking or separation at the minimum load specified in 7.4.

8.5 *Taper Pipe Threads*—All taper pipe threads shall be gaged in accordance with Specification F1498.

8.6 *Straight Pipe Threads (NPSM)*—For all fittings having straight pipe threads, threads shall be gaged in accordance with ASME B1.20.1 (NPSM).

NOTE 1—Some threads listed in Table 6, Table 9, and Table 12 are not

listed in ASME B1.20.1 (NPSM).

## 9. Retest and Rejection

9.1 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 seller. Under such agreement, minimum requirements shall not be lowered, changed, or modified, nor shall specification limits be changed. If upon request, failure occurs, the quantity of product represented by the test(s) does not meet the requirements of this specification.

## 10. Product Marking

10.1 *Tube*—The tube shall be marked in letters not less than 1/8 in. (3 mm) high in a contrasting color and shall at least consist of the nominal size, manufacturer’s name or trademark, and “ABS Tubular F409,” “PVC Tubular F409,” or “PP Tubular F409” at intervals of not greater than 2 ft (610 mm).

10.2 *Fittings*—All fittings shall be marked on the body or hub on both sides. The marking shall consist, at least, of the manufacturer’s name or trademark, the size, and “ABS Tubular F409,” “PVC Tubular F409,” or “P Tubular F409.”

10.3 All baffle tees and such fittings as so required shall be marked with arrows indicating the direction of flow when correctly installed.

TABLE 4 End Outlet Continuous Waste

NOTE 1—Radius optional.

NOTE 2—Baffle optional.

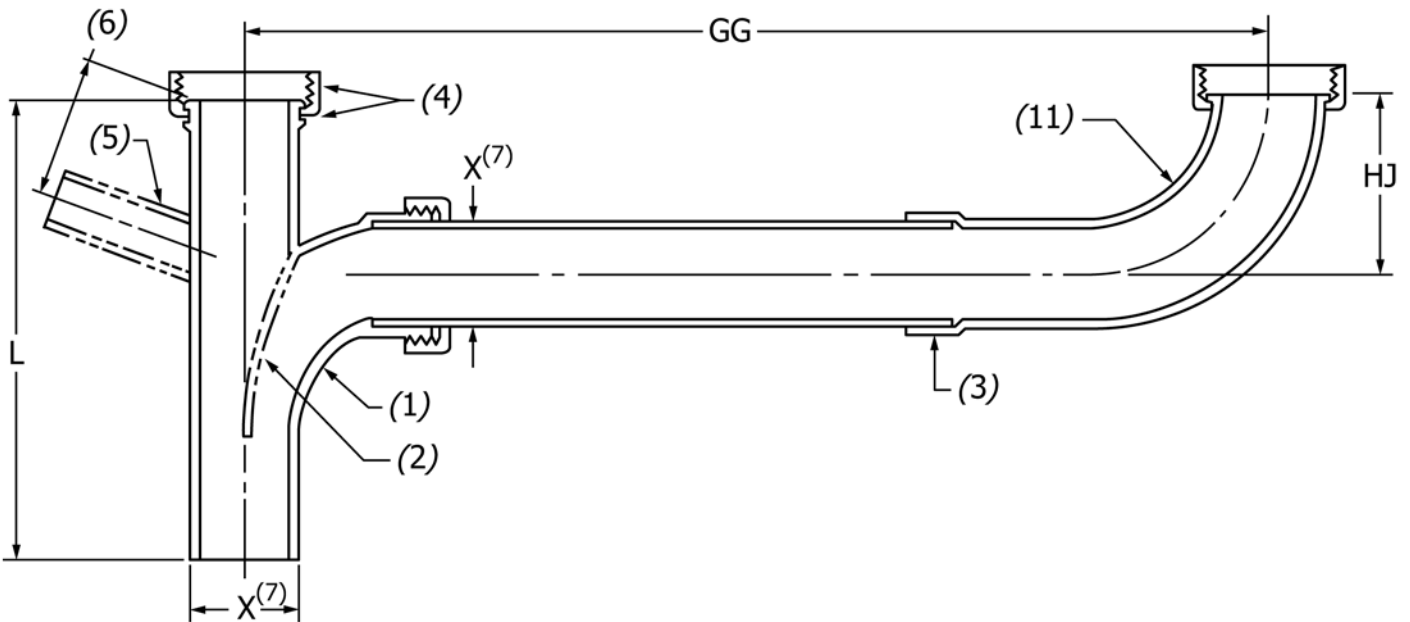
NOTE 3—Arm shall either be one-piece construction or assembled. If assembled, socket shall conform to Table 2.

NOTE 4—Shall be swivel nut, slip nut, or slip socket connection (shown in Table 5).

NOTE 5—Dishwasher branch optional.

NOTE 6—See Table 6.

NOTE 7—See Table 2.



L	HJ	GG			
Minimum in. (mm)	Minimum in. (mm)	Adjustable in four sizes, in. (mm)			
6 (152.4)	1½ (38.1)	12 (305)	16 (406)	21 (533)	25 (635)

## 11. Quality Assurance

11.1 When the product is marked with this designation, F409, 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.

## 12. Keywords

12.1 ABS; cellular; DWV; fittings; pipe; plastic; Schedule 40; thermoplastic

TABLE 5 Center Outlet Continuous Waste

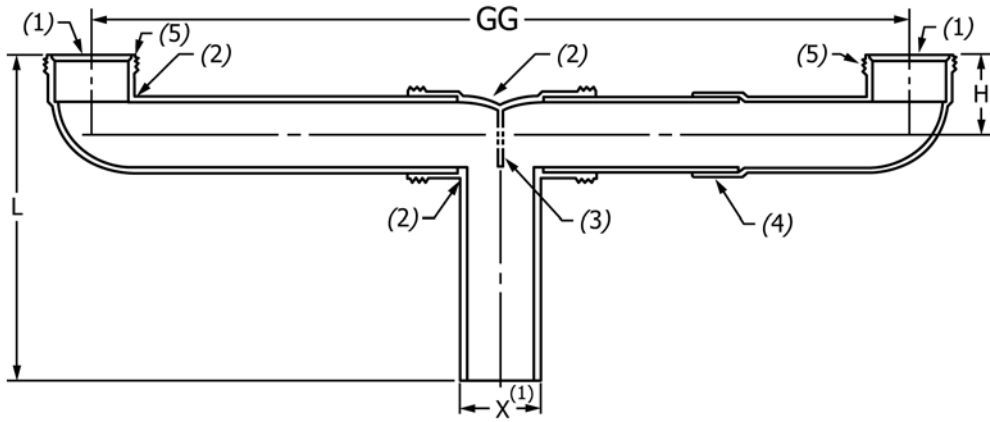
NOTE 1—See Table 2.

NOTE 2—Radius optional.

NOTE 3—Baffle optional.

NOTE 4—Arm shall be either one-piece construction or assembled. If assembled, socket shall conform to Table 2.

NOTE 5—Shall also be swivel connection as shown in Table 4.



H	L	GG			
Minimum in. (mm)	Minimum in. (mm)	Adjustable in four sizes, in. (mm)			
1½ (38.1)	6 (152.4)	12 (305)	16 (406)	21 (533)	25 (635)

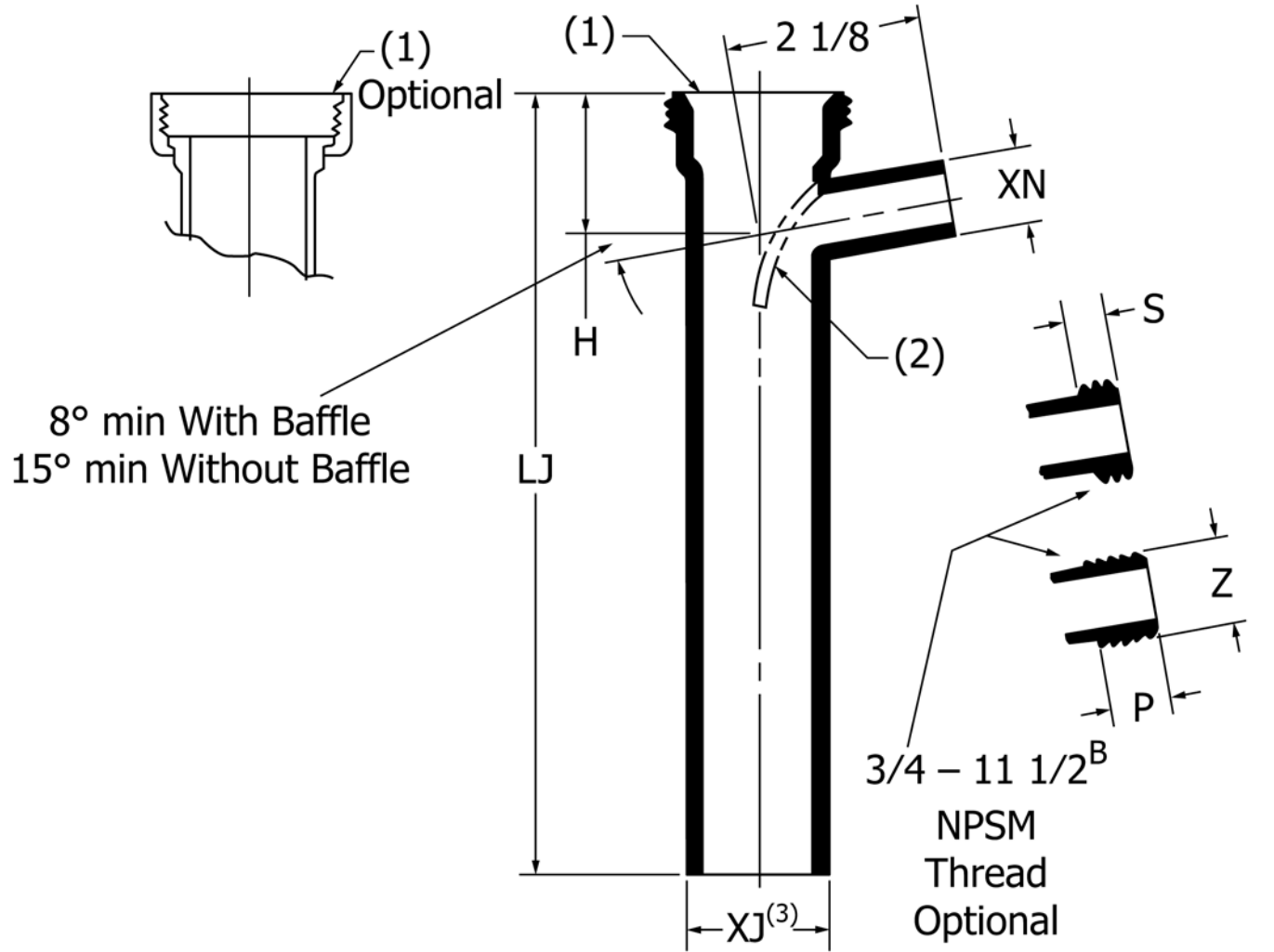
TABLE 6 Dishwasher Branch Tailpiece<sup>A</sup>

NOTE 1—May be swivel or slip connect construction.

NOTE 2—Baffle optional.

NOTE 3—See Table 2.

NOTE 4—See footnote below.<sup>B</sup>



H	P	S	Z	LJ <sup>C</sup>	XN
in. (mm)	in. (mm)	Minimum in. (mm)	in. (mm)	in. (mm)	in. (mm)
1 1/4 (31.8)	1/2 (12.7)	1/4 (6.4)	5/8 (15.9) or 7/8 (22.2)	4 (102) to 24 (610)	5/8 (15.9) or 7/8 (22.2)

<sup>A</sup> All fractional dimensions are minimum.

<sup>B</sup> Threads not listed in ASME B1.20.1 (NPSM).

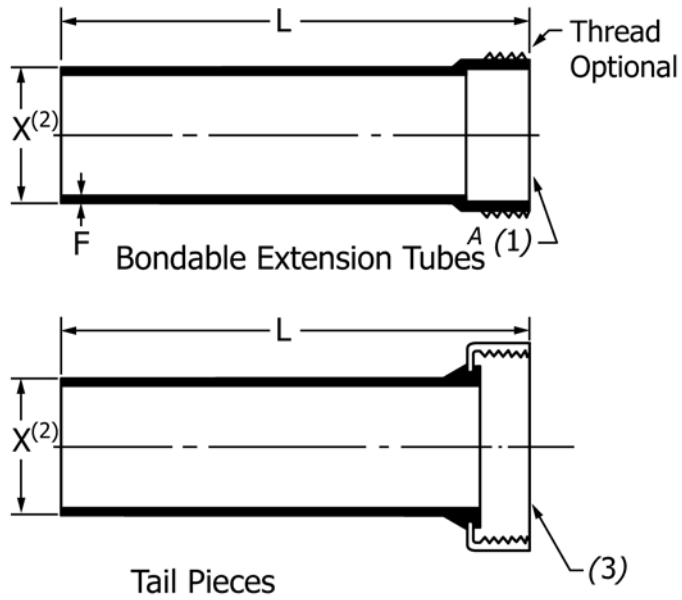
<sup>C</sup> Lengths shall be agreed upon between the purchaser and the manufacturer.

TABLE 7 Extension Tubes and Tail Pieces

NOTE 1—Bondable, belled, or two-piece bondable construction acceptable.

NOTE 2—See Table 2.

NOTE 3—Shall be swivel nut, slip nut, (with flanged tailpiece), or slip socket connection. See Table 8.



F, min	L, min
in. (mm)	in. (mm)
0.062 (1.58)	0.75 (19.1) <sup>A</sup>

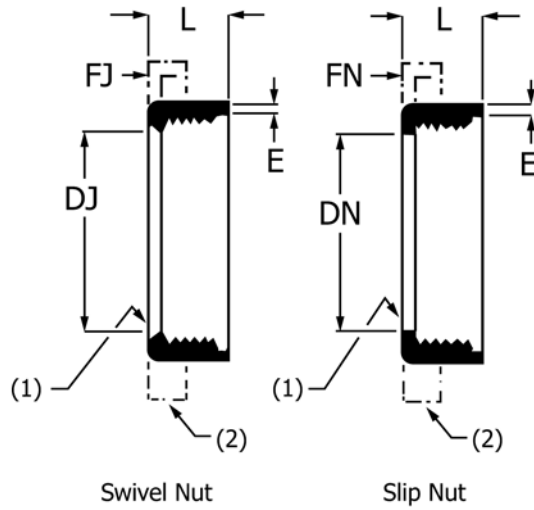
<sup>A</sup> Lengths shall be agreed upon between the purchaser and the manufacturer. Tubes shall be single- or double-ended.



TABLE 8 Swivel Nut and Slip Nut

NOTE 1—Chamfer or radius optional.

NOTE 2—Wing nut design optional.

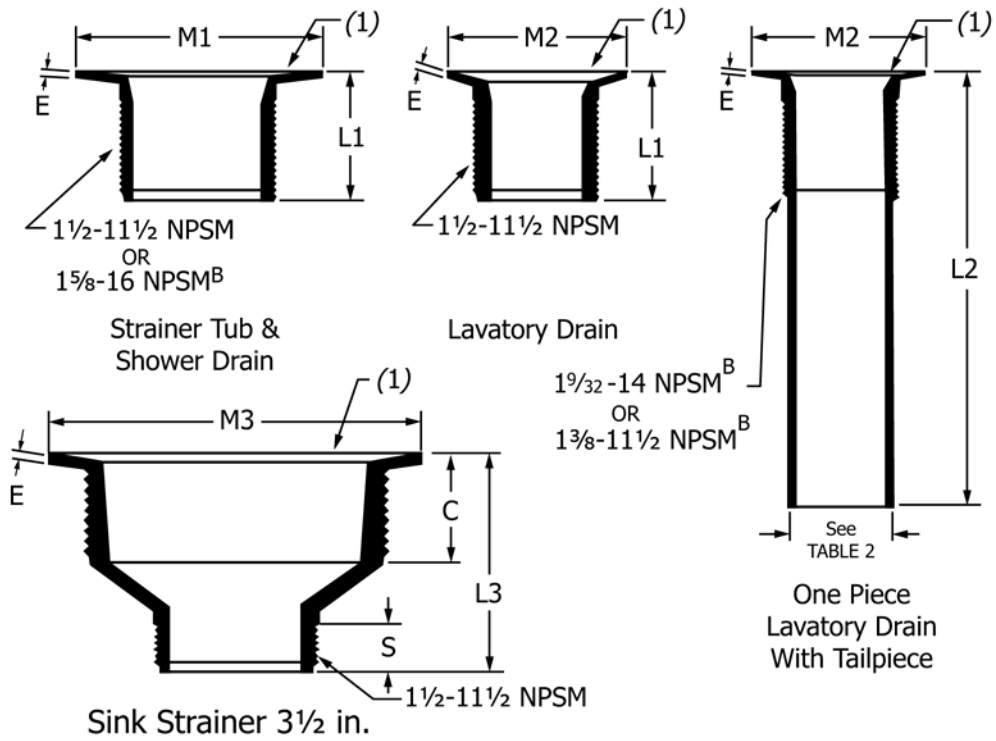


Size	Thread	E	L	DJ <sup>A</sup>		DN <sup>A</sup>		FJ	FN
in.	in.	in. (mm) min	in. (mm) min	in. (mm) max	in. (mm) min	in. (mm) max	in. (mm) min	in. (mm) min	in. (mm) min
1¼	1¼- 11½ NPSM	0.09 (2.3)	5⁄8 (15.9)			1.390 (35.31)	1.260 (32.00)		1⁄8 (3.2)
1½	1½- 11½ NPSM	0.09 (2.3)	5⁄8 (15.9)	1.665 (42.29)	1.580 (40.13)	1.655 (42.04)	1.525 (38.74)	0.09 (2.3)	1⁄8 (3.2)
1½ x 1¼	1½- 11½ NPSM	0.09 (2.3)	5⁄8 (15.9)			1.390 (35.31)	1.260 (32.00)		1⁄8 (3.2)

<sup>A</sup> The part diameter shall be within this dimensional range. The out-of-roundness tolerance from the average measured diameter is +0.010 to -0.010 in. (+0.254 to -0.254 mm).

TABLE 9 Drains<sup>A</sup>

NOTE 1—Metal flanges or inserts shall be molded or crimped in accordance with the manufacturer’s specifications.



C	E	M1	M2	M3	L1	L2	L3	S
in. (mm) min	in. (mm) min	in. (mm) 0.062 (±1.58)	in. (mm) 0.062 (±1.58)	in. (mm) 0.062 (±1.58)	in. (mm) min	in. (mm) min	in. (mm) min	in. (mm) min
1⅞ (33.3)	0.062 (1.57)	2⅞ (71.4)	2⅞ (54.0)	4⅞ (112.7)	1⅞ (28.6)	5 (127.0)	2 (50.8)	⅞ (11.1)

<sup>A</sup> Minimum wall thickness 0.062 (1.58).

<sup>B</sup> Threads not listed in ASME B1.20.1 (NPSM).

TABLE 10 P Traps<sup>A</sup>

NOTE 1—Dimensions shall be suitable for solvent welding to Schedule 40 DWV or threads shall be in accordance with 6.2.

NOTE 2—Radius optional.

NOTE 3—Ribs optional.

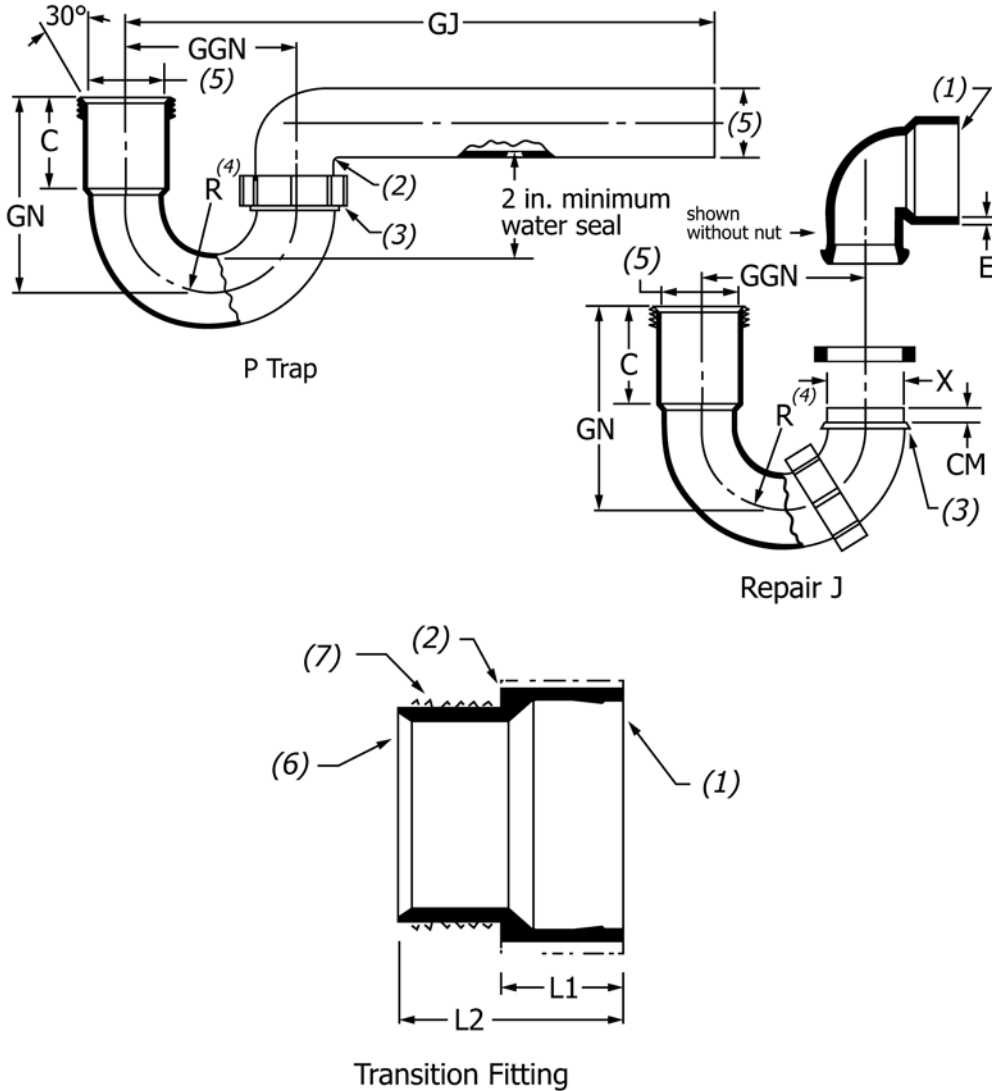
NOTE 4—Ground joint construction optional.

NOTE 5—Single-radius or multi-radius traps shall provide a 2-in. minimum water seal.

NOTE 6—See Table 2 for P-trap inlet slip socket and spigot end dimensions.

NOTE 7—Socket dimensions suitable for solvent welding to 1 1/4 or 1 1/2-in. tubular trap arm as required.

NOTE 8—Threads and socket dimensions for compression joint connection optional. Threads to be either 1 1/4-11 1/2 NPSM or 1 1/2 -11 1/2 NPSM as required.



Size	C	E	X	CM	GJ	GN	GGN	L1	L2
in.	in. (mm)	in. (mm)	in. (mm) ±0.010 (±0.254)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)
1 1/4	1 3/8 (34.9)	0.062 (1.57)	1.250 (31.75)	1/4 (6.4)	9 1/4 (235.0)	3 3/8 (87.5)	3 (76.2)	1 3/16 (20.6)	1 1/2 (38.1)
1 1/2	2 (50.8)	0.062 (1.57)	1.500 (38.10)	1/4 (6.4)	11 (279.4)	4 (101.6)	3 1/4 (82.6)	1 3/16 (20.6)	1 1/2 (38.1)

<sup>A</sup> All dimensions are minimum unless otherwise indicated.

TABLE 11 Lavatory Pop-up Drain

NOTE 1—Plastic or metal flanges shall be secured in accordance with the manufacturer’s specifications.

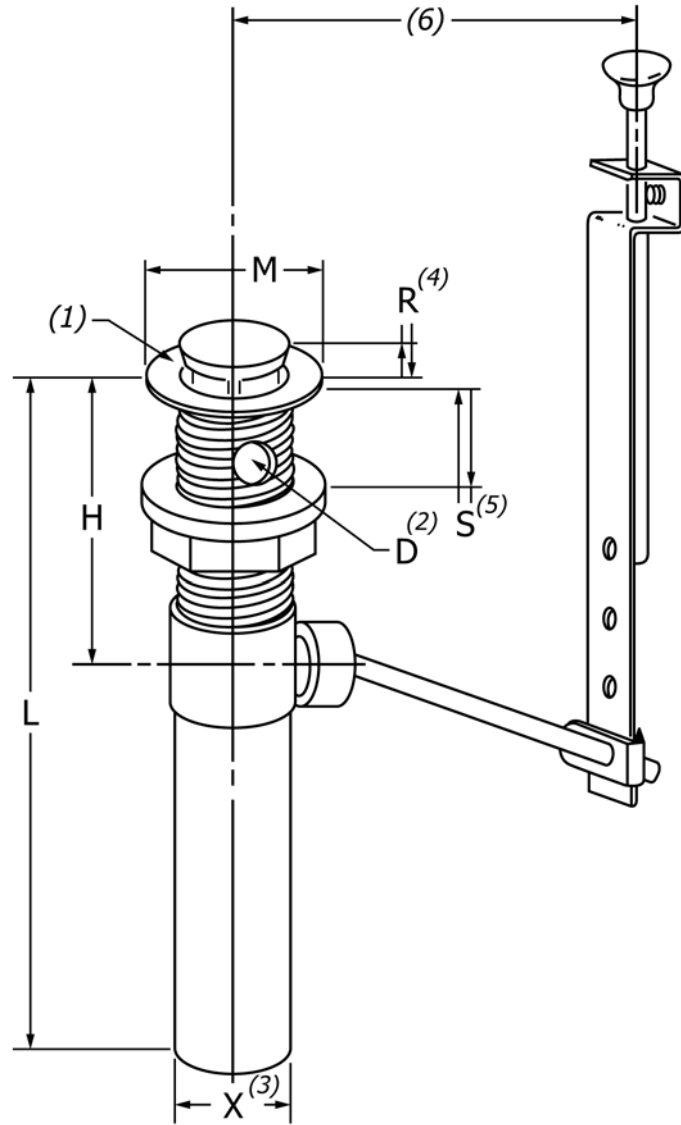
NOTE 2—Overflow openings are optional, when used they must have a combined area of at least 1 in.<sup>2</sup> (654.2 mm<sup>2</sup>).

NOTE 3—See Table 2.

NOTE 4—Stop movement shall be 0 to 0.50 in. (0 to 12.7 mm) min.

NOTE 5—Must be adjustable between 0 to 2 in. (0 to 50.8 mm), or 1½ to 2 in. (38.1 to 50.8 mm) when optional overflow is used.

NOTE 6—Pop-up shall operate at a minimum adjustable range from 4¼ to 7 in. (104.8 to 177.8 mm).



	H		L	M
min		max	min	in. (mm)
		in. (mm)	in. (mm)	0.062 (1.57)
	3⅞ (85.7)	5⅞ (137)	8½ (215.9)	2⅛ (54.0)

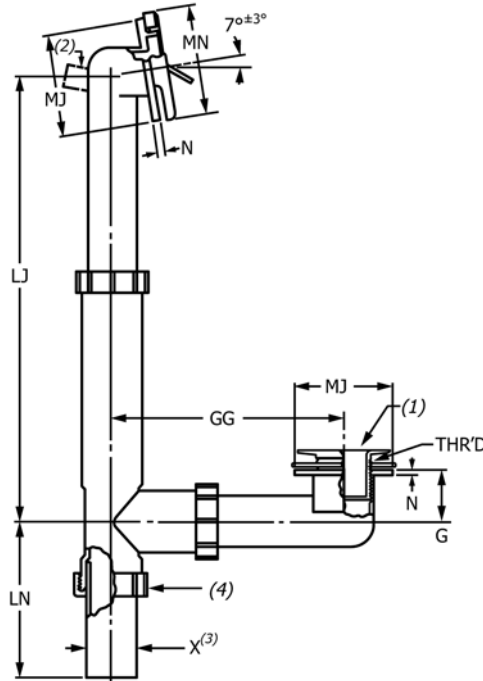
TABLE 12 Bath Drain<sup>A</sup>

NOTE 1—Tee seat-, pop-up-, and rubber stopper-type models are allowed.

NOTE 2—<sup>3</sup>/<sub>4</sub> IPS condensate connection permissible on overflow.

NOTE 3—See Table 2.

NOTE 4—Slip joint or one-piece construction optional.



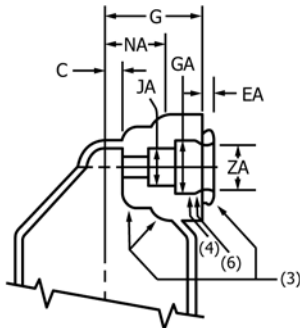
G	N	GG	LJ	LN	MJ	MN	THR'D
in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in.
1 <sup>1</sup> / <sub>8</sub> (28.6)	<sup>3</sup> / <sub>2</sub> (2.4)	6 (152.4)	10 <sup>7</sup> / <sub>8</sub> (276.2)	4 (101.6)	2 <sup>23</sup> / <sub>32</sub> (69.1)	3 (76.2)	1 <sup>1</sup> / <sub>2</sub> - 11 <sup>1</sup> / <sub>2</sub> NPSM 1 <sup>5</sup> / <sub>8</sub> - 16 NPSM <sup>B</sup>

<sup>A</sup> All dimensions are minimum unless otherwise specified.

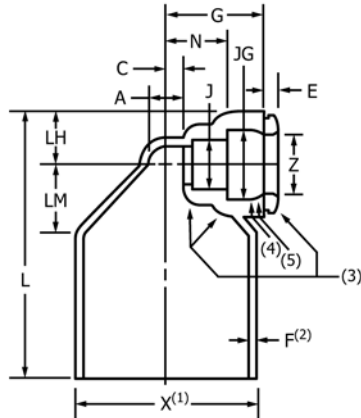
<sup>B</sup> Threads not listed in ASME B1.20.1 (NPSM).

TABLE 13 Transition Adapter

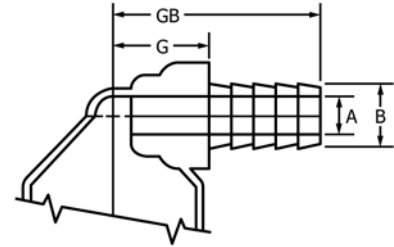
- NOTE 1 - See Table 1 and Table 2 (Spigot End).
- NOTE 2 - See Table 2 (Spigot End).
- NOTE 3 - Radius optional.
- NOTE 4 - 6° angle optional.
- NOTE 5 - 16° angle optional.
- NOTE 6 - 26.45° angle optional.



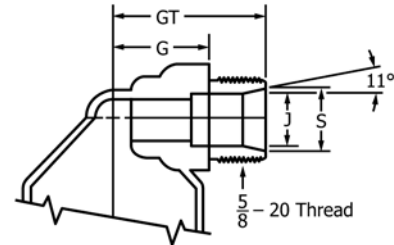
1/4" Push-in / Quick Disconnect



3/8" Push-in / Quick Disconnect



Insert Option (D2609)



NPSM Thread Compression Option

L	LM	LH	G	N	A	C	Z
in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)
2.070 (52.58)	0.550 (13.97)	0.410 (10.41)	0.807 (20.50), min	0.452 (10.80)	0.300 (7.62)	0.150 (3.81)	0.465 (11.81)
J	JG	E	GT	S	GB	B	
in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	
0.380 (9.65)	0.547 (13.89)	0.100 (2.54), min	1.272 (32.31), min	0.455 (11.56)	1.760 (44.70), min	0.510 (12.95)	
	NA	JA	GA	EA	ZA		
	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)		
	0.507 (12.88)	0.255 (6.48)	0.424 (10.77)	0.050 (1.27), min	0.308 (7.82)		

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 S1.1—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 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 S2.1—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 specification.

## APPENDIX

## (Nonmandatory Information)

## X1. STORAGE AND INSTALLATION PROCEDURES FOR PLASTIC TUBE AND TUBULAR FITTINGS

X1.1 *Storage*—Do not store tubing and fittings in direct sunlight for long periods. Store tubing in such a manner as to prevent sagging or bending.

X1.2 *Visibility of Marking*—Position tubing and fittings so that identifying markings are readily visible to inspection when installed.

X1.3 *Solvent Cement*—Use solvent cements meeting the requirements of Specification D2235 for ABS tube and fittings. Poly(vinyl chloride) requires solvent cements meeting the requirements of Specification D2564. No cement joining of PP is permissible. Cements should be packaged in containers suitable for size of pipe being joined. Do not thin the cement. Discard cement that has thickened. Solvent cements are flammable. Keep away from heat, spark, and open flame. Avoid prolonged breathing of vapors. Prolonged contact with skin is harmful. Use with adequate ventilation and avoid contact with eyes and skin. For further information, see Practice F402.

X1.4 *Socket Fit*—Tubular pipe and fittings are manufactured to close tolerances. Close tolerances are required to ensure satisfactory “interference” fit between pipe and fitting during the solvent cement joining. Use only pipe and fitting combinations that give interference fits. Pipe loose in the socket may not properly fuse chemically. The allowable tolerances ensure a forced fit and when solvent is applied will readily mate, thus ensuring a chemical fusion equal in strength to pipe or fitting. Attempting to correct a loose fit after assembly by additional cement may result in an unsatisfactory joint.

X1.5 *Joining Technique:*

X1.5.1 *Cutting the Pipe*—Cut the pipe square with saws or pipe cutters designed specifically for this material; protect pipe and fittings from serrated holding devices and abrasion.

X1.5.2 *Deburring Pipe*—Remove burrs from inside and outside pipe edges.

X1.5.3 *Cleaning Joining Surfaces*—Wipe off all dust, dirt, and moisture from surfaces to be cemented with a clean, dry rag or paper towel. Remove gloss and any oily film from the pipe and mating socket with clean steel wool, fine abrasive paper, chemical cleaner, or primer. In case of conflicting solvent cementing instructions, the instructions of the cement manufacturer should be followed.

X1.5.4 *Application of Cement*—Use a natural bristle or nylon brush of adequate size (usually at least ½ the pipe diameter) or applicator supplied with the can of cement. First apply a moderate even coating of cement in the fitting socket

completely covering the pipe joining surfaces only. Heavy or excessive applications of cement may become an obstruction inside of the piping. Quickly apply a heavy even coat of cement to the outside of the pipe. Make sure that the coated distance on the pipe is equal to the depth of the fitting socket.

X1.5.5 *Assembly*—Make the joint as quickly as possible after application of the cement and before the cement dries. Insert the pipe into the fitting socket, turning the pipe slightly to ensure even distribution of cement. Make sure that the pipe is inserted to the full depth of the socket. Remove excess solvent cement from the exterior of the joint with a clean, dry cloth. Reasonable handling of the assembly is permissible within 2 min after joining. Do not attempt to disturb the pipe-fitting joint until after the cement has set; damage to the joint and loss of fit may result. Should the cement dry partially before the joint is made up, reapply cement before assembling. Allow 15 min for the joint to develop good handling strength.

X1.6 *Threaded Connections*—Do not cut threads on tubular pipe. Molded threads are permitted. Only approved thread tape or thread lubricant specifically intended for use with plastic pipe should be used. Conventional pipe thread compounds, putty, linseed oil-based products, and unknown mixtures shall be avoided.

X1.6.1 *Thread Tightness*—Where a threaded joint is made, obtain tightness by maximum hand tightening plus tightening with a strap wrench not to exceed one full turn.

X1.6.2 *Connection to Traps*—Connect traps by means of approved threaded trap adaptors.

X1.6.3 *Connection to Non-Plastic Pipe*—When connecting plastic tube to other types of piping, use only approved types of fittings and adaptors, designed for the specific transition intended.

X1.7 *Alignment and Grade*—Align all piping system components properly without strain. Do not bend or pull pipe into position after being solvent welded. The grade of horizontal drainage and vent piping shall be as specified for other materials in the applicable code.

X1.8 *Antifreeze Protection*—When necessary protect traps and fixtures from freezing. Do not use alcohol or petroleum products. Use only approved plastic pipe antifreeze packaged for this purpose or one of the following solutions:

X1.8.1 Sixty weight percent of glycerin in water mixed at 23°C (73°F).

X1.8.2 Twenty-two percent of magnesium chloride in water. Strong solutions of common table salt (sodium chloride) may also be used.

## SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F409 – 12) that may impact the use of this standard.

- (1) Added Summary of Changes section, including required note at bottom of first page.
- (2) Revised wording of 1.1 for additional clarity.
- (3) Revised 1.3 to comply with Form and Style Manual.
- (4) Revised designation for ASME B1.20.1 in 2.4, 6.2, 6.3, 8.6, and Table 6, Table 9, and Table 12.
- (5) Updated URL in footnote 3.
- (6) Revised PVC cell class designation in 5.1.2 and 5.2.2.
- (7) Spelling corrections in Note 3 of Table 7.
- (8) Replaced “Thr’d” with “Thread” in Table 8.

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