



# Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent (DWV) Pipe and Fittings Having Post-Industrial Recycle Content<sup>1</sup>

This standard is issued under the fixed designation F2390; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification covers requirements and test methods for materials, dimensions and tolerances, pipe stiffness, crush resistance, impact resistance, hydrostatic burst resistance, and solvent cement for poly(vinyl chloride) plastic drain, waste, and vent (DWV) pipe and fittings.

1.2 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.

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

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.

## 2. Referenced Documents

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

- D618 Practice for Conditioning Plastics for Testing
- D1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
- D1600 Terminology for Abbreviated Terms Relating to Plastics

<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. Current edition approved Nov. 1, 2012. Published January 2013. Originally approved in 2007. Last previous edition approved in 2007 as F2390-07. DOI: 10.1520/F2390-12.

<sup>2</sup> 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.

- 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
- D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
- D2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
- D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
- F2135 Specification for Molded Drain, Waste, and Vent (DWV) Short-Pattern Plastic Fittings
- D3311 Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
- 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
- F1866 Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings

## 3. Terminology

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

### 3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *certificate of composition disclosure, n*—a certificate describing certain properties of an external recycled material, its formulation and source, and the specific material shipment to which it applies.

3.2.1.1 *Discussion*—Examples include polymer(s), molecular weight, percentage (and type) of inorganic material, tensile strength, modulus of elasticity, and izod impact; code or designation identifying the formulation and source information.

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

3.2.2 *post-industrial recycle, n*—recycled PVC material generated by a company or manufacturing plant that is different than the location producing products to this specification.

3.2.2.1 *Discussion*—Material used for a different product produced by the same manufacturer shall be considered as post-industrial recycle material for the product of this standard, unless the different product is made from the same compound.

3.2.3 *post-consumer recycle, n*—PVC plastic material used in products that have proceeded into the chain of commerce beyond the control of the original manufacturer.

3.2.3.1 *Discussion*—These materials are generally recycled by the users or consumers of the product, and have no specific identity or specificity of the compound.

3.2.3.2 *Discussion*—Post-consumer recycled material is NOT post-industrial recycle and is prohibited from use in products within this specification (see 5.4.1)

## 4. Significance and Use

4.1 The requirements of this specification are intended to provide pipe and fittings suitable for the drainage and venting of sewage and certain other liquid wastes.

NOTE 2—This standard specifies dimensional, performance and test requirements for plumbing and fluid handling, but does not address venting of combustion gases.

NOTE 3—Industrial waste disposal lines should be installed only with the specific approval of the cognizant building code authority since chemicals not commonly found in drains and sewers and temperatures in excess of 180 °F (82.2 °C) may be encountered.

## 5. Materials

5.1 *Basic Materials*—The pipe and fittings shall be made from a uniform blend containing virgin PVC compound and between 10 % by weight and 50 % by weight of post-industrial recycle material. The finished compound shall meet or exceed the minimum cell classification material requirements specified in 5.2, Virgin PVC Compounds.

5.2 *Virgin PVC Compounds*—Virgin PVC pipe compounds shall meet or exceed the requirements of Class 12454 as defined in Specification D1784. Virgin PVC fitting compounds shall meet or exceed the requirements of Class 12344 as defined in Specification D1784, but with a tensile strength of not less than 6 500 psi and a modulus of elasticity of not less than 380 000 psi. These plastics contain stabilizers, lubricants, and pigments.

5.3 *Rework Material*—The manufacturer is permitted to use his own clean pipe or fitting rework material, except as specified in 5.4, provided that the pipe or fittings produced shall meet all the requirements of this specification.

5.4 *Post-Industrial Recycled Materials*—The pipe or fittings manufacturer shall use post-industrial recycle material, as defined in 3.2.3 at a level of at least 10 % by weight or volume, but not exceeding 50 % by weight or volume.

5.4.1 *Post-Industrial Recycle Source*—The post-industrial recycle shall be clean, of a known source, and each shipment shall be provided with a certificate of composition disclosure. Post-consumer recycled materials shall not be used.

5.4.1.1 When blending with the manufacturer's own internal rework, the total post-industrial recycle level in the finished compound shall not exceed 50 %, by weight or volume.

5.4.1.2 Composition of the post-industrial recycle shall be known by the industrial source of the material.

5.4.1.3 The material shall not be purchased from a 3rd-party (for example, grinding, re-packaging facility, broker, etc.) unless there is a documented system in place to ensure that the material is clean, free of contamination and is of a single source and single material compound.

## 6. Requirements

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

6.1.1 The requirements in this section are intended only for characteristic minimum properties, not as simulated service tests.

6.2 *Dimensions and Tolerances:*

6.2.1 *Method*—All dimensions shall be determined in accordance with Test Method D2122.

6.2.2 *Dimensions:*

6.2.2.1 The outside diameter and wall thicknesses of pipe shall meet the requirements of Table 1. The pipe shall be in either 10 or 20-ft (3.05 or 6.1-m) lengths, unless otherwise specified, with an allowable tolerance of +1/2, -0 in. (+13, -0 mm).

6.2.2.2 The patterns, dimensions, and laying lengths of fittings, including adaptors, shall meet the requirements of Specification D3311 and Table 2.

6.2.2.3 The patterns, dimensions, and laying lengths of Short-Pattern fittings shall meet the requirements of Specification F2135.

6.2.2.4 The spigot dimensions of fittings shall meet the requirements of Table 1.

6.2.2.5 For all fittings having taper pipe threads, threads shall conform to Specification F1498 and be gauged in accordance with 7.5. Fittings of nominal sizes not given in Specification F1498 shall not have threads.

6.2.2.6 Fabricated DWV fittings shall comply with F1866.

6.3 *Pipe Stiffness, Deflection Load and Flattening:*

6.3.1 *Pipe*—The minimum pipe stiffness at 5 % deflection shall be in accordance with Table 3. The pipe shall deflect by 60 % of the nominal outside diameter (flattening) without cracking, rupture, or other visible evidence of failure when tested in accordance with 7.4.

6.3.1.1 *Pipe Stiffness (PS)*—Three specimens shall be tested. If all three meet the PS requirement, the sample meets the PS requirement. If one or two fail, additional testing shall be conducted in accordance with 6.3.1.2. If all three fail, the sample does not meet the PS requirement.

6.3.1.2 *Pipe Stiffness and Lower Confidence Limit*—In the event that one or two of the specimens tested in 6.3.1 fail to meet the minimum PS requirement, the average pipe stiffness of eleven specimens shall meet or exceed the minimum requirement given in Table 3. The 99 % lower confidence limit (LCL) shall be within 15 % of the average value. The LCL

**TABLE 1 Dimensions and Tolerances for Outside Diameters and Thicknesses of PVC Plastic Drain, Waste, and Vent Pipe**

Nominal Pipe Size	Outside Diameter			Wall Thickness	
	Average	Tolerance on Average	Out-of-Roundness (maximum minus minimum)	Minimum	Tolerance
	in. (mm)				
1¼	1.660 (42.16)	±0.005 (0.13)	0.024 (0.61)	0.140 (3.56)	+0.020 (0.51) -0.000
1½	1.900 (48.26)	±0.006 (0.15)	0.024 (0.61)	0.145 (3.68)	+0.020 (0.51) -0.000
2	2.375 (60.33)	±0.006 (0.15)	0.024 (0.61)	0.154 (3.91)	+0.020 (0.51) -0.000
3	3.500 (88.90)	±0.008 (0.20)	0.030 (0.76)	0.216 (5.49)	+0.026 (0.66) -0.000
4	4.500 (114.30)	±0.009 (0.23)	0.100(2.54)	0.237 (6.02)	+0.028 (0.71) -0.000
6	6.625 (168.28)	±0.011 (0.28)	0.100 (2.54)	0.280 (7.11)	+0.034 (0.86) -0.000
8	8.625 (219.08)	±0.015 (0.38)	0.150 (3.81)	0.322 (8.18)	+0.039 (0.99) -0.000
10	10.750 (273.05)	±0.015 (0.38)	0.150 (3.81)	0.365 (9.27)	+0.044 (1.12) -0.000
12	12.750 (323.85)	±0.015 (0.38)	0.150 (3.81)	0.406 (10.31)	+0.049 (1.24) -0.000
14	14.000 (355.6)	±0.015 (±0.38)	0.200 (5.08)	0.437 (11.1)	+0.053 (1.35) -0.000
16	16.000 (406.4)	±0.019 (±0.48)	0.320 (8.13)	0.500 (12.7)	+0.060 (1.52) -0.000

**TABLE 2 Dimensions and Tolerances for Fitting Sockets for PVC Plastic Drain, Waste and Vent Pipe Fittings**

Nominal Pipe Size	A		B			C	E	Internal Threads		
	Socket Entrance Diameter			Socket Bottom Diameter			Socket Depth, min	Wall thickness min. <sup>A</sup>	Outside Diameter of Hub, M. min.	Thread length min.
	Average	Tolerance on Avg.	Out-of - Roundness s	Average	Tolerance on Avg.	Out-of - Roundness s				
	in. (mm)									
1¼	1.675 (42.54)	+0.010/-0.005 (+0.25/-0.13)	0.024 (0.61)	1.655 (42.04)	±0.005 (±0.13)	0.024 (0.61)	0.687 (17.44)	0.156 (3.96)	1.871 (47.52)	0.687 (17.44)
1½	1.915 (48.64)	+0.010/-0.005 (+0.25/-0.13)	0.024 (0.61)	1.895 (48.13)	±0.005 (±0.13)	0.024 (0.61)	0.687 (17.44)	0.156 (3.96)	2.127 (54.03)	0.687 (17.44)
2	2.390 (60.71)	+0.010/-0.005 (+0.25/-0.13)	0.024 (0.61)	2.370 (60.20)	±0.005 (±0.13)	0.024 (0.61)	0.750 (19.05)	0.156 (3.96)	2.634 (66.90)	0.750 (19.05)
3	3.520 (89.41)	+0.010/-0.005 (+0.25/-0.13)	0.030 (0.76)	3.495 (88.77)	+0.005/-0.010 (+0.13/-0.25)	0.030 (0.76)	1.500 (38.10)	0.219 (5.56)	3.841 (97.56)	1.187 (30.15)
4	4.520 (114.8)	+0.010/-0.005 (+0.25/-0.13)	0.030 (0.76)	4.495 (114.2)	+0.005/-0.010 (+0.13/-0.25)	0.030 (0.76)	1.750 (44.45)	0.250 (6.35)	4.907 (124.6)	1.28 (32.54)
6	6.647 (168.8)	+0.015/-0.010 (+0.38/-0.25)	0.060 (1.52)	6.614 (168.0)	±0.010 (±0.25)	0.060 (1.52)	3.000 (76.20)	0.281 (7.14)	7.203 (183.0)	1.500 (38.10)
8	8.655 (219.8)	+0.020/ -0.010 (+0.51/ -0.25)	0.090 (2.29)	8.610 (218.7)	+0.015/ -0.015 (+0.38/ -0.3800)	0.090 (2.29)	4.000 (101.6)	0.328 (8.33)	<sup>B</sup>	<sup>B</sup>
10	10.780 (273.8)	+0.025/-0.020 (+0.64/-0.51)	0.120 (3.05)	10.735 (272.7)	±0.020 (±0.51)	0.120 (3.04)	5.000 (127.0)	0.365 (9.28)	<sup>B</sup>	<sup>B</sup>
12	12.780 (324.6)	+0.030/-0.025 (+0.76/-0.64)	0.150 (3.81)	12.735 (323.5)	±0.020 (±0.51)	0.150 (3.81)	6.000 (152.4)	0.406 (10.3)	<sup>B</sup>	<sup>B</sup>

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

<sup>B</sup>Not applicable for these nominal sizes.

shall be calculated using the Student's "t" distribution, with  $N-1$  degrees of freedom, where  $N$  is the number of specimens.