



Standard Specification for Polyolefin Pipe and Fittings for Drainage, Waste, and Vent Applications¹

This standard is issued under the fixed designation F3371; 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 requirements for non-pressure polyolefin pipe and fittings for drainage, waste, and vent applications.

NOTE 1—This specification does not include requirements for pipe and fittings intended to be used to vent combustion gases.

1.2 Pipe is produced in Schedule 40 and 80 IPS sizes, in metric sizes, and in DR IPS sizes for two polyolefins; polyethylene (PE) and polypropylene (PP).

1.3 The interchangeability of pipe and fittings made by different manufacturers is not addressed in this specification.

1.4 Pipe and fittings are joined by the heat fusion method (Practice D2657 for PP butt and saddle fusion, Practice F2620 for PE butt, saddle and socket fusion and Practice F1290 for polyolefin electrofusion) or by using mechanical or gasketed joints recommended by the pipe and fitting manufacturers.

1.5 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.

1.6 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.

1.7 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *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 Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

- D570 Test Method for Water Absorption of Plastics
- D618 Practice for Conditioning Plastics for Testing
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
- D2444 Practice for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
- D2657 Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
- D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- D3311 Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
- D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
- D4101 Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials
- F412 Terminology Relating to Plastic Piping Systems
- F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F585 Guide for Insertion of Flexible Polyethylene Pipe Into Existing Sewers
- F913 Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F1290 Practice for Electrofusion Joining Polyolefin Pipe and Fittings

¹ This test method 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 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

F1498 Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings

F2620 Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings

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 *ISO Standard*.⁴

ISO 265-1 Pipes and Fittings of Plastics Materials – Fittings for Domestic and Industrial Waste Pipes – Basic Dimensions: Metric Series – Part 1: Unplasticized Poly (Vinyl Chloride) (PVC-U)

3. Terminology

3.1 Definitions:

3.1.1 Definitions used in this specification are in accordance with the definitions given in Terminology **F412**, and abbreviations are in accordance with Terminology **D1600**, unless otherwise indicated.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *fire retardant*—material that exhibit reduced surface burning characteristics and resist propagation of fire.

3.2.2 *toe-in, n*—a small reduction of the outside diameter at the cut end of a length of thermoplastic pipe.

4. Classification

4.1 *General*—This specification covers polyolefin pipe made from polyethylene or polypropylene in Schedule 40 and 80 IPS sizes, metric sizes, and DR IPS sizes.

4.2 This specification also includes molded fittings and in larger sizes (8 in., 10 in., 12 in.) fabricated fittings.

4.3 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—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 °C) may be encountered.

5. Materials and Manufacture

5.1 Polyethylene (PE) virgin material for pipe or fittings shall be from a single compound manufacturer and shall be made from PE material that meets or exceeds the cell-classification requirements of 112110, 213330, or 324430 as defined in Specification **D3350**.

5.2 Polypropylene (PP) virgin material for pipe or fittings shall meet the requirements for polypropylene Group 01, 02, or 03, as defined in Specification **D4101**.

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

⁴ 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>.

5.3 The polyolefin material shall contain suitable stabilizers and antioxidants and may contain pigments and fillers not detrimental to pipe and fittings provided the pipe and fittings produced meet the requirements of this specification.

5.3.1 Polyolefin material can be produced in both regular and flame-retardant compounds for pipe and fittings.

5.4 *Rework Material*—Clean rework material generated from the manufacturer’s own pipe or fitting products may be used by the same manufacturer, using the same type and grade resin, provided that the pipe or fittings produced meet the requirements of this specification.

5.5 *Gaskets*—The elastomeric seal (gasket) shall comply with the requirements of Specification **F477** or **F913** at the time the fittings are manufactured.

5.6 *Lubricant*—The lubricant used for field assembly shall be the type recommended by the manufacturer of the gasketed joint.

6. Requirements

6.1 *General*—The pipe and fittings shall be homogeneous throughout and 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 use as quality control tests, not as simulated service tests.

6.2 Dimensions and Tolerances—Pipe:

6.2.1 Standard dimensions and tolerances shall meet the requirements as shown in **Table 1**, **Table 2**, and **Table 3** and when measured in accordance with Test Method **D2122**. The tolerance for out-of-roundness shall apply only to pipe prior to shipment.

6.2.2 Metric dimensions and tolerances shall meet the requirements as shown in **Table 4** and **Table 5** and when measured in accordance with Test Method **D2122**. The tolerance for out-of-roundness shall apply only to pipe prior to shipment.

6.2.3 *Toe-In*—The outside diameter when measured in accordance with Test Method **D2122** shall meet the requirements of **Table 1** or **Table 4** when measured at any point within 1.5

TABLE 1 Outside Diameters and Tolerances for Polyolefin Pipe in. (mm)

Nominal Pipe	Size Average Outside	Diameter Tolerance	Out-of-Roundness (maximum minus minimum)
1¼	1.660 (42.16)	±0.005 (±0.13)	0.050 (1.27)
1½ ^A	1.750 (44.45)	±0.010 (±0.25)	0.060 (1.52)
1½	1.900 (48.26)	±0.006 (±0.15)	0.060 (1.52)
2	2.375 (60.32)	±0.006 (±0.15)	0.070 (1.78)
3	3.500 (88.90)	±0.008 (±0.20)	0.080 (2.03)
4	4.500 (114.30)	±0.009 (±0.23)	0.100 (2.54)
6	6.625 (168.28)	±0.011 (±0.28)	0.100 (2.54)
8	8.625 (219.08)	±0.015 (±0.38)	0.150 (3.81)
10	10.750 (273.05)	±0.015 (±0.38)	0.150 (3.81)
12	12.750 (323.85)	±0.015 (±0.38)	0.150 (3.81)

^ANot an IPS size. Pipe shall be used with compatible fittings designed for this outside diameter. The wall thickness is the same as 1½ in. IPS Schedule 40 shown in **Table 2**.

TABLE 2 Wall Thickness and Tolerances for Polyolefin Pipe Schedules 40 and 80, in. (mm)

NOTE 1—For fittings, 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 Schedule 40 table.

Nominal Pipe Size	Schedule 40		Schedule 80	
	Minimum	Tolerance	Minimum	Tolerance
1 ¼	0.140 (3.56)	+0.020 (+0.51)	0.191 (4.85)	+0.023 (+0.58)
1½	0.145 (3.68)	+0.020 (+0.51)	0.200 (5.08)	+0.024 (+0.61)
2	0.154 (3.91)	+0.020 (+0.51)	0.218 (5.54)	+0.026 (+0.66)
3	0.216 (5.49)	+0.026 (+0.66)	0.300 (7.62)	+0.036 (+0.91)
4	0.237 (6.02)	+0.028 (+0.71)	0.337 (8.56)	+0.040 (+1.02)
6	0.280 (7.11)	+0.034 (+0.86)	0.432 (10.97)	+0.052 (+1.32)
8	0.322 (8.18)	+0.039 (+0.99)	0.500 (12.70)	+0.060 (+1.52)
10	0.365 (9.27)	+0.044 (+1.12)	0.593 (15.06)	+0.071 (+1.80)
12	0.406 (10.31)	+0.049 (+1.24)	0.687 (17.45)	+0.082 (+2.08)

TABLE 3 Wall Thickness and Tolerances for Polyolefin Pipe SDR, in. (mm)

NOTE 1—For fittings, 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 3.

Nominal Pipe Size	SDR 26		SDR 17	
	Minimum	Tolerance	Minimum	Tolerance
1 ¼	0.091 (2.32)	+0.020 (+0.51)	0.140 (2.32)	+0.017 (+0.43)
1½	0.091 (2.32)	+0.020 (+0.51)	0.140 (2.32)	+0.017 (+0.43)
2	0.091 (2.32)	+0.020 (+0.51)	0.140 (2.32)	+0.017 (+0.43)
3	0.135 (3.42)	+0.020 (+0.51)	0.206 (3.43)	+0.025 (+0.63)
4	0.173 (4.40)	+0.021 (+0.53)	0.265 (4.40)	+0.032 (+0.81)
6	0.255 (6.47)	+0.031 (+0.78)	0.390 (6.47)	+0.047 (+1.19)
8	0.332 (8.43)	+0.040 (+1.01)	0.507 (8.43)	+0.061 (+1.55)
10	0.413 (10.50)	+0.050 (+1.26)	0.632 (10.50)	+0.076 (+1.93)
12	0.490 (12.46)	+0.059 (+1.50)	0.750 (12.46)	+0.090 (+2.29)

TABLE 4 Outside Diameters and Tolerances for Polyolefin Pipe Metric Sizes OD

Nominal Pipe Size	Minimum Average OD, in. (mm)	Maximum Average OD, in. (mm)	Maximum Out-of-Roundness, in. (mm)
32	1.260 (32.0)	1.272 (32.3)	0.020 (0.5)
40	1.575 (40.0)	1.591 (40.4)	0.020 (0.5)
50	1.969 (50.0)	1.988 (50.5)	0.024 (0.6)
75	2.953 (75.0)	2.980 (75.7)	0.039 (1.0)
90	3.543 (90.0)	3.575 (90.8)	0.039 (1.0)
110	4.331 (110.0)	4.370 (111.0)	0.039 (1.0)
125	4.921 (125.0)	4.937 (125.4)	... (...)
160	6.299 (160.0)	6.358 (161.5)	... (...)
200	7.874 (200.0)	7.953 (202.0)	... (...)
250	9.842 (250.0)	9.941 (252.5)	... (...)
315	12.401 (315.0)	12.528 (318.2)	... (...)

pipe diameters or 11.8 in. (300 mm), whichever is less, to the cut end of the pipe length.

6.3 Dimensions and Tolerances—Fittings:

6.3.1 The minimum wall thickness of the body of all fittings shall not be less than the corresponding pipe size and shall be measured in accordance with Test Method D2122.

6.3.2 Spigot ends of fittings shall conform to the diameter and out-of-roundness requirements for pipe.

6.3.3 Socket ends of fittings shall conform to the dimensional requirements for size and tolerances as provided on request by the manufacturer.

6.3.4 The average minimum diameters of waterways of fittings excluding adapters shall be as specified in Table 6 or Table 7, as applicable.

6.3.5 For all fittings having taper pipe threads, threads shall conform to Specification F1498 and be gaged in accordance with 8.7.

6.3.6 The patterns, dimensions, and laying lengths of molded fittings, including adaptors, shall meet the requirements of Specification D3311 or shall be of a proven design and shall allow a smooth transition of fluid flow from one direction to another. Specialty fittings or fittings with laying lengths exceeding those shown in Specification D3311 shall not be excluded. For these fittings, laying lengths shall be provided by the manufacturer. Metric fittings shall conform to ISO 265-1.

6.3.7 Cleanouts—All polyolefin fitting cleanouts having female threads shall be supplied with polyolefin plugs to suit.

6.3.8 Cleanouts, cleanout plugs, and caps shall have a thread size and depth sufficient to ensure that the minimum waterway sizes are maintained.

6.3.9 Traps—All traps shall have a minimum water seal of 2 in. (50 mm).

6.4 Water Absorption—Pipe and fitting materials shall not change in weight more than 0.50 % when tested in accordance with 8.3.

6.5 System Integrity:

6.5.1 Fused joints and pipe associated with them shall withstand a pressure of 5 psi (0.034 MPa) without leaking when tested in accordance with 8.4.1.

6.5.2 Mechanical joints shall withstand a pressure of 5 psi (0.034 MPa) without leaking when tested in accordance with 8.4.2.

TABLE 5 Wall Thickness and Tolerances for Polyolefin Pipe Metric Sizes SDR, in. (mm)

NOTE 1—For fittings, 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 5.

Nominal Pipe Size	SDR 26		SDR 21		SDR 17.6	
	Minimum	Tolerance	Minimum	Tolerance	Minimum	Tolerance
32	... (...)	... (...)	0.070 (1.80)	+0.012 (+0.30)	0.070 (1.80)	+0.012 (+0.30)
40	0.070 (1.80)	+0.012 (+0.30)	0.079 (2.00)	+0.012 (+0.30)	0.094 (2.30)	+0.016 (+0.40)
50	0.079 (2.00)	+0.012 (+0.30)	0.094 (2.40)	+0.016 (+0.40)	0.114 (2.90)	+0.016 (+0.40)
75	0.114 (2.90)	+0.016 (+0.40)	0.142 (3.60)	+0.020 (+0.50)	0.169 (4.30)	+0.025 (+0.63)
90	0.136 (3.50)	+0.020 (+0.50)	0.169 (4.30)	+0.024 (+0.60)	0.208 (5.30)	+0.028 (+0.72)
110	0.165 (4.20)	+0.024 (+0.60)	0.208 (5.30)	+0.028 (+0.70)	0.248 (6.30)	+0.032 (+0.81)
125	0.189 (4.80)	+0.028 (+0.70)	0.234 (6.00)	+0.031 (+0.80)	0.280 (7.10)	+0.039 (+1.00)
160	0.272 (6.90)	+0.031 (+0.80)	0.303 (7.70)	+0.035 (+0.90)	0.358 (9.10)	+0.047 (+1.19)
200	0.339 (8.60)	+0.035 (+0.90)	0.377 (9.60)	+0.043 (+1.10)	0.449 (11.40)	+0.061 (+1.55)
250	0.377 (9.60)	+0.043 (+1.10)	0.468 (11.90)	+0.052 (+1.30)	0.559 (14.20)	+0.076 (+1.93)
315	0.476 (12.10)	+0.055 (+1.40)	0.590 (15.00)	+0.063 (+1.60)	0.705 (17.90)	+0.079 (+2.00)

TABLE 6 Average Waterway Diameter, in. (mm)

Nominal Pipe Size	Unthreaded Fittings, min	Threaded Male Adapters	
		min	max
1 ¼	1.227 (31.17)	1.220 (31.00)	1.280 (32.50)
1½	1.446 (36.73)	1.458 (37.00)	1.501(38.10)
2	1.881 (47.78)	1.915 (48.60)	1.946 (49.40)
3	2.820 (71.63)	2.849 (72.30)	2.983 (75.70)
4	3.737 (94.92)	3.806 (96.60)	3.972 (100.80)
6	5.646 (143.41)	5.851 (148.50)	6.005 (152.40)
8	7.490 (190.25)	...(...)	...(...)
10	9.407 (238.94)	...(...)	...(...)
12	11.197 (284.40)	...(...)	...(...)

TABLE 7 Average Waterway Diameter, Metric

Pipe OD (mm)	Pip ID (mm), min
32	26
40	34
50	44
75	68.8
90	79
110	100
125	113
160	146
200	184
250	230
315	290

NOTE 3—Mechanical joints include transition, compression, threaded, and other mechanical type joints.

6.5.3 Mechanical joints shall incorporate a positive mechanical system for axial restraint in addition to any restraint provided by friction.

6.5.4 Mechanical joints shall show no evidence of separation at the joint under force *P* when tested in accordance with 8.5.1 nor shall they leak or show any other damage when tested in accordance with 8.5.2. Two fittings shall be tested and both shall pass.

6.5.5 Gasketed joints shall show no evidence of leakage when tested in accordance with 8.4.3.

6.6 All stainless steel internal grab rings shall be manufactured from corrosion-resistant steel containing not less than 16 % chromium and not less than 6 % nickel by weight.

6.7 *Sealing Rings*—Polyethylene sealing rings shall be of a Type 1 (LDPE) compound.

6.8 *Flattening*—There shall be no evidence of splitting, cracking, or breaking when the pipe is tested in accordance with 8.7.

6.9 *Impact Resistance*—The minimum impact resistance of pipe and fittings, when tested at the time of manufacture in accordance with 8.8, shall comply with Table 8.

7. Workmanship, Finish, and Appearance

7.1 The manufacture of fittings and pipe shall be in accordance with good commercial practice so as to produce fittings meeting the requirements of this specification. Fittings and pipe shall be homogeneous throughout, smooth, clean and free from grooving, visible blistering, pores, cracks, holes, foreign inclusions, or injurious defects. The fittings and pipe shall be as uniform as commercially practicable in opacity, density, and other physical properties. Pipe ends shall be cleanly cut and the ends of pipe and fittings shall be square to each axis.

8. Test Methods

8.1 *Conditioning*—Condition the test specimens at 73.4 °F ± 3.6 °F (23 °C ± 2 °C) and 50 % ± 5 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D618, for those tests where conditioning is required.

8.2 *Test Conditions*—Conduct tests in the standard laboratory atmosphere of 73.4 °F ± 3.6 °F (23 °C ± 2 °C) and 50 % ± 5 % relative humidity, unless otherwise specified in the test methods or in this specification.

TABLE 8 Impact Resistance of Plastic Drain, Waste and Vent Pipe and Fittings

Description	Impact Resistance, min., ft-lbf (J) 73 °F (23 °C)
All pipe sizes	60 (81)
Fitting sizes and types (larger than 2 in. nominal OD) (larger than 40 mm nominal OD)	15 (20)
Fitting sizes and types (2 in. and smaller nominal OD) (40 mm and small nominal OD)	7.5 (10)

8.3 *Water Absorption*—Weigh three cleanly cut specimens having smooth edges to the nearest 0.001 g and immerse in distilled water at $73.4\text{ °F} \pm 1.8\text{ °F}$ ($23\text{ °C} \pm 1\text{ °C}$) for 24 h + $\frac{1}{2}$ – 0 h, in accordance with Test Method **D570**. Remove the specimens, wipe dry with a clean, dry cloth, and reweigh immediately. Calculate the average percent gain in weight to the nearest 0.01 % on the basis of the initial weight.

8.4 *Hydrostatic Pressure Tests:*

8.4.1 *Fused-Joint Pressure Test*—Select at random six specimens of pipe, each five times the nominal diameter or a maximum of 18 in. (450 mm) in length, for each size of piping and each type of system being considered. Also select three suitable couplings at random. Prepare three joined specimens by joining two pipe specimens with one coupling, using the fusion equipment and instructions supplied by the manufacturer of the system. Fill each specimen with water at $73.4\text{ °F} \pm 3.6\text{ °F}$ ($23\text{ °C} \pm 2\text{ °C}$) and cap, taking care to exclude all air from the system. Fix one end of the specimen to a pressurizing apparatus, and support the free end if necessary. Pressurize each specimen to 5 psi (0.034 MPa) for a minimum of 5 min and inspect for leaks. None of the three specimens shall leak (laboratory performance test only, not for field use).

8.4.2 *Mechanical Joint Pressure Test*—Perform the pressure test on mechanical joints on test specimens prepared in a manner similar to that described in **8.5.1**, except use appropriate pipe specimens where the joint is intended to join pipes of similar or dissimilar material and sizes. Pressurize the assembly to 5 psi (0.034 MPa) for a period of 24 h + 15, – 0.0 min and inspect for signs of leakage. Apply this test to each size and type of joint being considered (laboratory performance test only, not for field use).

8.4.3 *Gasketed Joint Pressure Test*—The joint assembly shall be in accordance with the fitting manufacturer's recommendation. The end of the pipe or fitting spigot shall not damage or dislodge the gasket during insertion. Lubricant is required on the spigot and sometimes additionally on the gasket. All surfaces of the joint that make contact with the gasket shall be smooth and free of imperfections, ridges, fractures, or cracks that could adversely affect the seal. Subject the assembly to internal and external hydrostatic tests using Test Method **D3212** and examine the assembly for evidence of leakage (laboratory performance test only, not for field use).

8.5 *Mechanical-Joint Pullout Test:*

8.5.1 Join two sections of pipe by a coupling with the positive mechanical axial restraint system removed or deactivated. Mount the assembly with the outer ends of the pipe sections fastened in the clamps of a tensile testing machine. Pull the two pipe sections apart at a rate of approximately 1 in./min (25 mm/min) until at least one pipe section has separated from the coupling. Record the maximum force F applied.

8.5.2 Using the set-up described above, subject a complete joint assembled in accordance with the manufacturer's instructions to an axial pullout force P of 25 lbf (110 N) greater than force F . In no case shall this force P be less than 50 lbf (220 N). Apply force P within 5 s to 30 s and maintain for at least 60 s.

8.5.3 Remove the axial force and pressurize the complete joint assembly to 5 psi (0.034 MPa) hydrostatic pressure for a period of 1 h and inspect for leaks.

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

8.7 *Flattening*—Using Test Method **D2412**, flatten three specimens of pipe 6 in. (152 mm) long, between parallel plates in a suitable press until the distance between the plates is 40 % of the original outside diameter of the pipe. The rate of vertical displacement shall be uniform and such that the flattening is completed within 2 min. to 5 min. On removal of the load, examine the specimens for evidence of splitting, cracking, or breaking.

8.8 *Impact Resistance:*

8.8.1 *Polyolefin Pipe and Fittings*—Test in accordance with Test Method **D2444** using Tup C and Holder A for pipe and Tup A and Holder B for fittings. Use a 12 lb (5 kg) tup for testing pipe sizes 4 in. and smaller and a 20 lb (10 kg) tup for pipe larger than 4 in. Test fittings with a 12 lb (5 kg) Tup. Test couplings cemented to short pieces of pipe and allowed to dry for 24 h. For fittings larger than 4 in., a symmetric section cut from the hub or body with a minimum centerline length of 2 in. shall be permitted to be used rather than the entire fitting.

8.8.2 Test 10 specimens. When 9 or 10 specimens pass, accept the lot. When 2 or more specimens fail, test 10 additional specimens. When 17 of 20 specimens tested pass, accept the lot. When 4 or more of 20 specimens tested fail, test 20 additional specimens. When 32 of 40 specimens pass, accept the lot. When 9 or more of 40 specimens fail, the lot does not meet the requirements of this specification.

8.8.3 Failure in the test specimens shall be shattering or any crack or break extending entirely through the pipe wall an visible to the unaided eye.

8.8.4 Bushings increasers and closet flanges are exempt from this requirement.

NOTE 4—This test is intended only for use as a quality control test, not as a simulated service test.

9. Retest and Rejection

9.1 If the results of any test(s) do not meet the requirements of this specification, the test(s) may be conducted again in accordance with an agreement between the purchaser and the seller. There shall be no agreement to lower the minimum requirement of the specification by such means as omitting tests that are a part of the specification, substituting or modifying a test method, or by changing the specification limits. In retesting, the product requirements of this specification shall be followed. If upon retest, failure occurs, the quantity of product represented by the test(s) does not meet the requirement of this specification

10. Product Marking

10.1 *Quality of Marking*—The markings shall be applied to the fittings and pipe in such a manner that they remain legible under normal handling and installation practices.

10.2 *Content of Marking:*

10.2.1 Fittings shall be marked with the following:

10.2.1.1 Manufacturer's name or trademark.

10.2.1.2 Raw material designation and type in accordance with 5.1 or 5.2. Flame-retardant material shall be designated "FR". For example, flame-retardant polypropylene shall be marked "PPFR 110" or "FRPP 110".

10.2.1.3 Size.

10.2.1.4 This designation F3371, with which the fitting complies.

10.2.2 Marking on the pipe shall include the following, spaced at intervals of not more than 5 ft (1.5 m):

10.2.2.1 Manufacturer's name or trademark,

10.2.2.2 Raw material and designation and type, in accordance with 5.1 or 5.2. Flame-retardant material shall be designated "FR". For example, flame-retardant polypropylene shall be marked "PPFR 110" or "FRPP 110".

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

10.2.2.4 This designation F3371, with which the pipe complies.

10.2.2.5 Schedule size or DR (SCH40, SCH80, or SDR XX, whichever is applicable).

10.2.2.6 The symbol "DWV"

NOTE 5—It is common practice to dual mark corrosive waste and DWV piping in which compliance with each applicable standard is met.

11. Quality Assurance

11.1 When the product is marked with this designation, F3371, 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 DWV; drainage; drain pipes; installation; joints; pipe fittings; pipes; plastic pipes; polyethylene; polyolefin; polypropylene; thermoplastic polymers; traps (drainage); waste; waste disposal (building)

SUPPLEMENTARY REQUIREMENTS

GOVERNMENT/MILITARY PROCUREMENT

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

Responsibility for Inspection—Unless otherwise specified in the contract or purchase order, the producer is responsible for 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 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 S2.1—The inclusion of the 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.

ANNEX

(Mandatory Information)

A1. INSTRUCTIONS

A1.1 The manufacturer shall ensure that equipment and instructions needed for joining the pipe and fittings are readily obtainable by the installer.

A1.2 Polyolefin drainage systems shall be installed and supported in accordance with the manufacturer's recommendations.

APPENDIXES
(Nonmandatory Information)
X1. STORAGE

X1.1 *Outside Storage*—Plastic pipe should be stored on a flat surface or supported in a manner that will prevent sagging or bending. Do not store pipe in direct sunlight for long periods.

X1.2 Inventories of plastic pipe should be used first-in, first-out basis.

X2. JOINING

X2.1 *Field Inspection*—Prior to use, all pipes should be carefully inspected for cuts, gouges, deep scratches, damaged ends, or other major imperfections. Defective pipe should be rejected or the damaged sections should be cut out.

X2.2 *Pipe Fit*—Pipe is manufactured to close tolerances to ensure satisfactory fit between the pipe and the fittings socket during assembly. Use only combinations of pipe and fittings that yield manufacturer recommended fits.

X2.3 Caution must be taken if there is an excess amount of toe-in. This could result in excess clearance and, if not cut off, result in a poorly fused joint.

X2.4 *Cutting*—Pipe can be easily cut with ordinary saws. The pipe should be cut square and all burrs removed with a sharp knife, fine tooth file, or other suitable tool such as chamfering tool or reamer. A miter box is recommended to ensure square cut ends. The use of specially designed plastic pipe cutters with extra wide rollers and thin cutting wheels is recommended.

X2.5 *Cleaning*—Remove burrs from inside and outside pipe edges. Wipe off all dust, dirt, and moisture from surfaces to be joined with a clean dry rag or a paper towel. Pipe and fittings must be dry before assembly to obtain good joints

X3. INSTALLATION

X3.1 *Underground Installation*—Underground installations of pipe shall be in accordance with Practice **D2321**, except aggregate size shall be limited to ½ in. (13 mm) for angular and ¾ in. (19 mm) for rounded particles.

X3.2 *Above-Ground Installation*—Flame-retardant pipe and fittings are used in applications where the burning rate is an important consideration.

X3.3 *DWV Installation*—Pipe should be installed in conformance with governing building codes. In areas not governed by codes, pipe should be installed in accordance with accepted engineering practices.

X3.4 *Installation Under Freezing Conditions*—Plastic pipe has decreased resistance to impact under freezing conditions. Increased care should be exercised if installation is likely to occur under these conditions, particularly during handling, transportation, installation, and backfilling. When possible, installation should be avoided during freezing conditions. Allowance shall be made for expansion that will occur when the temperature of the pipe is raised.

X3.5 *Alignment and Grade*—Align all piping system components properly without strain. Do not bend or pull pipe into position after being joined. The grade of horizontal drainage and vent piping shall be as specified in the application code.

X3.6 *Supports and Spacing*—Hangers and straps should not

compress, distort, cut, or abrade the piping and should allow free movement of pipe. Support horizontal piping in accordance with the manufacturer's recommendations. Supports should allow free movement. Maintain vertical piping in straight alignment with supports at each floor level or at 10 ft (3.1 m) intervals, whichever is less.

X3.7 *Threaded Connections*—Do not cut threads on pipe. Molded threads on adapter fittings for transition to threaded construction are necessary except in the case of cleanout plugs. Only approved thread tape or thread lubricant specifically intended for use with plastic pipe should be used.

X3.8 *Thread Tightness*—Maximum thread tightness is hand tight plus one full turn.

X3.9 *Connection to Nonplastic Pipe*—When connecting plastic pipe to other types of piping, use only approved types of fittings and adapters designed for the specific transition.

X3.10 *Building Drains Under Floor Slabs*—Trench bottoms should be smooth and of uniform grade with either undisturbed soil or a layer of selected and compacted backfill so that no settlement will occur. Bottom of pipe must rest on this material throughout the entire length.

X3.11 *Thermal Expansion*—Allow for thermal expansion and movement in all piping installations by the use of approved methods. Support, but do not rigidly restrain piping at branches