



Designation: **F3219–18 F3219 – 19**

# Standard Specification for 3 to 30 in. (75 To 750 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Fittings<sup>1</sup>

This standard is issued under the fixed designation F3219; 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, workmanship, elongation, brittleness, pipe stiffness, and markings for single wall corrugated polypropylene (PP) pipe and fittings. It covers nominal sizes 3 in. through 30 in. (75 mm through 750 mm)

1.2 The corrugated polypropylene pipe and fittings are for use in non-pressure gravity applications, including applications where soil-tight joints are acceptable, such as leach field effluent disposal, and drainage applications such as land, roads, foundations, agricultural, and landfill. Products meeting this specification are not suitable for applications requiring water-tight joints unless the manufacturer offers such joints as an option.

NOTE 1—Watertight joints, when requested or specified, should meet a 10.8 psi (74 kPa) laboratory internal and external pressure in accordance with Specification [D3212](#) and should utilize a bell and spigot design with a gasket that complies with Specification [F477](#).

1.3 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 *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.*

1.5 *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.*

## 2. Referenced Documents

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

[D256](#) Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

[D618](#) Practice for Conditioning Plastics for Testing

[D638](#) Test Method for Tensile Properties of Plastics

[D790](#) Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

[D792](#) Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

[D1238](#) Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

[D1505](#) Test Method for Density of Plastics by the Density-Gradient Technique

[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)

[D3212](#) Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

[D3895](#) Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee [F17](#) on Plastic Piping Systems and is the direct responsibility of Subcommittee [F17.65](#) on Land Drainage. Current edition approved Nov. 1, 2018/April 1, 2019. Published January 2019/April 2019. Originally approved in 2017. Last previous edition approved in 2017/2018 as F3219–17–18. DOI: [10.1520/F3219-18.1520/F3219-19](#)

<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.

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

**D4101** Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials

**F412** Terminology Relating to Plastic Piping Systems

**F449** Practice for Subsurface Installation of Corrugated Polyethylene Pipe for Agricultural Drainage or Water Table Control

**F477** Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

2.2 *AASHTO Standard*:<sup>3</sup>

**AASHTO LRFD** Bridge Design Specifications

### 3. Terminology

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

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *single wall pipe, n*—corrugated pipe without an interior or exterior liner.

3.2.2 *lot size, n*—the total number of completely finished fittings or appurtenances that are manufactured under conditions of production that are considered uniform.

### 4. Significance and Use

4.1 Single wall corrugated PP pipe and fittings are intended for underground applications where soil provides support to their flexible walls. Their major use is to collect or convey drainage water, or both.

4.2 Single wall corrugated PP pipe shall have perforations where groundwater control or replenishing is specified.

4.3 Single wall corrugated PP pipe shall not be used for storm sewer or sanitary sewer applications.

### 5. Materials

5.1 *Polypropylene*—Polypropylene compounds used in the manufacture of corrugated single wall pipe shall have the minimum properties as shown in **Table 1**. Polypropylene compounds shall be comprised of the base polypropylene virgin material and all additives, colorants, UV inhibitors, and stabilizers. Polypropylene compounds can be pre-compounded or made in-situ during pipe extrusion by combining natural polypropylene material with a color masterbatch or other additives, or both. Conditioning, sampling, preparation and testing of molded specimens shall be in accordance with the requirements in Specification **D4101**. Material for preparation of molded specimens shall be taken from the pipe. Compounds that have a higher cell classification in one or more performance properties shall be permitted provided the density of the base resin shall not exceed 0.0343 lb/in.<sup>3</sup> (0.950 g/cm<sup>3</sup>) and all other product requirements are met.

5.2 *Color and Ultraviolet (UV) Stabilization*—The pipe shall be colored or black. Black polypropylene compounds shall have between 2.0 and 3.0 percent carbon black. Colored polypropylene compounds shall be protected from Ultraviolet (UV) degradation with UV stabilizers. Colored polypropylene compounds shall contain sufficient UV protection to allow pipe made according to this standard to be stored outdoors for at least two years from the date of manufacture without degradation of the stated properties.

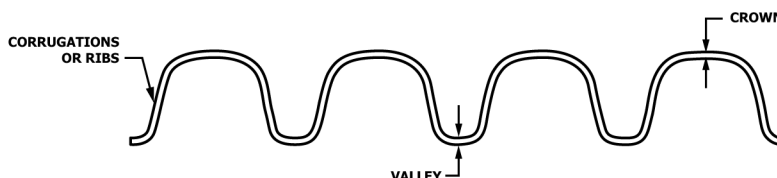
5.3 *Rework Material*—Clean polypropylene rework material, generated from the manufacturer’s own production of the product and having the same minimum physical properties, may be used by the manufacturer, provided that the pipe produced meets all the requirements of this specification.

5.4 *Rubber Materials*—Rubber compounds used in the manufacture of sealing rings or gaskets shall meet the requirements of Specification **F477**.

5.5 *Lubricant*—The lubricant used for assembly of gasketed joints shall have no detrimental effect on the gasket or on the pipe

### 6. Joining and Joint Systems

6.1 *Bell and Spigot Joint:*



**FIG. 1 Typical Annular Corrugated Profile Wall Polypropylene**

<sup>3</sup> Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, <http://www.transportation.org>.

**TABLE 1 Polypropylene Compound Properties**

Property	ASTM Test Method	Units (SI Units)	Minimum Value
Melt Flow Rate (at 446°F (230°C))	<b>D1238</b>	g/10 min	0.15
Density	<b>D792, D1505</b>	lb/in <sup>3</sup> (g/cm <sup>3</sup> )	0.0325 (0.900)
Tensile Strength at Yield	<b>D638</b>	psi (N/mm <sup>2</sup> )	3500 (24.1)
Elongation at Yield	<b>D638</b>	% (%)	5 (5)
Flexural Modulus (1% secant)	<b>D790</b>	psi (N/mm <sup>2</sup> )	175,000 (1200)
IZOD Impact Strength (73°F(23°C))	<b>D256</b>	ft-lb/in (J/m)	8 (427)
Oxidative- Induction Time (392°F (200°C))	<b>D3895</b>	min	25

6.1.1 The pipe ends shall consist of integrally formed bell and spigot designed to accommodate a gasket, which when assembled forms a soiltight seal by the radial compression of the gasket between the spigot and the bell ends.

6.1.2 The joint shall be designed to avoid displacement of the gasket when it is assembled in accordance with the manufacturer's recommendations.

6.1.3 The assembly of the joint shall be in accordance with the manufacturer's recommendations.

6.2 *Other Joining Systems*—Joining methods such as external snap couplers, split couplers, or other joining processes that are equally effective are to be used in accordance with the manufacturer's recommendations.

## 7. Requirements

7.1 *Workmanship*—The pipe and fittings shall be homogeneous throughout and be as uniform as commercially practical in color, opacity, and density. The pipe wall shall be free of cracks, holes, blisters, voids, foreign inclusions or other defects that are visible to the naked eye and that may affect the wall integrity. The ends shall be cut cleanly and squarely.

### 7.2 Pipe Dimensions:

7.2.1 *Nominal Size*—The nominal size for pipe and fittings shall be as shown in **Table 2** and are based on the inside diameter of the pipe.

**TABLE 2 Nominal Pipe Sizes, Inside Diameters and Tolerances for Single Wall Corrugated Polypropylene Pipes**

Nominal Pipe Size	Minimum Inside Diameter, in. (mm)	Inside Diameter Tolerances, in. (mm)
3	2.90 (74)	±0.040 (±1.02)
4	3.88 (99)	±0.040 (±1.02)
6	5.61 (142)	±0.040 (±1.02)
7	6.93 (176)	±0.045 (±1.14)
8	7.70 (196)	±0.045 (±1.14)
9	8.65 (220)	±0.055 (±1.40)
10	9.70 (246)	±0.055 (±1.40)
11	10.87 (276)	±0.075 (±1.91)
12	11.90 (302)	±0.100 (±2.54)
14	13.68 (347)	±0.100 (±2.54)
15	14.85 (377)	±0.150 (±3.81)
17	16.95 (431)	± 0.125 (±3.18)
18	17.93 (455)	±0.170 (±4.32)
21	20.75 (527)	±0.170 (±4.32)
22	21.48 (546)	±0.170 (±4.32)
24	23.90 (607)	±0.227 (± 5.77)
30	29.79 (757)	±0.240 (± 6.1)

NOTE—The manufacturer's stated inside diameter is the nominal diameter plus or minus the inside diameter tolerance. The minimum inside diameter is the smallest diameter the pipe can be with these tolerances and is used for the hydraulic design of the pipe.