
Standard Specification for

**Polypropylene Pipe, 300- to 1500-
mm (12- to 60-in.) Diameter**

AASHTO Designation: MP 21-11



**American Association of State Highway and Transportation Officials
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1. SCOPE

- 1.1. This specification covers the requirements and methods of tests for corrugated polypropylene (PP) pipe, couplings, and fittings for use in surface and subsurface drainage application.
- 1.1.1. Nominal sizes of 300 to 1500 mm (12 to 60 in.) are included.
- 1.1.2. Materials, workmanship, dimensions, pipe stiffness, environmental stress crack resistance, joining systems, brittleness, and form of markings are specified.
- 1.2. Corrugated polypropylene pipe is intended for surface and subsurface drainage applications where soil provides support to its flexible walls. Its major use is to collect or convey drainage water by open gravity flow, as culverts, storm drains, sewers, etc. This standard does not cover applications which require polypropylene pipe over 600 mm (24 in.) with a minimum pipe stiffness over 314 kPa (46 psi) and low-pressure watertight joints (7.6 m (25 ft) of constant head), such as required in sanitary sewer applications.
- 1.3. This specification does not include requirements for bedding, backfill, or earth cover load. Successful performance of this product depends upon proper type of bedding and backfill, and care in installation. The structural design of thermoplastic pipe and the proper installation procedures are given in the *AASHTO LRFD Bridge Design Specifications*, Section 12, and *AASHTO LRFD Bridge Construction Specifications*, Section 30, respectively. Upon request of the user or engineer, the manufacturer shall provide profile wall section detail required for a full engineering evaluation.
- 1.4. The values stated in SI units are to be regarded as standard. Within the text the U. S. Customary Units are shown in parentheses and may not be exact equivalents.
- 1.5. The following precautionary caveat pertains only to the test method portion, Section 9.4 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. *AASHTO Standard:*
- R 16, Regulatory Information for Chemicals Used in AASHTO Tests
 - T 341, Determination of Compression Capacity for Profile Wall Pipe by Stub Compression Loading
 - *AASHTO LRFD Bridge Design Specifications*, Section 12

- *AASHTO LRFD Bridge Construction Specifications, Section 30*
- *Standard Specifications for Highway Bridges*

2.2. *ASTM Standards:*

- D 256, Standard Test Methods for Determining the IZOD Pendulum Impact Resistance of Plastics
- D 618, Standard Practice for Conditioning Plastics for Testing
- D 638, Standard Test Method for Tensile Properties of Plastics
- D 790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- D 792, Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- D 883, Standard Terminology Relating to Plastics
- D 1238, Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- D 1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique
- D 1600 Standard Terminology for Abbreviated Terms Relating to Plastics
- D 1928, Standard Practice for Preparation of Compression-Molded Polyethylene test Sheets and Test Specimens
- D 2122, Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D 2412, Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
- D 2444, Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
- D 2990, Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
- D 3895, Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
- D 4101, Standard Specification for Polypropylene Injection and Extrusion Materials
- D 6992, Standard Test Method for Accelerated Tensile Creep and Creep-Rupture of Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method
- F 412, Standard Terminology Relating to Plastic Piping Systems
- F 2136, Standard Test Method for Notched, Constant Ligament-Stress (NCLS) Test to Determine Slow-Crack-Growth Resistance of HDPE Resins or HDPE Corrugated Pipe.

3. TERMINOLOGY

- 3.1. The terminology used in this standard is in accordance with the definitions given in ASTM D 883, D 1600, and F 412 unless otherwise specified.
- 3.2. *crack*—Any break or split that extends through the wall.
- 3.3. *crease*—An irrecoverable indentation, generally associated with wall buckling.
- 3.4. *delamination*—A separation between the inner liner and the outer corrugated wall of Type S pipe as evidenced by a visible gap extending completely through at least one corrugation valley at any

point around the circumference of the pipe. For Type D pipe, delamination is a separation of the inner and/or outer wall as evidenced by a visible gap extending completely between the internal supports and inner or outer wall at any point around the circumference of the pipe.

- 3.5. *polypropylene (PP)*—A polymer prepared by the polymerization of propylene as the sole monomer (ASTM D 883).
- 3.6. *reworked plastic*—A plastic from a processor's own production that has been reground, pelletized, or solvated after having been previously processed by molding, extrusion, etc. (ASTM D 883).
- 3.7. *slow crack growth*—A phenomenon by which a stress crack may form. A stress crack is an external or internal crack in plastic caused by tensile stresses less than its short-time mechanical strength.
- 3.8. *virgin polypropylene material*—PP plastic material in the form of pellets, granules, or powder that has not been subject to use or processing other than required for initial manufacture.

4. CLASSIFICATION

- 4.1. *The corrugated polypropylene pipe covered by this specification is classified as follows:*
 - 4.1.1. *Type C*—This pipe shall have a full circular cross section, with a corrugated surface both inside and outside. Corrugations shall be annular.
 - 4.1.1.1. *Type CP*—This pipe shall be Type C with perforations.
 - 4.1.2. *Type S*—This pipe shall have a full circular cross section, with an outer corrugated pipe wall and a smooth inner liner. Corrugations shall be annular.
 - 4.1.2.1. *Type SP*—This pipe shall be Type S with perforations.
 - 4.1.3. *Type D*—This pipe shall consist of an essentially smooth waterway braced circumferentially or spirally with projections or ribs joined to an essentially smooth outer wall. Both walls shall be fused to, or continuous with, the internal supports.
- 4.2. Two classes of perforations are as described in Sections 7.3.1 and 7.3.2.

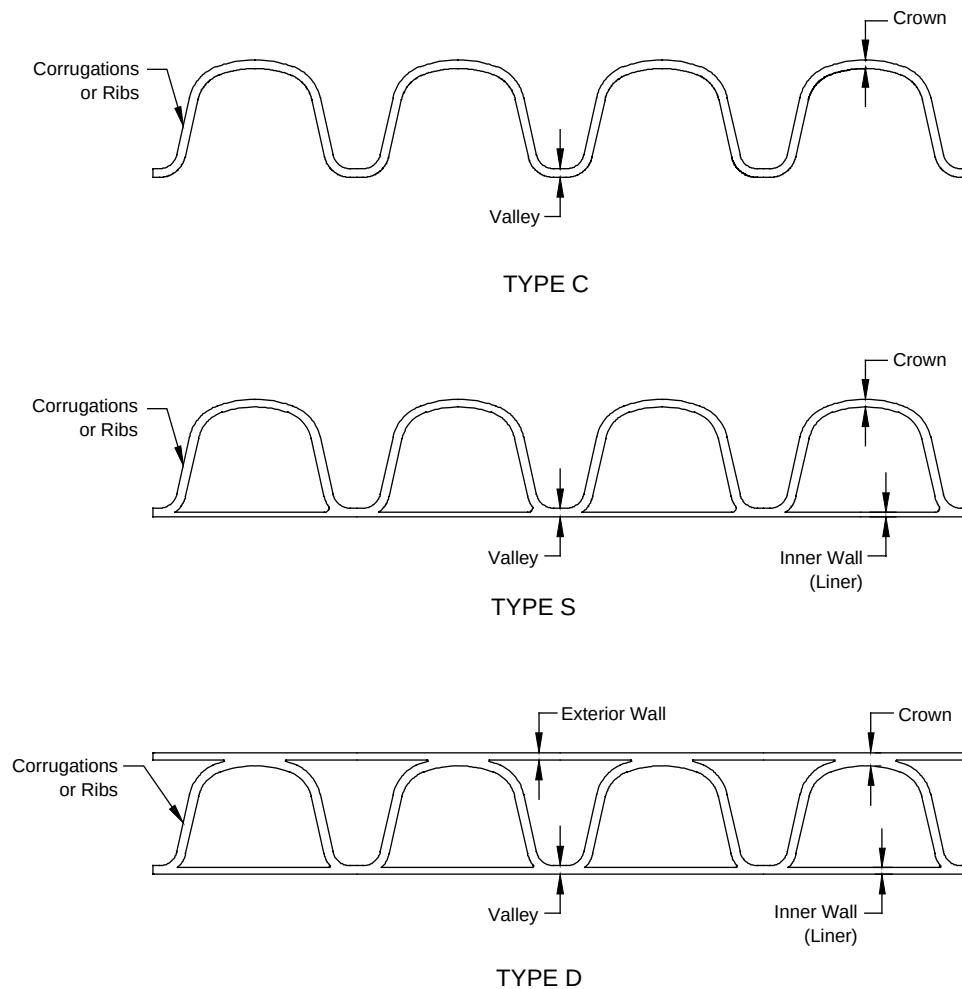


Figure 1—Types of Corrugated Polypropylene Pipe

5. ORDERING INFORMATION

- 5.1. Orders using this specification shall include the following information as necessary to adequately describe the desired product;
 - 5.1.1. AASHTO designation and year of issue;
 - 5.1.2. Type of pipe (see Section 4.1);
 - 5.1.3. Diameter and length required, either total length or length of each piece and number of pieces;
 - 5.1.4. Number of couplings;
 - 5.1.5. Class of perforations (Class 2 is furnished if not specified) (see Section 7.3); and
 - 5.1.6. Certification, if desired (see Section 12.1).