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An American National Standard

Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications[1]

This standard is issued under the fixed designation F 2306/F 2306M; 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 and test methods for annular, corrugated profile wall polyethylene pipe and fittings with an interior liner. The nominal inside diameters covered are 12 to 60 in. [300 to 1500 mm].

1.2 The requirements of this specification are intended to provide pipe and fittings suitable for underground use for gravity-flow storm sewer and subsurface drainage systems.

NOTE 1—Pipe and fittings produced in accordance with this specification shall be installed in compliance with Practice D 2321.

1.3 This specification covers pipe and fittings with an interior liner using a corrugated exterior profile (Fig. 1).

1.4 *Units*—The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text the SI units are shown in brackets. The values stated in each system may not be exact equivalents: therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 The following precautionary caveat pertains only to the test method 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.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 618 Practice for Conditioning Plastics for Testing

D 1600 Terminology for Abbreviated Terms Relating to Plastics

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D 2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

D 2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)

D 3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

D 3350 Specification for Polyethylene Plastics Pipe and Fittings Materials

F 412 Terminology Relating to Plastic Piping Systems

F 477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F 2136 Test Method for Notched, Constant Ligament-Stress (NCLS) Test to Determine Slow-Crack-Growth Resistance of HDPE Resins or HDPE Corrugated Pipe

2.2 *AASHTO Standard:*

LRFD, Section 12 AASHTO LRFD Bridge Design Specifications Section 12 – Buried Structures and Tunnel Liners[3]

2.3 *Department of Agriculture Standard:*

Standard 606 Soil Conservation Service Engineering[4]

2.4 *Federal Standard:*

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[5]

2.5 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[5]

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600, unless otherwise specified. The abbreviation for polyethylene is PE.

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[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.62 on Sewer.

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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.

[3] 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.

[4] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

[5] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

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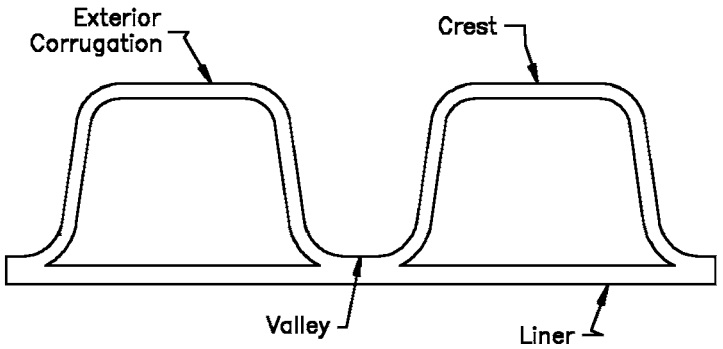

FIG. 1 Typical Annular Corrugated Pipe Profile

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *design diameter*, *n*—the manufacturer's stated inside diameter.

3.2.2 *mold line*, *n*—a line formed on the product as a result of the mold blocks coming together during manufacturing.

3.2.3 *profile wall*, *n*—a pipe wall construction that presents an interior liner in the waterway but includes ribs, corrugations, or other shapes, which can be either solid or hollow, that helps brace the pipe against diametrical deformation.

4. Ordering Information

4.1 Orders for product made to this specification shall include the following information to adequately describe the desired product:

4.1.1 This ASTM designation and year of issue,

4.1.2 Perforations:

4.1.2.1 With perforations,

4.1.2.2 Without perforations,

4.1.3 Diameters,

4.1.4 Total footage of each pipe diameter involved,

4.1.5 Pipe laying length,

4.1.6 Fitting type(s):

4.1.6.1 Size and type of fittings, including mainline and branch diameters, and

4.1.6.2 Number of fittings per diameter.

5. Materials and Manufacture

5.1 *Basic Materials*:

5.1.1 *Pipe and Blow-Molded Fittings*—The pipe and fittings shall be made of virgin PE plastic compound meeting the requirements of cell classification 435400C or 435400E as defined in Specification D 3350, except that carbon black content shall not exceed 4 %. Compounds that have a higher cell classification in one or more properties shall be permitted provided the density of the base resin shall not exceed 0.955 g/cm^3 and all other product requirements are met. For slow crack-growth resistance, resins shall be evaluated using the notched constant ligament stress (NCLS) test according to the procedure described in 7.8. The average failure time of the five test specimens shall exceed 24 h with no single test specimen's failure time less than 17 h.

5.1.2 *Rotationally Molded Fittings and Couplings*—Compounds used in the manufacture of rotationally molded fittings and couplings shall be virgin PE having a cell classification of 213320C or 213320E as defined in Specification D 3350, except that the carbon black content shall not exceed 4 %. Compounds that have a higher cell classification in one or more properties shall be permitted provided the density of the base resin shall not exceed 0.940 g/cm^3 and all other product requirements are met.

5.1.3 *Injection-Molded Fittings and Couplings*—Compounds used in the manufacture of injection molded fittings and couplings shall be made of virgin PE plastic compound meeting the requirements of cell classification 414420C or 414420E as defined in Specification D 3350, except that the carbon black content shall not exceed 4 %. Compounds that have a higher cell classification in one or more properties shall be permitted provided all other product requirements are met.

5.2 *Rework Material*—Clean rework material generated from the manufacturer's own pipe and fittings production shall be permitted to be used by the same manufacturer, provided that the material meets the requirements of 5.1.1 or 5.1.2 as applicable for the intended part and pipe or fittings produced meet all the requirements of this specification.

6. General Requirements

6.1 *Workmanship*—The pipe and fittings shall be homogeneous throughout and be as uniform as commercially practical in color, opacity, and density. The pipe walls 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. Holes intentionally placed in perforated pipe are acceptable.

6.1.1 Visible defects, cracks, creases, splits, obstruction to flow in perforations, or in pipe are not permissible.

6.2 *Dimensions and Tolerance*:

6.2.1 *Nominal Size*—The nominal size for the pipe and fittings shall be the inside diameter shown in Table 1.

6.2.2 *Inside Diameter*—The average inside diameter for pipe and fittings shall not vary more than ± 1 % from the design diameter when measured in accordance with 7.4.1.

NOTE 2—The outside diameters and the corrugation pitch of products manufactured to this specification are not specified; therefore, compatibility between pipe and fittings from different manufacturers or the same manufacturer shall be verified.

6.2.3 *Length*—The pipe shall be supplied in any length agreeable to both the owner and the manufacturer. Length shall

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