



Standard Specification for Billets made by Winding Molten Extruded Stress-Rated High Density Polyethylene (HDPE)¹

This standard is issued under the fixed designation F3034; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification covers billets made from stress-rated high-density polyethylene (HDPE) materials.

1.2 The billets are manufactured by application of molten extruded material onto a rotating mandrel to form a monolithic mass. Removal of the mandrel provides a billet in the approximate shape of a thick-walled cylindrical shell. Machining prior to dimensioning is acceptable.

NOTE 1—Although it is impossible to address all manufacturing details related to the fabrication of billets in this specification, successful heat fusion bonding of HDPE is obtained through controlled application of sufficient heat to cause melting in combination with applied force over a period of time.

1.3 The billets are intended for fabrication into pipe fittings such as flange adapters and reducers.

1.4 Requirements for and use of the fabricated pipe fittings shall be in accordance with an applicable product specification. This specification for billets does not include requirements for items fabricated from the billets.

1.5 This specification includes thermoplastic pipe material designation codes for selection of appropriate stress-rated material, together with performance requirements for billets and test methods for determining conformance with the requirements.

1.6 Minimum quality control measures are prescribed for manufacturers. See **Annex A1** for quality control for billets conforming to this specification.

1.7 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.

1.8 *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 appro-*

priate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.9 *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:²

- D618 Practice for Conditioning Plastics for Testing
- D638 Test Method for Tensile Properties of Plastics
- D1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D1603 Test Method for Carbon Black Content in Olefin Plastics
- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
- D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
- D4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
- F412 Terminology Relating to Plastic Piping Systems

2.2 NSF/ANSI Standards:³

- Standard No. 14 for Plastic Piping Components and Related Materials
- Standard No. 61 for Drinking Water Systems Components—Health Effects

¹ This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.26 on Olefin Based Pipe.

Current edition approved Nov. 15, 2021. Published February 2022. Originally approved in 2013. Last previous edition approved in 2020 as F3034–15 (2020). DOI: 10.1520/F3034–21

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 NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48105, <http://www.nsf.org>.

2.3 PPI Standards:⁴

PPI TR-3 Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

PPI TR-4 HDB/SDB/PDB/MRS Listed Materials, PPI Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

3. Terminology

3.1 Unless otherwise specified, definitions are in accordance with Terminology **F412** and abbreviations are in accordance with Terminology **D1600**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *average outside diameter, n*—the average distance following all forming and machining operations when measured in accordance with **6.3.1**.

3.2.2 *billet, n*—a mass formed from a single polyethylene compound in the approximate shape of a thick-walled cylindrical shell.

3.2.3 *mid-wall, n*—the location half-way between the outside diameter and the inside diameter following all forming and machining operations.

3.2.4 *minimum wall thickness, n*—the minimum distance following all forming and machining operations when measured in accordance with **6.3.2**.

4. Materials

4.1 *Polyethylene Compound*—Polyethylene compounds used in the manufacture of billet under this specification shall have thermoplastic pipe materials designation code PE3608, PE4608 or PE4710; shall have a minimum Specification **D3350** cell classification of 333344C and shall meet all other requirements of Specification **D3350**.

4.1.1 *General*—The PE compound used to make billet shall be virgin PE compound or reworked PE compound (see **4.3**) and shall have a hydrostatic design basis listed in Plastics Pipe Institute (PPI) TR-4.

4.1.2 *Color and Ultraviolet (UV) Stabilization*—Polyethylene compounds shall meet Specification **D3350** code C. In addition, Code C polyethylene compounds shall have 2.0 to 3.0 percent carbon black.

4.1.3 *Hydrostatic Design Basis (HDB) Substantiation*—The HDB for PE compound at 73 °F (23 °C) shall be substantiated to be linear to 50 years as described in Substantiation of the HDB for Polyethylene Materials in Test Method **D2837**.

NOTE 2—This is 5.7 in the 2011 publication of Test Method **D2837**.

4.1.4 *Melt Flow Requirement*—Polyethylene compounds shall be tested in conformance with Test Method **D1238** either at condition 190/2.16 or 190/21.6. When tested at condition

190/2.16, the resulting value shall be ≤ 0.15 g/10 min. When tested at condition 190/21.6, the resulting value shall be ≤ 20 g/10 min.

4.2 *Potable Water Requirement*—When required by the purchaser, billets intended for fabrication into products intended for contact with potable water shall utilize PE compounds certified for conformance with NSF/ANSI Standard No. 61 or the health effects portion of NSF/ANSI Standard No. 14 by an acceptable certifying organization.

4.3 *Rework Material*—Clean polyethylene compound from the manufacturer's own production that meets **4.1** and **4.2** of this specification as new compound is suitable for reextrusion into billet, when blended with new compound of the same thermoplastic pipe material designation code. Billet containing rework material shall meet the requirements of this specification.

5. Requirements

5.1 *Workmanship*—The billet shall be uniform in appearance and consistent throughout. The walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that affect the wall integrity (see **Annex A1**). A single hole deliberately placed in the center of the billet is required.

NOTE 3—Manufacturers should use appropriate quality assurance procedures to ensure that billets are free from injurious defects including laminations.

5.2 *Dimensions and Tolerances*: Requirements for dimensions shall only apply to a billet that is transferred from a seller to a buyer prior to being fabricated into one or more pipe fittings. When a billet is produced and fabricated into pipe fittings by a single manufacturer, there are no dimensional requirements specified for the billet by this Standard. All dimensional requirements for pipe fittings are as given in the applicable product standard.

5.2.1 *Average Outside Diameter and Minimum Wall Thickness*—The average outside diameter and minimum wall thickness shall fall within the range of acceptable values established in either **Table 1** or **Table 2** depending on nominal mandrel dimensions for billets manufactured to meet a standard size. When measured in accordance with Test Method **D2122** conditioning is required according to Practice **D618**, Procedure A to standard temperature without regard to relative humidity.

5.2.2 *Length*—Any length shall be allowable, provided it is agreeable to both buyer and seller. When specified, the minimum length shall be measured following conditioning according to Practice **D618**, Procedure A to standard temperature without regard to relative humidity.

5.2.3 *Special Sizes*—Where existing system conditions or special local requirements make other average outside diameters or minimum wall thicknesses necessary, other average outside diameters or minimum wall thicknesses, or both, shall be acceptable when mutually agreed upon by the customer and the manufacturer, provided the billet meets all other requirements of this specification. For average outside diameters not shown in **Table 1** or **Table 2**, the tolerance shall be the same

⁴ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.