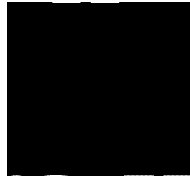


American Water Works Association

ANSI/AWWA C906-99

(Revision of ANSI/AWWA C906-90)



AWWA STANDARD
FOR
**POLYETHYLENE (PE) PRESSURE PIPE
AND FITTINGS, 4 IN. (100 mm) THROUGH
63 IN. (1,575 mm), FOR WATER DISTRIBUTION
AND TRANSMISSION**



Effective date: March 1, 2000.

First edition approved by AWWA Board of Directors June 21, 1990.

This edition approved June 20, 1999.

Approved by American National Standards Institute Dec. 30, 1999.

AMERICAN WATER WORKS ASSOCIATION

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Foreword

This foreword is for information only and is not a part of AWWA C906.

I. Introduction.

I.A. *Background.* This standard describes polyethylene (PE) pressure pipe and fittings in diameters ranging from 4 through 63 in. (100 through 1,575 mm) for use primarily in the construction and rehabilitation of underground water distribution system.

This document describes pipe and fittings made from PE materials with standard PE code designations PE 2406, PE 3406, and PE 3408. Pipes are classified in accordance with standard pipe dimension ratios (DR) [i.e., the ratio of pipe outside diameter to pipe minimum wall thickness] that range from 7.3 to 32.5. The resultant combinations of PE material designations and DRs yields pipe of pressure classes (PC) that range from 40 to 254 psig (276 to 1,751 kPa).

Three standard pipe diameter systems are described, as follows:

- Outside diameters in accordance with the iron pipe size (IPS) system [ANSI B36.10].
- Outside diameters in accordance with the ductile iron sizing system (DIOD) [ANSI/AWWA C110/A21.10].
- Outside diameters in accordance with the International Standards Organization (ISO) sizing system [ISO 161/1].

However, this standard also includes provision for the specifying of pipe of custom diameters and diameter ratios.

I.B. *History.* In 1984, the Standards Committee on Thermoplastic Pressure Pipe appointed a subcommittee to prepare a standard covering 4-in. (100 mm) and larger diameter polyethylene (PE) pressure pipe and fittings. The first proposed draft was submitted to the Thermoplastic Pressure Pipe Committee by letter ballot in May 1986.

The Thermoplastic Pressure Pipe Committee was subsequently dissolved, and its standards task responsibilities were divided between two new AWWA standards committees—the PVC Pressure Pipe and Fittings Committee and the Polyolefin Pressure Pipe and Fittings Committee. The Polyolefin Pressure Pipe and Fittings Committee assumed the responsibility for developing this standard in the fall of 1988.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for all direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research Foundation (AWWARF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later. In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.* Local agencies may choose to impose requirements

*Persons in Canada, Mexico, and non-North American countries should contact the appropriate authority having jurisdiction.

more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.
3. Two standards developed under the direction of NSF, ANSI/NSF[†] 60, Drinking Water Treatment Chemicals—Health Effects, and ANSI/NSF 61, Drinking Water System Components—Health Effects.
4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,[‡] and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with ANSI/NSF 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Appendix A, “Toxicology Review and Evaluation Procedures,” to ANSI/NSF 61 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of “unregulated contaminants” are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Appendix A procedures may not always be identical, depending on the certifier.

AWWA C906-99 does not address additives requirements (i.e., substances that can be extracted from the pipe by the flowing potable water). Thus, users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.
2. Determine the status of certifications by all parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

II. Special Issues.

II.A. *Advisory Information on Product Application.* This standard presents criteria related to the manufacture and purchase of polyethylene pressure pipe to be used in the transmission of potable water in either buried or aboveground applications. Pipe provided according to the provisions of this standard may also be suitable for insertion into existing pipelines for rehabilitation and for the transmission of other liquids.

This standard restricts the materials used for the manufacture of polyethylene pipe to three standard PE code designations: PE 2406, PE 3406, and PE 3408. These three materials provide two series of pressure class ratings, one for PE 2406 or PE 3406 material and one for PE 3408 material. This standard describes 10 dimension ratios for nominal pipe sizes ranging from 4 in. (100 mm) through 63 in. (1,575 mm). Actual outside pipe diameters conform to the outside diameter dimensions of iron

*American National Standards Institute, 11 W. 42nd St., New York, NY 10036.

†NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

‡Both publications available from National Academy of Sciences, 2102 Constitution Ave. N.W., Washington, DC 20418.

pipe sizes (IPS), ductile-iron pipe sizes (DIOD), or to those outside diameters established by the International Organization for Standardization (ISO).

Although this standard generally presents adequate information to order pipe to meet project working pressure requirements, it does not include information to guide the designer in the determination of wall thicknesses, pipe flexibility requirements, and installation conditions to meet external loading conditions. The AWWA Standards Committee on Polyolefin Pressure Pipe and Fittings has addressed a number of these matters in a committee report issued 1997. This report is being followed by a detailed manual on polyethylene pipe design and installation. In the meantime, pipe designers are referred to the bibliography in Appendix A. In addition, consultation with PE pipe manufacturers is recommended.

III. Use of This Standard. AWWA has no responsibility for the suitability or compatibility of the provisions of this standard to any intended application by any user. Accordingly, each user of this standard is responsible for determining that the standard's provisions are suitable for and compatible with that user's intended application.

III.A. Purchaser Options and Alternatives. Some items in this standard are optional requiring identification of the selected option(s) such as material type, color, and size. When specifying products described in this standard, the purchaser should provide specific information regarding the following:

1. Standard used—that is, AWWA C906, Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,575 mm), for Water Distribution and Transmission, of latest edition.

2. Pipe

a. Standard code designation of the PE material (Sec. 4.2.1 and Table 1).

b. Color or color coding.

c. Nominal size, outside diameter base (IPS, DIOD, or ISO), dimension ratio (DR), and pressure class (PC); length of individual pieces, and total linear feet for each different item to be provided. For special sizes, the purchaser should establish, in consultation with the pipe manufacturer, the actual outside diameter, the actual dimension ratio, and the actual wall thickness.

3. Fittings

a. Standard code designation of the PE material (Sec. 4.2.1 and Table 1).

b. Description of fitting (e.g., tee, elbow, and so forth); nominal size(s) at point of fusion; whether molded or fabricated; and pressure class (PC).

4. Fusion conditions. To ensure optimum efficiency of fusion when joining the product(s) being purchased, the purchaser should request from the manufacturer a list of the recommended fusion parameters and documentation that these parameters have been validated by appropriate testing. If the purchased piping is to be fused with existing PE piping, the purchaser should inform the manufacturer of the cell classification of the existing PE pipe (see Table 1 and ASTM* D3350), and obtain from the manufacturer a list of the validated fusion parameters that may be used to join the purchased piping to the existing piping.

5. Specifications. When desired, requirements such as the following may be specified on the purchase contract:

a. Special quality-assurance testing (Sec. 5).

b. Plant inspection by purchaser (Sec. 5).

* American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

- c. Special markings (Sec. 6.1).
- d. Shipping (Sec. 6.2).
- e. Affidavit of compliance (Sec. 6.3).

III.B. *Modification of Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided in the purchaser's specifications.

IV. Major Revisions. Major changes made to the standard in this revision include the following:

1. The format has been changed to AWWA standard style.
2. The acceptance clause (Sec. I.C) has been revised to approved wording.
3. Section 1.2, Purpose, and Sec. 1.3, Application, were added.
4. Section 3, Definitions, was revised to include working pressure rating (WPR).
5. Section 4.2.2 (old Sec. 2.1.2) was revised.
6. Table 1, 2, and 3 were revised.
7. Table 7, which details pipe made to ductile iron diameters, was added.
8. Section 4.2.7, Materials for pipe marking, was added.
9. Section 4.3.4 (old Sec. 2.2.4) was revised.
10. Section 4.3.10 (old Sec. 2.2.10) was revised.
11. A footnote was added to Sec. 4.4.1 (old Sec. 2.3.1).
12. Section 4.5.4, Electrofusion, was added.
13. Section 4.6 (old Sec. 2.5) was revised.
14. Section 4.6.1, Pressure class, was added.
15. Sections 5.2, 5.3, and 5.4 (old Sec. 4.2, 4.3, and 4.4) were revised.
16. Appendix B was added.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer & Technical Support Group, (303) 794-7711 ext. 6283, FAX (303) 795-7603, or write to the group at 6666 W. Quincy Ave., Denver, CO 80235.



AWWA STANDARD FOR POLYETHYLENE (PE) PRESSURE PIPE AND FITTINGS, 4 IN. (100 mm) THROUGH 63 IN. (1,575 mm), FOR WATER DISTRIBUTION AND TRANSMISSION

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes polyethylene (PE) pressure pipe made from materials conforming to standard PE code designations PE 2406, PE 3406, and PE 3408. The pipe is primarily intended for use in transporting potable water in either buried or aboveground installations. The standard describes 10 dimension ratios (DRs) for nominal pipe sizes ranging from 4 in. (100 mm) through 6 in. (1,575 mm). Pipe outside diameters (ODs) conform to the outside diameter dimensions of iron pipe sizes (OD-based, IPS), to those established by the International Organization for Standardization (ISO), or to those established for DI equivalent ODs (DIOD).

Pressure class ratings range from 40 psi (276 kPa) to 198 psi (1,365 kPa) for both PE 2406 and PE 3406 materials and from 51 psi (352 kPa) to 254 psi (1,751 kPa) for PE 3408 material.

Sec. 1.2 Purpose

The purpose of this standard is to provide purchasers, manufacturers, and suppliers with the minimum requirements for PE pressure pipe and fittings, 4 in. (100 mm) through 63 in. (1,575 mm), for water distribution and transmission.

Sec. 1.3 Application

This standard can be referenced in specifications for purchasing and receiving PE pressure pipe and fittings, 4 in. (100 mm) through 63 in. (1,575 mm), for water distribution and transmission. The stipulations of this standard apply when this document has been referenced and then only to PE pressure pipe and fittings, 4 in. (100 mm) through 63 in. (1,575 mm), for water distribution and transmission.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

ANSI^{*}/ASTM D618—Standard Practice for Conditioning Plastics and Electrical Insulating Materials for Testing.

ANSI/ASTM D638—Standard Test Method for Tensile Properties of Plastics.

ANSI/ASTM D1238—Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

ANSI/ASTM D1505—Standard Test Method for Density of Plastics by the Density-Gradient Technique.

ASTM D1598—Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.

ASTM D1599—Standard Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings.

ASTM D1603—Standard Test Method for Carbon Black in Olefin Plastics.

ASTM D2122—Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

ASTM D2290—Standard Test Method for Apparent Tensile Strength of Ring or Tubular Plastics and Reinforced Plastics by Split Disk Method.

ASTM D2837—Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

ANSI/ASTM D2839—Standard Test Method for Use of a Melt Index Strand for Determining Density of Polyethylene.

ASTM D3035—Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

ASTM D3350—Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

ANSI/ASTM D4218—Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.

ASTM F412—Standard Terminology Relating to Plastic Piping Systems.

ASTM F714—Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

ASTM F1055—Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

ANSI/AWWA C101/A21.1-67(R77)—American National Standard for Thickness Design of Cast Iron Pipe.

^{*}American National Standards Institute, 11 W. 42nd St., New York, NY 10036.