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ANSI/AWWA C105/A21.5-18
(Revision of [ANSI/AWWA C105/A21.5-10](#))

AWWA Standard

Polyethylene Encasement for Ductile-Iron Pipe Systems

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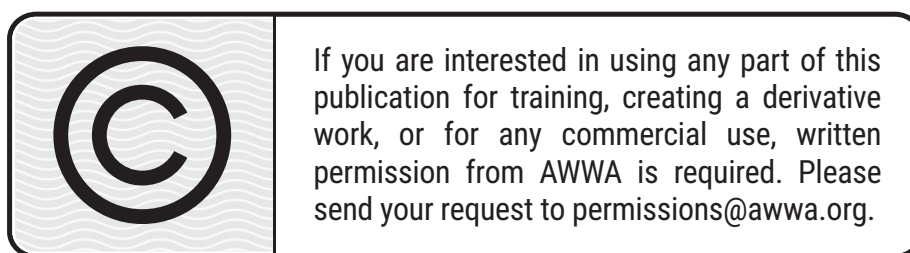
AWWA Standard

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C105/A21.5.*

I. Introduction.

I.A. *Background.* In 1926, the American Standards Association (ASA; now American National Standards Institute [ANSI]) Committee A21, Cast-Iron Pipe and Fittings, was organized under the sponsorship of the American Gas Association (AGA), the American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), and the New England Water Works Association (NEWWA). The current sponsor is AWWA, and the present scope of Committee A21 is to develop standards and manuals for ductile-iron pressure pipe for water, wastewater, and reclaimed water service and ductile-iron and gray-iron fittings for use with this pipe. These standards and manuals include design, dimensions, materials, coatings, linings, joints, accessories, and methods of inspection and testing.

In 1958, Committee A21 was reorganized. Standards were divided into groups focusing on the topics listed above, and subcommittees were established to study each group in accordance with the review and revision policy of ASA. In 1984, the committee became AWWA Standards Committee A21 on Ductile-Iron Pipe and Fittings.

The present scope of A21 Subcommittee 4, Coatings and Linings, is to review interior and exterior corrosion of ductile-iron pipe and fittings and to draft standards for the interior and exterior protection of ductile-iron pipe and fittings. Accordingly, Subcommittee 4 is responsible for the development of

1. Standards on polyethylene encasement materials and their installation to provide corrosion protection, when required, for ductile-iron pipe and fittings.
2. Procedures for the investigation of soil to determine when polyethylene protection is indicated.

I.A.1. History of polyethylene encasement. Loose polyethylene encasement was first used experimentally in the United States in 1951 for protection of gray-iron pipe in corrosive environments. The first field installation of polyethylene wrap on gray-iron pipe in an operating water system was in 1958. The installation consisted of approximately 600 ft (180 m) of 12-in. (300-mm) pipe installed in a waste-dump fill area. Since 1958, polyethylene encasement has been used extensively in installations in severely corrosive soils throughout the United States on pipe ranging in size from 3 in.

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

to 64 in. (80 mm to 1,600 mm) in diameter. Polyethylene encasement has been used as a soil-corrosion preventive in a number of other countries as well. An International Standard for Polyethylene Sleeving (ISO-8180)* has been adopted since the procedure was developed in the United States.

I.B. *Research.* The Cast Iron Pipe Research Association (CIPRA)[†] (now known as the Ductile Iron Pipe Research Association [DIPRA]) has researched several severely corrosive test sites. The tests indicate that polyethylene encasement provides a high degree of protection resulting in minimal and generally insignificant exterior surface corrosion of ductile-iron and gray-iron pipe protected in this manner.

Investigations of many field installations in which loose polyethylene encasement has been used as protection for ductile-iron and gray-iron pipe against soil corrosion confirm DIPRA's findings. These field installations also indicate that the dielectric capability of polyethylene provides shielding for ductile-iron and gray-iron pipe from stray direct current at most levels encountered in the field.

I.C. *History.* The first edition of this standard was published in 1972 as American National Standard for Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids.

In 1976, Subcommittee 4 reviewed the 1972 edition and submitted a recommendation to Committee A21 that the standard be reaffirmed without change, except for updating the foreword.

In the 1982 revision, [ANSI/AWWA C105/A21.5-82](#), references to gray cast-iron pipe were deleted from the title and throughout the standard because gray cast-iron pipe was no longer produced in the United States. Also, metric conversions of all dimensions were added to the standard.

The 1986 edition of the standard defined the thickness requirement for polyethylene film; provided new figures showing installation methods; and extended the length of connecting piping to be wrapped from 2 ft (0.6 m) to 3 ft (0.9 m). Additionally, a requirement for wrapping service lines of dissimilar metals for a distance of 3 ft (0.9 m) from the ductile-iron pipe was also incorporated.

In the 1993 revision of the standard, Sec. 4.1, Materials, was expanded to include 4-mil high-density cross-laminated (HDCL) polyethylene, and Class B (colors) material was added to allow the purchase of colored polyethylene. Additionally, Table 1 was modified to reflect reduced tube widths comparable with push-on

* International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401 - 1214 Vernier, Geneva, Switzerland.

[†] CIPRA became the Ductile Iron Pipe Research Association (DIPRA) in 1979.

joint pipe and fittings, and the size range was expanded to include 60- and 64-in. (1,500- and 1,600-mm) pipe. A recommendation that circumferential wraps of tape be placed at 2-ft (0.6-m) intervals along the barrel of the pipe for installation below the water table or in areas subject to tidal actions was added to Sec. 4.3.1, and Sec. 4.3.6 was revised to indicate the preferred method of making direct service taps on polyethylene-encased pipe. An illustration of this procedure was added.

In 1999, the format was changed to AWWA standard style; Sec. II.D, Copper Service Connections, was added to the foreword of the standard; and definitions of parties and types of polyethylene film were added to Sec. 3, Definitions, of the standard. Additionally, changes to Sec. 4.1, Materials, included: (1) deletion of low-density polyethylene film; (2) the addition of linear low-density polyethylene film and appropriate material requirements and physical properties; (3) increasing the tensile strength requirements for the high-density cross-laminated polyethylene film; (4) the addition of impact- and tear-resistance requirements for both polyethylene materials; (5) deletion of the minus tolerance on film thickness for both materials; and (6) the addition of an ultraviolet inhibitor to any natural or colored film except black film containing 2 percent or more of carbon black. Other changes to the standard included the addition of Sec. 4.3, Marking, to facilitate traceability and to help ensure compliance with the standard; the addition of an alternate method of using a 3-ft (0.9-m) sheet of polyethylene rather than a 3-ft (0.9-m) length of polyethylene tube for joint makeup to Sec. 4.4.2.2, Method; and the addition of Sec. 5.1, Inspection and Certification by Manufacturer, to help ensure compliance with the standard. Also, in appendix A, a new paragraph on stray current corrosion and a new section on uniquely severe environments were added. Additionally, the resistivity ranges in Table A.1, Soil-Test Evaluation, were increased to make the procedure more conservative.

Subsequent editions of ANSI/AWWA C105/A21.5 were approved by the AWWA Board of Directors on June 12, 2005, and on June 20, 2010. This edition of ANSI/AWWA C105/A21.5 was approved on June 9, 2018.

II. Special Issues.

II.A. *Useful Life of Polyethylene.* Tests of polyethylene used to protect ductile-iron and gray-iron pipe have shown that after 40 years of exposure to severely corrosive soils, strength loss and elongation reduction are insignificant. US Bureau of Reclamation (BUREC) studies* of polyethylene film used underground illustrate

* Laboratory and Field Investigations of Plastic Films. US Department of the Interior, Bureau of Reclamation, Rept. No. ChE-82 (September 1968).