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AMERICAN NATIONAL STANDARD
FOR
POLYETHYLENE ENCASEMENT
FOR DUCTILE IRON PIPE SYSTEMS



Administrative Secretariat
AMERICAN WATER WORKS ASSOCIATION

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AMERICAN WATER WORKS ASSOCIATION

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Foreword

This foreword is for information only and is not a part of 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 supply 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. (305-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. to 64 in. (76 mm to 1,600 mm) in diameter. Polyethylene encasement has been used as a soil-corrosion preventative 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.A.2 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.

*International Organization for Standardization, Geneva, Switzerland.

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

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.B. *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, Section 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 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 Section 4.3.1, and Section 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.

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 that tensile strength was nearly constant and that elongation was only slightly affected during a seven-year test period. BUREC's accelerated soil-burial testing (acceleration estimated to be 5 to 10 times that of field conditions) shows polyethylene to be highly resistant to bacteriological deterioration.

II.B. *Type of material.* The materials described in this standard are a linear low-density polyethylene film and a high-density cross-laminated film. A low-density film was used in the initial research and testing of polyethylene encasement to protect ductile-iron and gray-iron pipe from corrosion. The current materials provide the same degree of protection as the low-density film and are stronger and more damage resistant. Other types of polymeric material are also available that may provide equally suitable protection.

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