

American Water Works Association
ANSI/AWWA C104/A21.4-95
(Revision of ANSI/AWWA C104/A21.4-90)



AMERICAN NATIONAL STANDARD
FOR
CEMENT-MORTAR LINING
FOR DUCTILE-IRON PIPE AND FITTINGS
FOR WATER



Administrative Secretariat
AMERICAN WATER WORKS ASSOCIATION

Cosecretariat
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AMERICAN WATER WORKS ASSOCIATION

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Foreword

This foreword is for information only and is not part of ANSI/AWWA C104/A21.4.

I. Introduction

I.A. *Background.* The first cast-iron water mains were not lined but were installed in the same condition in which they came from the molds following cleaning. After many years it became evident that the interior of the pipe could be affected by certain types of water. The first lining used to combat aggressive waters was a hot-dip bituminous lining that protected the pipe satisfactorily, except in areas where water penetrated the pinholes in the bituminous lining, wherein tuberculation ensued. The need for a better lining to combat tuberculation led to experiments with cement mortar as a lining material.

Cement-mortar linings prevent tuberculation by creating a high pH at the pipe wall and ultimately by providing a physical barrier to the water. Cement-mortar linings are also smooth, which results in high flow coefficients.

In 1922, the first cement-mortar-lined, cast-iron pipe was installed in the water distribution system of Charleston, S.C. The pipe was lined by means of a projectile drawn through the pipe. Since this initial installation, many improvements have been made in the production of cement-mortar-lined pipe. Cement-mortar-lined pipes are now centrifugally lined at the foundry to ensure that the best possible quality control is maintained and that a uniform thickness of mortar is distributed throughout the length of the pipe.

I.B. *History.* From 1922 to 1929, many installations of cement-mortar-lined, cast-iron pipe were made under various manufacturers' specifications. In 1929, the American Standards Association (ASA), now the American National Standards Institute (ANSI),* Sectional Committee A21 on Cast-Iron Pipe and Fittings, issued a tentative standard for cement-mortar linings, which was published by the American Water Works Association (AWWA) as a tentative standard in 1932. After many revisions and refinements, the standard was officially adopted by ASA in 1939 under the designation A21.4, American Standard Specifications for Cement-Mortar Lining for Cast-Iron Pipe and Fittings.

From 1940 to 1952, considerable research was done to improve the quality of the cement-mortar lining. The centrifugal process of lining was improved to provide the controls and techniques necessary to ensure uniformity of lining thickness throughout the length of the pipe. Methods of curing cement mortar were investigated, resulting in the recognition that asphaltic seal-coat materials could be used as a substitute for the moist-curing process. As a result of this research, a revised edition of the 1939 standard was approved and issued in 1953.

In 1958, Sectional Committee A21 was reorganized and subcommittees were established to study each group of standards in accordance with ASA's review and revision policy. Subcommittee 4, Coatings and Linings for Cast-Iron Pipe, was organized to examine the existing ASA A21.4-53, American National Standard Specifications for Cement-Mortar Lining for Cast-Iron Pipe and Fittings. The subcommittee completed its study of A21.4-53 and submitted a proposed revision to Sectional Committee A21 in 1963. The revised third edition was approved and issued in 1964 and

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