ANSI/AWWA C210-07
(Revision of ANSI/AWWA C210-03)

American Water Works Association

The Authoritative Resource on Safe Water®

AWWA Standard

Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

Effective date: May 1, 2008.
First edition approved by AWWA Board of Directors May 18, 1978.
This edition approved June 24, 2007.
Approved by American National Standards Institute Jan. 14, 2008.

6666 West Quincy Avenue
Denver, CO 80235-3098
T 800.926.7337
www.awwa.org

Advocacy
Communications
Conferences
Education and Training
Science and Technology
Sections

AWWA Standard

This document is an American Water Works Association (AWWA) standard. It is not a specification. AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in specifications. The AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. AWWA publication of a standard does not constitute endorsement of any product or product type, nor does AWWA test, certify, or approve any product. The use of AWWA standards is entirely voluntary. This standard does not supersede or take precedence over or displace any applicable law, regulation, or codes of any governmental authority. AWWA standards are intended to represent a consensus of the water supply industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the classified advertising section of *Journal AWWA*. The action becomes effective on the first day of the month following the month of *Journal AWWA* publication of the official notice.

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether that person has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review, and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American National Standard are encouraged to state on their own responsibility in advertising and promotional materials or on tags or labels that the goods are produced in conformity with particular American National Standards.

CAUTION NOTICE: The American National Standards Institute (ANSI) approval date on the front cover of this standard indicates completion of the ANSI approval process. This American National Standard may be revised or withdrawn at any time. ANSI procedures require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036; (212) 642-4900.

Committee Personnel

The Steel Water Pipe-Manufacturer's Technical Advisory Committee (SWPMTAC) Task Group on C210, which developed this revision, had the following personnel at the time:

Mike Bauer, *Chair*

F.D. Barnes, Barnes Group International, Windsor, Calif.	(AWWA)
M. Bauer, Tnemec Company Inc., Kansas City, Mo.	(AWWA)
R.M. Buchanan, Canusa-CPS, Toronto, Ont.	(AWWA)
T. Enoch, Carboline Company, Ottsville, Pa.	(AWWA)
A. Fletcher, Tyco Water Pipelines Technologies, Southbank, Victoria, Australia	(AWWA)
A.L. Mamish, Covalence Adhesives, Lexington, Mass.	(AWWA)
L. McKinney, Womble Company, Houston, Texas	(AWWA)
B. Murphy, Sherwin-Williams Company, Villanueva, N.M.	(AWWA)
R. Newby, ICI Devoe Coatings, Mandeville, La.	(AWWA)
F. Rampton, Trenton Corporation, Ann Arbor, Mich.	(AWWA)
M. Sangalli, Smith-Blair Inc., Texarkana, Texas	(AWWA)
R.N. Satyarthi, Baker Coupling Company Inc., Los Angeles, Calif.	(AWWA)
D. Seals, JCM Industries, Nash, Texas	(AWWA)
H.R. Stoner, Consultant, North Plainfield, N.J.	(AWWA)
D.R. Wagner, Wagner Consultants, St. Louis, Mo.	(AWWA)

The AWWA Standards Committee on Steel Pipe, which reviewed and approved this standard, had the following personnel at the time of approval:

John H. Bambei Jr., *Chair*
George J. Tupac, *Vice Chair*
Dennis A. Dechant, *Secretary*

General Interest Members

J.B. Allen,* Standards Engineer Liaison, AWWA, Denver, Colo.	(AWWA)
W.R. Brunzell, Brunzell Associates Ltd., Skokie, Ill.	(AWWA)
R.L. Coffey, HDR Engineering, Inc., Omaha, Neb.	(AWWA)

* Liaison, nonvoting

H.E. Dunham, MWH Inc., Bothell, Wash. (AWWA)
S.N. Foellmi, Black & Veatch Corporation, Irvine, Calif. (AWWA)
J.W. Green, McDonough Associates Inc., Chicago, Ill. (AWWA)
M.B. Horsley,* Black & Veatch Corporation, Kansas City, Mo. (AWWA)
J.K. Jeyapalan, Consultant, New Milford, Conn. (AWWA)
J.L. Mattson, Corrosion Control Technologies, Sandy, Utah (AWWA)
R. Ortega, Lockwood Andrews & Newnam, Houston, Texas (AWWA)
A.E. Romer, Boyle Engineering Corporation, Newport Beach, Calif. (AWWA)
H.R. Stoner, Consultant, North Plainfield, N.J. (AWWA)
C.C. Sundberg, CH2M Hill Inc., Issaquah, Wash. (AWWA)
G.J. Tupac, G.J. Tupac & Associates Inc., Pittsburgh, Pa. (AWWA)
W.R. Whidden, Post Buckley Schuh & Jernigan, Orlando, Fla. (AWWA)
K.E. Wilson,† Standards Council Liaison, Post Buckley Schuh & Jernigan, Tampa, Fla. (AWWA)

Producer Members

S.A. Arnout, Hanson Pressure Pipe Inc., Dallas, Texas (AWWA)
H.H. Bardakjian, Ameron International, Rancho Cucamonga, Calif. (AWWA)
M. Bauer, Tnemec Company Inc., Kansas City, Mo. (AWWA)
R.J. Card, Victaulic, Atlanta, Ga. (AWWA)
R.R. Carpenter, American Spiralweld Pipe Company, Birmingham, Ala. (MSS)
D. Dechant, Northwest Pipe Company, Denver, Colo. (AWWA)
B.D. Keil, Continental Pipe Manufacturing Company, Pleasant Grove, Utah (SPFA)
J.L. Luka,* American SpiralWeld Pipe Company, Columbia, S.C. (AWWA)
B.F. Vanderploeg,* Northwest Pipe Company, Portland, Ore. (AWWA)
J.A. Wise, Canus International Sales Inc., Surrey, B.C. (AWWA)

User Members

A. Andersen, New York City Bureau of Water Supply, Little Neck, N.Y. (AWWA)
J.H. Bambei Jr., Denver Water, Denver, Colo. (AWWA)
D.W. Coppes, Massachusetts Water Resources Authority, Southborough, Mass. (NEWWA)
R.V. Frisz, US Bureau of Reclamation, Denver, Colo. (USBR)

* Alternate
†Liaison, nonvoting

G. George, Tacoma Water, Water Supply Section, Tacoma, Wash. (AWWA)
T.J. Jordan, Metropolitan Water District of Southern California, La Verne, Calif. (AWWA)
M. McReynolds,* Metropolitan Water District of Southern California, La Mirada, Calif. (AWWA)
G. Oljaca, Greater Vancouver Regional District, Burnaby, B.C. (AWWA)
V.B. Soto, Los Angeles Department of Water & Power, Los Angeles, Calif. (AWWA)
G.P. Stine, San Diego County Water Authority, Escondido, Calif. (AWWA)
J.V. Young, City of Richmond, Richmond B.C. (AWWA)

*Alternate

This page intentionally blank.

Contents

All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.

This page intentionally blank.

Foreword

This foreword is for information only and is not a part of ANSI/AWWA C210.

I. Introduction.

I.A. *Background.* This standard was developed to provide information for the use of liquid epoxy coatings for the exterior coating and interior lining of steel water pipe. The standard has been revised periodically to meet increasingly demanding environmental and health-effects regulations and to modify procedures based on technological advances.

I.B. *History.* The first edition of ANSI/AWWA C210 was approved for issue in May 1978 under the title "Coal-Tar Epoxy Coating System for the Interior and Exterior of Steel Water Pipe." The second and third editions were approved on June 10, 1984, and June 18, 1992, respectively, and published under the title "Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines." The fourth edition of ANSI/AWWA C210 was approved by the AWWA Board of Directors on June 15, 1997. The fifth edition was approved on Jan. 19, 2003. This edition was approved on June 24, 2007.

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 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 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.

* Persons outside the United States should contact the appropriate authority having jurisdiction.

3. Two standards developed under the direction of NSF, NSF*/ANSI† 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 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 NSF/ANSI 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.

Annex A, "Toxicology Review and Evaluation Procedures," to NSF/ANSI 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 Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C210 does not address additives requirements. 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 parties offering to certify products for contact with, or treatment of, drinking water.

3. Determine current information on product certification.

II. Special Issues. This standard provides guidance to the water industry in selecting and evaluating liquid epoxy coatings for use in potable water service, and sets minimum requirements for linings and coatings used on steel water pipe in the potable water supply industry.

Users of this standard are advised to consider additional lining thickness for pipe that handles water containing higher than normal levels of particulates or that operates at higher than normal velocities. A penstock carrying mountain water would be a viable example. The required finished coating thickness shall be specified by the purchaser. The specified thickness should not exceed the maximum recommended by the coating manufacturer.

Soluble salts and other inorganic contaminants on a prepared steel surface have been

*NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48113.

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

‡Both publications available from National Academy of Sciences, 500 Fifth Street, N.W., Washington, DC 20418.

known to influence coating performance. Procedures for determining the presence of these contaminants as well as the method of quantifying them are currently being evaluated by technical organizations serving the paint industry.

If an extended period of aboveground storage of the coated pipe is anticipated, consideration should be given to the ability of the coating to resist degradation by ultraviolet light and other atmospheric and environmental conditions. The purchaser should consult the manufacturer for specific conditions and limitations.

This standard does not describe materials and procedures that may be required for difficult conditions, such as those encountered in construction of some submarine lines, casing pipe, river crossings, and rocky areas.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives.* The following items should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines, of latest revision.
2. Whether compliance with NSF/ANSI 61 Drinking Water System Components—Health Effects is required, in addition to the requirements of the Safe Drinking Water Act.
3. Any exceptions to the standard.
4. Diameter, length, and location of pipeline.
5. Materials and safety (Sec. 4.2).
6. Details of other federal, state or provincial, and local requirements (Sec. 4.2.2).
7. Government regulations (Sec. 4.2.2).
8. The minimum and maximum dry film thickness (DFT) of the lining or coating (Sec. 4.3.2).
9. Visual comparative standard for surface preparation (Sec. 4.4.2.3).
10. Profile determination (Sec. 4.4.2.2).
11. Requirements for coating application (Sec. 4.4.3).
12. Holdback for field welds (Sec. 4.4.3.2).
13. Requirements for field joint coating (Sec. 4.6).
14. Coating requirements for special connections and appurtenances (Sec. 4.7).
15. Provisions for bedding and trench backfill (Sec. 4.8.3).
16. Requirements for material inspection and rejection (Sec. 5.1 and 5.3).
17. Requirements for adhesion testing of coating (Sec. 5.1.6).
18. Packaging, handling, stacking, and storage (Sec. 6.2).

19. Affidavit of compliance, if required (Sec. 6.3).

III.B. *Modification to Standard*. Any modification to the provisions, definitions, or terminology in this standard must be provided by the purchaser.

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

1. Table 1 and Sec. 5.1.6—Minimum adhesion in accordance with ASTM D4541 has been increased.
2. Table 2 and Sec. 5.2—Cathodic disbondment qualification testing has been added.
3. Sec. 4.4.2—Pipe preparation was revised.

V. Comments. If you have any comments or questions about this standard, please contact the AWWA Volunteer & Technical Support Group at 303.794.7711, FAX at 303.795.7603, write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail at standards@awwa.org.

ANSI/AWWA C210-07
(Revision of ANSI/AWWA C210-03)

American Water Works Association

AWWA Standard

Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard sets minimum requirements for shop- and field-applied, liquid-epoxy interior linings and exterior coatings used in the water-supply industry for steel water pipelines installed underground or underwater, under normal construction conditions.

1.1.1 *Conditions not described in this standard.* The coating systems described in this standard are not intended for use on pipe that will be bent after the coating or lining system has been applied.

1.1.2 *Coating and lining systems.* The coating and lining systems may consist of any of the following three types: (1) a two-part, chemically cured epoxy primer and one or more coats of a different two-part, chemically cured epoxy topcoat; (2) two or more coats of the same two-part, chemically cured epoxy coating, in which case the first coat shall be considered as the prime coat; or (3) a single coat of a two-part, chemically cured epoxy coating.