



**American Water Works  
Association**

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**ANSI/AWWA C213-15**  
(Revision of ANSI/AWWA C213-07)

**AWWA Standard**

# Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings

Effective date June 1, 2015.

First edition approved by AWWA Board of Directors Feb. 3, 1979.

This edition approved: Jan. 24, 2015.

Approved by American National Standards Institute: Feb. 12, 2015.



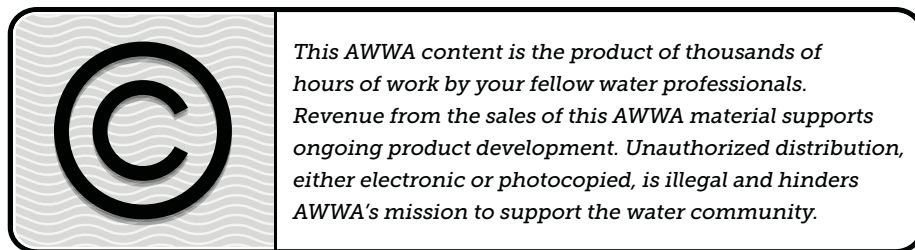
## AWWA Standard

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ISBN-13, print: 978-1-62576-091-3

eISBN-13, electronic: 978-1-61300-335-0

DOI: <http://dx.doi.org/10.12999/AWWA.C213.15>

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# Foreword

*This foreword is for information only and is not a part of ANSI\*/AWWA C213.*

## **I. Introduction.**

I.A. *Background.* Fusion-bonded epoxy coatings are one-part dry-powder thermosetting epoxies that, when heat activated, produce a chemical reaction to the steel pipe surface while maintaining the performance of its properties. The first known applications for corrosion protection in the United States occurred in 1960 on the external surfaces of small-diameter pipe for gas distribution. Since then, applications have expanded to larger pipe sizes as internal and external coatings for gas, oil, water, and wastewater applications. Custom application to accessory fittings, pumps, valves, couplers, flowmeters, and a variety of other parts is also possible. Materials are applied by electrostatic spray, air spray (flocking), or fluid bed, usually in a controlled plant environment. However, equipment is available that allows for internal or external application to pipe joints in the field.

I.B. *History.* The first edition of this standard was approved in 1979. The 1985 revision incorporated changes reflecting fusion-bonded epoxy technology, which was current at that time. The primer provision was deleted in the 1985 revision. The 2001 and 2007 revisions incorporated the latest technology and requirements at that time. This edition was approved on Jan. 24, 2015.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International<sup>†</sup> (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 Water Research Foundation (formerly 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.<sup>‡</sup> Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health

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

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

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

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: 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 jurisdictions. 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 C213 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.**

II.A. *Advisory Information on Material Application.* This standard defines the quality of fusion-bonded epoxy to establish the characteristics desired for long-term corrosion protection. It is intended for interior linings and exterior coatings for steel water pipelines for underground and underwater installation under normal conditions.

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\* Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.



**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 specified by the purchaser:

1. Standard used—that is, ANSI/AWWA C213, Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings, of latest revision.
2. Any exceptions to the standard.
3. Diameter, length, and location of pipeline.
4. Temperature of conveyed water (Sec. 1.1.2).
5. Details of other federal, state or provincial, and local requirements (Sec. 4.2.1).
6. For applications other than potable water, whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required (Sec. 4.2.2).
7. Whether visual comparative standards are required (Sec. 4.4.2.3).
8. Requirements for epoxy application at pipe ends (Sec. 4.4.3.2).
9. Optional epoxy performance testing (Sec. 4.4.3.7, Sec. 5.5.5).
10. Requirements for field-welded joint coating (Sec. 4.4.5).
11. Coating requirements for thread systems, special connections, and appurtenances (Sec. 4.5.3.2).
12. Requirements for cure of epoxy (Sec. 4.4.3.5 and Sec. 4.5.3.4).
13. Whether repaired areas are to be electrically inspected (Sec. 4.5.3.6.1 [Item d]).
14. Provision for field procedures (Sec. 4.6).
15. Requirements of inspection and laboratory testing (Section 5).
16. Requirements for adhesion testing of coating (Sec. 5.2.2.4 and Sec. 5.5.3).
17. Requirement for epoxy thickness (Sec. 5.5.4).
18. Additional optional epoxy testing (Sec. 5.5.5).
19. Rejection of pipe (Sec. 5.6).
20. 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.** Revisions made to this standard in this edition include the following:

1. The title of the standard was changed to be consistent with other AWWA steel pipe standards.
2. References in Section 2 were updated.

3. A definition for potable water was added (Section 3).
4. A new Sec. 4.2.2, Certification, was added to include a requirement for NSF/ANSI 61 certification on products if they will be in contact with potable water.
5. Sec. 4.3.1.1, Shelf Life, was revised.
6. Table 2 was divided into two separate tables (2 and 3) to better define prequalification requirements of the coating system and quality control tests of the applied coating system.
7. A cathodic disbondment requirement was added to Table 2.
8. Sec. 4.4.2.2, Abrasive Blast Cleaning, was updated.
9. A new Sec. 4.5.3.3, Thickness, was added for epoxy application under Sec. 4.5, Special Pipe Connections and Appurtenances.
10. Sec. 4.5.3.4, Cure, was revised.
11. Sec. 4.6, Field Procedures, was revised and the handling, bedding, and back-fill information included in the previous edition of C213 has been deleted and is now included in ANSI/AWWA C604. The reader is now referred to ANSI/AWWA C604 for this information.
12. Section 5, Verification, was revised and the heading titles and format were updated to be consistent with the new language and format being used in all AWWA steel pipe coating and lining standards.
13. Additional information was added to Sec. 5.2.2.6, Abrasion Resistance, and the ASTM reference was updated to reflect current industry practice.
14. New sections on dielectric strength (Sec. 5.2.2.8) and volume resistivity (Sec. 5.2.2.9) were added to be consistent with the requirements included in Table 2.
15. A new Sec. 5.2.2.10 on cathodic disbondment testing was added.
16. Old Sec. 5.2, Notice of Nonconformance, was renamed to Sec. 5.6, Rejection, and revised to be consistent with other coating and lining standards.
17. A new section on Quality Assurance and Records was added (Sec. 5.3).
18. Sec. 6.2, Packaging and Shipping, was revised to be consistent with other AWWA steel pipe coating and lining standards. The sections on stacking, trench side placement, and outdoor storage were deleted.

**V. Comments.** If you have any comments or questions about this standard, please contact AWWA Engineering and Technical Services at 303.794.7711, FAX at 303.795.7603; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email at [standards@awwa.org](mailto:standards@awwa.org).



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# Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings

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## SECTION 1: GENERAL

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### Sec. 1.1 Scope

This standard describes the material and application requirements for fusion-bonded epoxy coatings and linings for steel water pipe, special sections, welded joints, connections, and fittings for steel water pipelines installed underground or underwater. Fusion-bonded epoxies are heat-activated chemically cured systems.

1.1.1 *Minimum pipe diameter.* The minimum pipe diameter for application of epoxy lining that can be inspected and repaired by entering the pipe shall be 24 in. (600 mm).<sup>\*</sup> Pipe diameters less than 24 in. (600 mm) that can be electrically inspected internally may be included, provided the work complies with applicable provisions of this standard.

1.1.2 *Maximum temperatures.* AWWA pipe coating standards are written for and based on the service temperature of potable water. Consult the epoxy manufacturer for conditions and limitations.

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<sup>\*</sup> Metric conversions given in this standard are direct conversions of US customary units and are not those specified in International Organization for Standardization (ISO) standards.