ANSI/AWWA C222-18
(Revision of ANSI/AWWA C222-08)

American Water Works Association

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AWWA Standard

Polyurethane Coatings and Linings for Steel Water Pipe and Fittings

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Contents

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

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Foreword

This Foreword is for information only and is not a part of ANSI/AWWA C222.*

I. Introduction.

I.A. *Background.* Fast-setting, very high solids polyurethanes were first used in North America to protect steel underground fuel storage tanks from corrosion in the mid-1970s. The materials were also used to protect oil and gas pipelines in Europe at approximately the same time. Because of further development of the technology during the 1980s, polyurethanes have been used successfully in water and wastewater pipelines and tanks.

I.B. *History.* In April 1996, the AWWA Standards Council authorized the Steel Pipe Committee to develop a new standard for the use of polyurethanes on the interior and exterior of steel water pipe and fittings. The first edition of ANSI/AWWA C222 was approved by the AWWA Board of Directors on June 20, 1999. The second edition of this standard was approved on June 8, 2008. This edition was approved on Jan. 20, 2018.

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 Water Research Foundation (formerly AwwaRF[†]) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association 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

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
† Water Research Foundation, 6666 West Quincy Avenue, Denver, CO 80235.
‡ Persons outside the United States should contact the appropriate authority having jurisdiction.

1. Specific policies of the state or local agency.

2. 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.

3. 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 C222 does not address additives requirements. 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 all 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. *Soluble Salts*. Soluble salts and other inorganic contaminants on a prepared steel surface have been known to influence coating performance. Procedures for determining the presence of these contaminants, the method of quantifying them, and the acceptable levels are currently being evaluated by technical organizations serving the coating and lining industry.

II.B. *Surface Cleanliness*. ISO 8502-3‡ may be used to assess the substrate cleanliness per the manufacturer's recommendation.

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

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

‡ "Preparation of Steel Substrates Before Application of Paints and Related Products—Tests for the Assessment of Surface Cleanliness," Part 3.

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 information should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C222, Polyurethane Coatings and Linings for Steel Water Pipe and Fittings, of latest revision.
2. Color of coating required (if applicable).
3. Coating system or lining system to be provided (Sec. 1.1.1).
4. Temperature of conveyed water (Sec. 1.1.3).
5. Details of other federal, state or provincial, and local requirements (Sec. 4.1).
6. Dry film thickness (Sec. 4.3).
7. Thickness for special applications (Sec. 4.3.2).
8. Abrasive blast profile (Sec. 4.4.2.2).
9. Visual comparative standard for surface preparation (Sec. 4.4.2.3).
10. Field joint material selection (Sec. 4.7.5).
11. Coating requirements for other mating surfaces (Sec. 4.9.4).
12. For applications other than potable water, whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required (Sec. 4.11.2).
13. Prequalification testing (Sec. 5.1).
14. Additional reagents for chemical resistance testing (Sec. 5.2.5)
15. Scoring requirements around dolly, if required (Sec. 5.5.5).
16. Additional adhesion tests, if required (Sec. 5.5.5).
17. Affidavit of compliance (Sec. 6.3).

III.B. *Modification to Standard*. Any modification of 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. The title of the standard was changed to be consistent with other AWWA steel pipe coating standards.
2. All references to exterior coating and interior lining were changed to reference only coating and lining, respectively.
3. Information on inorganic contaminants and surface cleanliness was added to the Foreword in Sec. II.A. and Sec. II.B.
4. Two additional purchaser options were added to the Foreword in Sec. III.A for scoring requirements around dolly and additional adhesion tests.

5. The maximum operating water temperature was deleted from Sec. 1.1.3.

6. Section 2, References, was updated.

7. A definition for *potable water* was added (Section 3).

8. The titles of Tables 1 and 2 were changed to be consistent with other AWWA steel pipe coating standards.

9. Adhesion to steel was added to Table 1 as a prequalification test.

10. Table 2 was revised and the minimum requirements were added.

11. Maximum blast profile was added to Sec. 4.4.2.2.

12. Sec. 4.5.8 was added to address exposure of coated pipe to atmospheric conditions.

13. Sec. 4.7.3, Surface Preparation, was revised.

14. Sec. 4.8 was modified to only address gasketed joints.

15. All existing wording in Sec. 4.10, Field Procedures, of the previous edition of C222 was removed. The section now references ANSI/AWWA C604.

16. Sec. 4.11.2, Certification, was revised to include a requirement for NSF/ANSI 61 certification on products if they will be in contact with potable water.

17. Section 5, Verification, was changed to be consistent with other AWWA steel pipe coating standards.

18. Sec. 5.2.1, Cathodic Disbondment, was changed to be consistent with other AWWA steel pipe coating standards.

19. The polyurethane thickness and sample size were added to Sec. 5.2.2, Flexibility.

20. Sec. 5.2.7, Water Absorption, was modified to specify the long-term immersion method and the sample size.

21. Prequalification adhesion testing was added as Sec. 5.2.9.

22. The title and content of Sec. 5.4, Inspection and Testing by the Purchaser, were revised to be consistent with other coating and lining standards.

23. Sec. 5.5.1 was added to independently distinguish quality control testing on polyurethane coatings and linings.

24. Sec. 5.5.2, Polyurethane Appearance, was modified to be more consistent with other AWWA steel pipe coating standards.

25. Sec. 5.5.3, Dry Film Thickness, was revised for clarity.

26. Sec. 5.5.4, Electrical Continuity Inspection, was revised including the addition of a reference to NACE SP0274 and a reference to the polyurethane's "cure to handle" state.

27. Sec. 5.5.5, Adhesion to Steel, was modified to more closely represent the general practices in the steel pipe industry and address the variability of the test.

28. Section 6, Delivery, was modified to be consistent with other AWWA steel pipe coating standards.

29. Sec. 6.3, Affidavit of Compliance, was modified to include an affidavit for workmanship. Similar language will be added to all other AWWA steel pipe coating and lining standards.

V. Comments. If you have any comments or questions about this standard, please call 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 e-mail at standards@awwa.org.

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AWWA Standard

Polyurethane Coatings and Linings for Steel Water Pipe and Fittings

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard sets minimum requirements for shop- and field-applied polyurethane coatings and linings used in the water supply industry. Polyurethanes are used for steel water pipe, special sections, welded joints, connections, and fittings for steel water pipelines installed underground or underwater operating under normal conditions.

1.1.1 *Coating and lining systems.* The coating and lining systems shall consist of an ASTM D16 Type V thermoset, aromatic polyurethane plastic polymer that is the reaction product of diphenylmethane diisocyanate resin and polyol resin, polyamine resin, or a mixture of polyol and polyamine resins. Typically, these systems are solvent free or almost solvent free (less than 10 percent solvent by volume). They are fast setting (cure to handle in less than 30 minutes) and are applied in one coat direct to steel. However, there is a wide variety of polyurethane technologies available on the market that may contain up to 10 percent solvent or are slower setting that also meet the requirements of this standard.