ANSI/AWWA C224-11
(Revision of ANSI/AWWA C224-06)

American Water Works Association

The Authoritative Resource on Safe Water®

AWWA Standard

Nylon-11-Based Polyamide Coating System for the Interior and Exterior of Steel Water Pipe, Connections, Fittings, and Special Sections

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AWWA Standard

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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 C224.*

I. Introduction.

I.A. *Background.* Polyamide (Nylon-11-based) coatings are thermoplastic coatings. Typically, they are placed by applying dry polyamide powder (ordinarily in a controlled plant environment, by any of several techniques, e.g., electrostatic spray, immersion in a fluidized bed, spray onto preheated article, rotocoating) onto steel surfaces previously primed with a thin layer of epoxy primer (note that other primers may be used, as appropriate). When treated at the appropriate temperature, the dry polyamide powder melts to form a uniform, continuous polyamide coating on the steel surface. Simultaneously during this thermal treatment, chemical reactions occur between the steel surface and epoxy and between epoxy and polyamide. These chemical reactions provide for bonding between the polyamide coating and steel surface.

The first commercial use of polyamide coatings for the protection (from corrosion) of steel used in water-handling applications was in West Germany in 1970. Regarding the United States, it is believed that first use was in 1985. However, prior to this, polyamide coatings had been used in 1983 for the protection of the interior of steel piping used in the petroleum industry. Currently, the use of polyamide coatings to protect steel has grown to include many types of articles (both interiors and exteriors) in a variety of industries, such as oil and natural gas exploration and production, and water and wastewater handling. Polyamide coatings also can be used to protect accessory steel articles, such as pumps, valves, couplers, and flowmeters.

I.B. *History.* C224-01 was the first standard specifically concerning polyamide coating systems. However, it is noted that polyamide-based coatings have been used according to ANSI/AWWA Standard C550-01. The second edition of C224 was approved by the AWWA Board of Directors on Feb. 12, 2006. This edition was approved on June 12, 2011.

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

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

Foundation (AwwaRF, now Water Research Foundation*) 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.
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 C224 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.

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* Water Research Foundation, 6666 W. Quincy Ave., Denver, CO 80235.

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

‡ NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

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

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 use of polyamide coatings for the interiors and exteriors of steel articles used for water handling in the following environments: aboveground, belowground, or underwater—under normal conditions. Also, this standard describes the quality of polyamide coatings needed to produce long-term coating performance—in particular, long-term corrosion protection. Normal conditions are defined as those conditions, specified by the coating manufacturer (see Section 3), that are known beforehand not to adversely affect polyamide coatings.

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 C224, Nylon-11-Based Polyamide Coating System for the Interior and Exterior of Steel Water Pipe, Connections, Fittings, and Special Sections, of latest revision.
2. Any required exceptions to the standard.
3. Diameter, length, thickness, design, and location of coated steel articles.
4. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
5. Temperature, pH, and composition of water to be handled (Sec. 1.1.2).
6. Details of other federal, state, or provincial, and local requirements (Sec. 4.2).
7. Weld treatment (Sec. 4.5.2.1).
8. Visual standards (Sec. 4.5.2.4).
9. Coating holdback at pipe ends (Sec. 4.5.3.2).
10. Coating thickness (Sec. 4.5.3.3).
11. Field-welded joint coatings (Sec. 4.5.5).
12. Pipe bedding and trench backfill (Sec. 4.6.3).
13. Inspection (Sec. 5.4).
14. Number of adhesion tests (Sec. 5.5.4).
15. Delivery (Section 6).
16. Outdoor storage (Sec. 6.2.5).
17. Affidavit of compliance, if required (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 definitions for potable water and supplier were added to Section 3.
2. Specific gravity data and moisture absorption were modified in Table 1.
3. Sec. 4.4 was rewritten to include prequalification requirements of coating system (Table 2) and quality control requirements of applied coating system (Table 3).
4. Coating application methods were refined in Sec. 4.5.1 for accuracy purposes.
5. Steel surface preparation and primer application procedure have been refined in Sec. 4.5.2.
6. Sec. 4.5.3 was rewritten to modify some of the application procedure criteria, including the frequency of checking the article surface temperature and special thickness considerations.
7. Sec. 4.6, Field Procedures, was rewritten to be consistent with the other pipe coating standards.
8. Section 5, Verification, was rewritten to be consistent with the other pipe coating 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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Nylon-11-Based Polyamide Coating System for the Interior and Exterior of Steel Water Pipe, Connections, Fittings, and Special Sections

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes Nylon-11-based polyamide coating systems for interior and exterior of steel pipe, connections, fittings, and special sections (articles) that are used in water-handling equipment that is installed aboveground, belowground, or underwater. Polyamide coating systems are thermoplastic and are ordinarily applied in a shop or manufacturing facility.

1.1.1 *Minimum pipe diameter.* The minimum pipe diameter for application of the polyamide coating system to the interior of a pipe shall be the diameter that permits effective inspection and repair. For joints of pipe, this minimum diameter is ordinarily 24 in. (600 mm). For pipe diameters less than 24 in. (600 mm), the coating manufacturer shall be consulted regarding methods of inspection and repair.

1.1.2 *Maximum temperature.* AWWA pipe coating standards are written for and based on the service temperature of potable water. The maximum