

American Water Works Association

ANSI/AWWA C203-97

(Revision of ANSI/AWWA C203-91)



AWWA STANDARD
FOR
**COAL-TAR PROTECTIVE
COATINGS AND LININGS FOR STEEL
WATER PIPELINES—ENAMEL
AND TAPE—HOT APPLIED**



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AMERICAN WATER WORKS ASSOCIATION

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Foreword

This foreword is for information only and is not a part of AWWA C203.

I. Introduction.

I.A. *Background.* Hot-applied coal-tar enamel has been used for corrosion protection of steel water pipe, both as an interior lining and as an exterior coating since the mid 1930s. Internally, the coal-tar enamel is used without reinforcement or shielding. The hot enamel is spun into the pipe and provides a smooth internal lining having low hydraulic frictional resistance. External coal-tar enamel coatings are reinforced with fibrous material. For many years the reinforcing material of choice was asbestos felt; however, as health effect concerns associated with asbestos in our environment developed, alternative materials such as woven or nonwoven glass-fiber matting, lock-welded glass fiber, polyethylene kraft paper, and so forth, have been developed and substituted. This is the first edition of this standard that does not include asbestos felt as an alternative outerwrap.

I.B. *History.* The first AWWA standards for coal-tar enamel were approved Apr. 25, 1940, and were designated 7A.5, for steel water pipe in sizes 30 in. (750 mm) and larger, and 7A.6, for steel water pipe of sizes up to, but not including, 30 in. (750 mm). Revisions of these documents were approved on Oct. 3, 1949; June 21, 1950; May 1, 1951; and July 14, 1955.

In 1951, the designations of 7A.5 and 7A.6 were changed to AWWA C203 and AWWA C204, respectively.

On Mar. 27, 1957, a revision was approved that combined the two standards into one document designated as AWWA C203. Subsequent revisions were approved on Jan. 23, 1962; May 22, 1966; Jan. 29, 1973; June 25, 1978; Jan. 26, 1986, and June 23, 1991.

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 all 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 in Canada, Mexico, and non-North American countries should contact the appropriate authority having jurisdiction.

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

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

AWWA C203-97 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 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. *Advisory Information on Product Application.* This standard defines coal-tar protective coatings and linings in terms of performance to establish the quality desired for long-term prevention of corrosion. The standard covers the external coating and internal lining of steel water pipelines for underground or underwater installation. If an extended period of aboveground storage of coated pipe is anticipated, consideration should be given to the ability of the coating to resist ultraviolet degradation and other atmospheric and environmental conditions.

III. **Use of This Standard.** AWWA has no responsibility for the suitability or compatibility of the provisions of this standard to any intended application by any user. Accordingly, each user of this standard is responsible for determining that the standard’s provisions are suitable for and compatible with that user’s intended application.

III.A. *Purchaser Options and Alternatives.* The following items should be covered in the purchaser’s specifications:

1. Standard used—that is, ANSI/AWWA C203, Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines—Enamel and Tape—Hot-Applied, of latest revision, or any part or combination of Sec. 1, 4.3, 4.4, 4.5, and 4.6.
2. Any exceptions to the standard that may be required.
3. Operating temperature.

^{*}American National Standards Institute, 11 W. 42nd St., New York, NY 10036.

[†]NSF International, 3475 Plymouth Rd., Ann Arbor, MI 48106.

[‡]Both publications available from National Academy of Sciences, 2102 Constitution Ave. N.W., Washington, DC 20418.

4. Requirements for outdoor storage (Sec. 1.1.1).
5. Government regulations (Sec. 1.1.2).
6. Location of coating application with reference to environmental considerations.
7. Additional exterior protection that may be required (Sec. 4.7).
8. Diameter, length, and location of pipeline, including maps and drawings necessary to show all details of the pipeline.
9. Length of pipeline requiring internal protection (Sec. 4.4.1.1).
10. Length of pipeline requiring: (1) normal exterior protection (Sec. 4.4.1.2) together with any preference regarding finish coat of whitewash, water-emulsion latex paint, or kraft paper; and (2) each type of additional exterior protection required for unusual underground or underwater conditions (Sec. 4.7).
11. Affidavit of compliance, if required (Sec. 6.3).
12. Type of primer (Sec. 4.3.2).
13. Type of coal-tar enamel (Sec. 4.3.3.1).
14. Samples of materials, if required (Sec. 5.1.4).
15. Inspection, testing, and rejection (Sec. 5.1.4.1).
16. Type of outerwrap (Sec. 4.3.4).
17. Requirements for coating thickness (Sec. 4.3.8 and 4.7).
18. Lining and coating of pipe ends (Sec. 4.4.10).
19. Trench bedding and backfilling (Sec. 4.8.3 and 4.8.4).
20. Thickness of tape (Sec. 4.6.5.2.2).
21. Single or double wrap (Sec. 4.6.2).
22. If materials only are being purchased according to the requirements of Sec. 4.3 of this standard, then the purchaser shall specify quantities for the following items: (1) primer by type (Sec. 4.3.2); (2) coal-tar enamel by type (Sec. 4.3.3.1 and Table 1); (3) outerwrap (Sec. 4.3.4); and (4) glass-fiber outerwrap (Sec. 4.7.3.1). The purchaser should also specify if an affidavit of compliance is required (Sec. 6.3).
23. If materials only are being purchased according to the requirements of Sec. 4.6 of this standard, then, in addition to items 20 and 21, the purchaser should specify the following: (1) quantity of primer (Sec. 4.6.5.1); (2) quantity of tape (Sec. 4.6.5.2); and (3) affidavit of compliance, if required (Sec. 6.3).
24. Adhesion tests (Sec. 4.6.8).
25. ANSI/AWWA C209, Standard for Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines, and ANSI/AWWA C216, Standard for Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines may also be used in combination with ANSI/AWWA C203, if specified by the purchaser.
26. Application and use of materials covered in this standard should conform to warnings and instructions provided by the manufacturers and with existing federal and local governmental regulations.

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

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

1. The format has been changed to AWWA standard style.
2. The acceptance clause (Sec. I.C) has been revised to approved wording.
3. The outerwrap systems of coal-tar saturated asbestos felt and coal-tar saturated mineral felt were deleted. Pipeline woven glass-fiber outerwrap

(Sec. 4.3.4.4), and pipeline lock-welded glass fiber outerwrap (Sec. 4.3.4.5) were added.

4. Section 4.4.11.2.2, Coating exterior welds, was revised. New procedures are provided that must be followed.

5. Section 4.3.2 was revised to allow the use of alternative resin-based primers where air emission regulations restrict the use of Type A and Type B primers.

6. Section 4.3.2.1, the restriction against benzene in Type A primer was removed.

7. Section 5.2.2.2.2, an electrical inspection of interior coal tar enamel linings was added.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Standards and Materials Development Department, (303) 794-7711 ext. 6283, FAX (303) 795-1440, or write to the department at 6666 W. Quincy Ave., Denver, CO 80235.



AWWA STANDARD FOR COAL-TAR PROTECTIVE COATINGS AND LININGS FOR STEEL WATER PIPELINES—ENAMEL AND TAPE— HOT APPLIED

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard provides minimum requirements for coal-tar protective exterior coatings and interior linings used in the potable water supply industry for buried steel water pipelines.

Sections 4.3 through 4.5 and Sec. 4.8 cover the requirements for hot-applied, coal-tar enamel and its exterior and interior application to pipe, special sections, connections, fittings, and field procedures. Section 4.6 covers the requirements for hot-applied, coal-tar base tapes for application to special sections, connections, and fittings. Section 4.7 presents alternative coal-tar coating systems, wraps, and procedures for external coating systems that provide additional coating protection for use in severe trench locations.

All AWWA steel pipe coating standards are written for and based on the service temperature of potable water. For operating temperatures higher than the normal temperature of potable water, consult the manufacturer for recommendations concerning temperature limitations for coal-tar protective coatings and linings.

1.1.1 Storage conditions. Since aboveground and environmental conditions vary, the purchaser should consult the manufacturer as to type of coating that is recommended for the specific anticipated storage conditions, including the necessity for ultraviolet-light protection.

1.1.2 *Government regulations.* The purchaser (or the constructor) shall determine that no portion of this standard is in conflict with any existing government regulations.

1.1.3 *Safety and environmental considerations.* The components of the coating system may contain skin irritants and may be flammable. Precautions should be taken to protect against these hazards and to comply with the manufacturer's recommendations concerning the use and handling of the components.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for coal-tar protective coatings and linings for steel water pipelines—enamel and tape—hot applied, including materials, application, verification, and delivery.

Sec. 1.3 Application

This standard can be referenced in specifications for hot-applied coal-tar protective coatings and linings of steel water pipelines. The stipulations of this standard apply when this document has been referenced and then only to protective coatings and linings of steel water pipelines with hot-applied coal-tar enamel systems and to hot-applied coal-tar tape on the exterior of special sections, connections, and fittings.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

ASTM* D5—Standard Test Method for Penetration of Bituminous Materials.

ASTM D36—Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus).

ASTM D71—Standard Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method).

ANSI/ASTM D146—Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.

ASTM D388—Standard Classification of Coals by Rank.

ASTM D546—Standard Test Method for Sieve Analysis of Mineral Filler for Road and Paving Materials.

ASTM D689—Standard Test Method for Internal Tearing Resistance of Paper.

ASTM D737—Standard Test Method for Air Permeability of Textile Fabrics.

ANSI/ASTM D882—Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

ASTM D1000—Standard Test Method for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.

*American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

†American National Standards Institute, 11 W. 42nd St., New York, NY 10036.

ANSI/ASTM D1238—Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

ASTM D1505—Standard Test Method for Density of Plastics by the Density-Gradient Technique.

ANSI/ASTM D2103—Standard Specification for Polyethylene Film and Sheeting.

ASTM D2415—Standard Test Method for Ash in Coal Tar and Pitch.

ANSI/AWWA C205—Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe—4 in. and Larger—Shop Applied.

ANSI/AWWA C209—Standard for Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.

ANSI/AWWA C216—Standard for Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.

BS* 4164—Coal Tar Based Hot-Applied Coating Materials for Protecting Iron and Steel Including Suitable Primer.

ISO† 719—Waterproofing Fiberglass at 98°C, Testing Procedure and Classification.

NACE‡ No. 2—Joint Surface Preparation Standard Near-White Blast Cleaning.

NACE No. 3—Joint Surface Preparation Standard Commercial Blast Cleaning.

SSPC§ SP1—Solvent Cleaning.

SSPC SP2—Hand Tool Cleaning.

SSPC SP3—Power Tool Cleaning.

SSPC SP6—Joint Surface Preparation Standard Commercial Blast Cleaning.

SSPC SP10—Joint Surface Preparation Standard Near-White Blast Cleaning.

TAPPI** T403—Bursting Strength of Paper.

TAPPI T404—Tensile Breaking Strength and Elongation of Paper and Paperboard.

TAPPI T410—Grammage of Paper and Paperboard.

TAPPI T411—Thickness (Caliper) of Paper, Paperboard, and Combined Board.

TAPPI T414—Internal Tearing Resistance of Paper.

SECTION 3: DEFINITIONS

The following definitions shall apply in this standard:

1. *Blasting*: Blasting shall refer to blasting with sand, steel shot, or grit.
2. *Centrifugal casting*: The process of applying coal-tar enamel to the inside surface of the pipe. Molten coal-tar enamel is introduced into the pipe, spread on the surface of the pipe, and held thereon by the centrifugal force developed by rotating the pipe about its longitudinal axis until the enamel has cooled and solidified and become bonded to the pipe.

*British Standard Institution, 2 Park St., London, England W1A 2BS.

†International Standards Organization.

‡National Association of Corrosion Engineers, 1440 S. Creek Dr., PO Box 218340, Houston, TX 77218-8340.

§Steel Structures Painting Council, 40 24th St., Pittsburgh, PA 15222.

**Technical Association of the Pulp and Paper Industry, 15 Technology Parkway South, Norcross, GA 30092.

3. *Constructor*: The party that furnishes the work and materials for placement or installation.

4. *Manufacturer*: The party that manufactures, fabricates, or produces materials or products.

5. *Purchaser*: The person, company, or organization that purchases any materials or work to be performed.

SECTION 4: REQUIREMENTS

Sec. 4.1 Equipment

The constructor's equipment for blasting, priming, enameling, wrapping, and taping shall be designed, manufactured, and maintained in adequate condition so that the application procedure produces the results prescribed in this standard.

Sec. 4.2 Materials and Workmanship

Materials furnished shall meet the provisions of this standard. Work or material that fails to conform to the requirements of this standard may be rejected at any time prior to final acceptance thereof.

Sec. 4.3 Materials for Hot, Coal-Tar Enamel Coating Systems

4.3.1 *General*. This section describes the composition and physical properties of materials to be used for primers, coal-tar enamel, several alternative outerwraps, and finish coats intended for use in hot-applied, coal-tar enamel, interior linings, and exterior protective coating systems for steel water pipelines. The primer and coal tar shall be furnished by the same manufacturer.

4.3.2 *Primers*. Both Type A (coal-tar) and Type B (fast-drying, synthetic) primers are covered by this standard. Unless Type A primer is specified by the purchaser, Type B primer, which may be employed under all conditions when coal-tar enamel is applicable, shall be used. At site locations where air emission regulations may restrict the use of Type A and B primers, other resin base primers may be used as equivalent to the Type A and B primers covered in this standard, provided they meet the performance requirements of Table 1 and are approved by the purchaser. Consult the manufacturer for specific alternative surface preparation systems.

Type A primer shall not be specified for either laboratory testing or field usage when the following conditions exist:

1. The enamel will be applied less than 16 h or more than 72 h after priming.
2. The temperature and humidity conditions are such that adequate drying of the primer and bonding of enamel will not be obtained within 24 h.
3. The pipe is to be coated with Type I enamel and will be handled at temperatures below 30°F (−1°C).

4.3.2.1 *Type A (coal-tar) primer*. Coal-tar primer shall consist only of processed coal-tar pitch and refined coal-tar oils, suitably blended to produce a liquid that may be applied cold by brushing or spraying and that will produce an effective bond between the metal and a subsequent coating of coal-tar enamel.

4.3.2.2 *Type B (fast-drying, synthetic) primer*. Fast-drying, synthetic primer shall consist of chlorinated rubber, synthetic plasticizer, and solvents. These constituents shall be suitably compounded to produce a liquid coating that can be readily