



**American Water Works
Association**

The Authoritative Resource on Safe Water®

AWWA C203-08
(Revision of ANSI/AWWA C203-02)

AWWA Standard

Coal-Tar Protective Coatings and Linings for Steel Water Pipelines— Enamel and Tape— Hot-Applied



Effective date: April 1, 2009.

First edition approved by AWWA Board of Directors April 23, 1940.

This edition approved by AWWA Board of Directors June 8, 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.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information or retrieval system, except in the form of brief excerpts or quotations for review purposes, without the written permission of the publisher.

Copyright © 2009 by American Water Works Association
Printed in USA

Committee Personnel

The Steel Water Pipe-Manufacturer's Technical Advisory Committee (SWPMTAC) Task Group for AWWA C203, which developed this standard, had the following personnel at the time:

J. A. Wise, *Chair*

F.D. Barnes, Barnes Group International, Windsor, Calif.	(AWWA)
D. Kathrein, Tapecoat Company, Evanston, Ill.	(AWWA)
L. McKinney, Womble Company Inc., Houston, Texas	(AWWA)
R.N. Satyarthi, Baker Coupling Company Inc., Los Angeles, Calif.	(AWWA)
C. Smith, Vertellus Pipeline Coatings Group, Indianapolis, Ind.	(AWWA)
H.R. Stoner, Consultant, North Plainfield, N.J.	(AWWA)
J.A. Wise, Canus International Sales Inc., Surrey, B.C.	(AWWA)

The 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 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)
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, Pipeline Consultant, New Milford, Conn.	(AWWA)
J.L. Mattson, Corrosion Control Technologies, Sandy, Utah	(AWWA)
W.J. Moncreif,† HDR Engineering Inc., San Diego, Calif.	(AWWA)
R. Ortega, Lockwood Andrews & Newman, Houston, Texas	(AWWA)
A.E. Romer, Boyle Engineering Corporation, Newport Beach, Calif.	(AWWA)
H.R. Stoner, Consultant, North Plainfield, N.J.	(AWWA)

* Liaison, nonvoting

† Alternate

C.C. Sundberg, CH2M Hill, 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. Arnaout, Hanson Pressure Pipe Inc., Dallas, Texas	(AWWA)
H.H. Bardakjian, Consultant, Glendale, Calif.	(AWWA)
M. Bauer, Themec Company Inc., North Kansas City, Mo.	(AWWA)
R.J. Card, Victaulic, Atlanta, Ga.	(AWWA)
R.R. Carpenter, American Cast Iron Pipe Company, Birmingham, Ala.	(MSS)
D. Dechant, Dechant Infrastructure Services, Aurora, Colo.	(AWWA)
W.B. Geyer, Steel Plate Fabricators Association, Lake Zurich, Ill.	(AWWA)
J.L. Luka,† American SpiralWeld Pipe Company, Columbia, S.C.	(AWWA)
R.D. Mielke,† Northwest Pipe Company, Raleigh, N.C.	(AWWA)
J. Olmos, Ameron International, Rancho Cucamonga, Calif.	(AWWA)
B. Vanderploeg, Northwest Pipe Company, Portland, Ore.	(AWWA)
J.A. Wise, Canus International Sales, Surrey, B.C.	(AWWA)

User Members

G.A. Andersen, New York City Bureau of Water Supply, Little Neck, N.Y.	(AWWA)
J.H. Bambei Jr., Denver Water Department, Denver, Colo.	(AWWA)
D.W. Coppes, Massachusetts Water Resources Authority, Southborough, Mass.	(NEWWA)
R.V. Frisz, US Bureau of Reclamation, Denver, Colo.	(USBR)
G. George, Tacoma Water, Tacoma, Wash.	(AWWA)
T.J. Jordan, Metropolitan Water District of Southern California, La Verne, Calif.	(AWWA)
M. McReynolds, † Metropolitan Water District of Southern California, LaMirada, 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)

* Liaison, nonvoting

† Alternate

Contents

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

SEC.	PAGE	SEC.	PAGE
<i>Foreword</i>		4.5	Coating Special Connections and Appurtenances, Internal and External..... 20
I	vii	4.6	Tapes, Coal-Tar Base, Hot-Applied, for Special Sections, Connections, and Fittings 22
I.A	vii	4.7	Additional Exterior Protection..... 24
I.B	vii	4.8	Field Procedures 26
I.C	vii	5	Verification
II	ix	5.1	Materials Inspection and Rejection.. 27
II.A	ix	5.2	Electrical Inspection 29
	ix	5.3	Thickness Testing 31
III	ix	5.4	Test Procedures..... 32
III.A	ix	6	Delivery
III.B	x	6.1	Packaging, Marking, and Transportation of Coal-Tar Base Tapes..... 44
IV	x	6.2	Handling, Transportation, and Storage of Coal-Tar Enamel Coated Pipe.. 44
V	xi	6.3	Affidavit of Compliance 45
<i>Standard</i>		<i>Tables</i>	
1	General	1	Physical Properties of Coal-Tar Enamel..... 7
1.1	1	2	Physical Properties of Base Glass and Outerwraps 8
1.2	2	3	Physical Properties of Innerwrap 9
1.3	2	4	Physical Properties of Tape 23
2	References 2		
3	Definitions 3		
4	Requirements		
4.1	4		
4.2	4		
4.3	4		
4.4	10		

This page intentionally blank.

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. When used as an external coating, the coal-tar enamel, when specified, is reinforced with glass fiber inner and outer wraps. These wraps have replaced the original fibrous material, such as asbestos felt, which was a standard wrap for many years until health concerns regarding asbestos surfaced. The glass fiber inner and outer wraps are now being specified as routine reinforcements for coal-tar enamel coatings.

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 ANSI/AWWA C203 and ANSI/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; June 23, 1991; Feb. 1, 1998; and Jan. 20, 2002. This edition was approved by the Board of Directors on June 8, 2008.

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.
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.

AWWA C203 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.

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

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

‡ 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 NW, Washington, DC 10036.

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.** 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 covered by the purchaser:

1. Standard used—that is, AWWA C203, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines—Enamel and Tape—Hot-Applied.
2. Any exceptions to the standard that may be required.
3. Operating temperature.
4. Location of coating application with reference to environmental considerations.
5. Diameter, length, and location of pipeline, including maps and drawings necessary to show all details of the pipeline.
6. 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.
7. The purchaser should state whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
8. Requirements for outdoor storage (Sec. 1.1.1).
9. Details of other federal, state or provincial, and local requirements (Sec. 4.2).
10. If materials only are being purchased according to the requirements of Sec. 4.3 of this standard, 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 inner mat (Sec. 4.3.5). The purchaser should also specify if an affidavit of compliance is required (Sec. 6.3).
11. Type of liquid adhesive (Sec. 4.3.2).
12. Type of coal-tar enamel (Sec. 4.3.3).

13. Type of outerwrap (Sec. 4.3.4).
14. Length of pipeline requiring internal protection (Sec. 4.4.1.1).
15. 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).
16. Requirements for coating system thickness (Sec. 4.4.1.3 and 4.7).
17. Lining and coating of pipe ends (Sec. 4.4.10).
18. 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 liquid adhesive (Sec. 4.6.5.1); (2) quantity of tape (Sec. 4.6.5.2); and (3) affidavit of compliance, if required (Sec. 6.3).
19. Additional materials or procedures (Sec. 4.6.2).
20. Thickness of tape (Table 4).
21. Adhesion tests (Sec. 4.6.8).
22. Additional exterior protection that may be required. Typically, the exterior coating includes a glass fiber innerwrap and outerwrap (Sec. 4.7).
23. Trench bedding and backfilling (Sec. 4.8.3).
24. Samples of materials, if required (Sec. 5.1.4).
25. Inspection, testing, and rejection (Sec. 5.1.4.1).
26. 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 revisions made to the standard in this edition include the following:

1. Sec. 4.2 was revised to include a requirement for NSF/ANSI 61 certification if a lining system is to be in contact with drinking water.
2. Former Sec. 4.4.7, Enameling of adhesive coated pipe after heating, has been deleted.
3. Former Sec. 4.4.9.8, Exterior coating system construction requirements, has been moved and included as part of Sec. 4.7.2, Additional exterior protection systems.
4. Additional requirements have been added under Sec. 4.7.2, Additional exterior protection systems.
5. Sec. 4.8, Field procedures, has been rewritten.
6. A new Sec. 5.3, Thickness testing, has been added.

7. A new Sec. 5.4.15, Cathodic disbondment, has been added.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer and 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 the group at standards@awwa.org.

This page intentionally blank.



**American Water Works
Association**

AWWA C203-08
(Revision of ANSI/AWWA C203-02)

AWWA Standard

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

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.* Because 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 *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.