ANSI/AWWA **C223-25**

(Revision of ANSI/AWWA C223-19)

Fabricated Steel and Stainless-Steel Tapping Sleeves

Effective date: Oct. 1, 2025.
First edition approved by Board of Directors June 16, 2002.
This edition approved Jan. 23, 2025.
Approved by American National Standards Institute Feb. 10, 2025.

American Water Works Association

Approved American National Standard ANSI

STANDARD Since 1881

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 code of any governmental authority. AWWA standards are intended to represent a consensus of the water industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed in the Official Notice 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.

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether that person has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review, and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American National Standard are encouraged to state on their own responsibility in advertising and promotional materials or on tags or labels that the goods are produced in conformity with particular American National Standards.

Caution Notice: The American National Standards Institute (ANSI) approval date on the front cover of this standard indicates completion of the ANSI approval process. This American National Standard may be revised or withdrawn at any time. ANSI procedures require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of ANSI approval. Purchasers of American National Standards may receive current information on all standards by writing the American National Standards Institute, 1180 Avenue of the Americas, 10th Floor, New York, NY 10036; calling 212.642.4900; or emailing info@ansi.org.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including scanning, recording, or any information or retrieval system. Reproduction and commercial use of this material is prohibited, except with written permission from the publisher. Please send any requests or questions to permissions@awwa.org.

ISBN-13, print: 978-1-64717-268-8

ISBN-13, electronic: 978-1-61300-789-1

DOI: https://doi.org/10.12999/AWWA.C223.25

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including scanning, recording, or any information or retrieval system. Reproduction and commercial use of this material is prohibited, except with written permission from the publisher.

Copyright © 2025 by American Water Works Association
Printed in USA

Copyright 2025 by American Water Works Association All Rights Reserved

Committee Personnel

The Steel Water Pipe Manufacturers Technical Advisory Committee (SWPMTAC) Task Group for AWWA C223, which reviewed and revised this standard, had the following personnel at the time:

James Tubb, *Chair*

C. Boone, Romac Industries, Bothell, Wash.
S. Bradberry, Ford Meter Box Company, Pell City, Ala.
B. Dix, Felker Brothers Corp., Marshfield, Wis.
C. Dodson, Smith-Blair Inc., Texarkana, Ark.
T. Bain Ervin, Mueller Company, Cleveland, Tenn.
R. Fontes, Dresser, Olean, N.Y.
J.M. Grocki, Nickel Institute, Enfield, Conn.
K. Hicks, Ford Meter Box Company, Pell City, Ala.
A. Lemke, Romac Industries, Bothell, Wash.
M. Levine, Performance Coupling (Straub), National City, Calif.
C. Littlebrant, Cascade Waterworks Manufacturing Co., Yorkville, Ill.
E. Nunes, Mueller Co./Krausz, Cleveland, Tenn.
L. Prinsloo, Victaulic, Ft. Mill, S.C.
P. Ray, JCM Industries Inc., Nash, Tex.
J. Reinheimer, Robar Industries Ltd., Surrey, B.C.
D. Seals, JCM Industries Inc., Nash, Tex.
J. Tubb, JCM Industries Inc., Nash, Tex.

The AWWA Standards Committee on Stainless-Steel Pipe, which reviewed and approved this standard, had the following personnel at the time of approval:

J. Warren Green, *Chair*
Terri A. Tovey, *Vice-Chair*
Katherine Despinoy, *Secretary*

General Interest Members

R.J. Card (*alternate*), Lockwood, Andrews & Newnam Inc., Suwanee, Ga.
K. Despinoy, Stanley Consultants, Chicago, Ill.
M. Garcia, AECOM, Denver, Colo.
J.W. Green, Lockwood, Andrews & Newnam Inc., Oak Brook Terrace, Ill.

Copyright 2025 by American Water Works Association All Rights Reserved

A. Gruber, STV Inc., San Antonio, Tex.
J. Holzapfel, Consultant, Naperville, Ill.
M. Kurtis (*alternate*), Jacobs Engineering, Bellingham, Wash.
K. LeBrasse, Burns and McDonnell, Denver, Colo.
D. Mason (*liaison, nonvoting*), Standards Council Liaison, O&M Enterprises Inc., Holden, Mo.
D.L. McPherson, HDR Engineering Inc., Charlotte, N.C.
J. Metcalf, Dannenbaum Engineering Corp., Spring, Tex.
E.S. Ralph (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.
T.A. Tovey, Jacobs Engineering, Portland, Ore.
R. Wagner (*alternate*), HDR Engineering, Dallas, Tex.

Producer Members

D.A. Dechant, Dechant Infrastructure Service, Aurora, Colo.
D. DiGiallonardo, Primus Pipe and Tube, Wildwood, Fla.
J.M. Grocki, Advantage Resources Consulting LLC, Hilton Head Island, S.C.
B.D. Keil, Northwest Pipe Company, Salt Lake City, Utah
A. Lemke, Romac Industries Inc., Bothell, Wash.
R.D. Mielke (*alternate*), Northwest Pipe Company, Raleigh, N.C.
L. Prinsloo *(alternate),* Victaulic, Easton, Pa.
J. Reinheimer, Robar Industries Ltd., Surrey, B.C.
B. Ripley, Victaulic, Lexington, S.C.
D. Seals, JCM Industries, Nash, Tex.

User Members

L. Adams (*alternate*), USBR, Denver, Colo.
G. Bailey, Dallas Water Utilities, Carrollton, Tex.
D. Hughes, Denver Water, Denver, Colo.
D. Martin, Green Bay Water Utility, Green Bay, Wis.
B.R. Osborne, Clark County Public Works, Las Vegas, Nev.
B. Powell (*alternate*), Green Bay Water Utility, Green Bay, Wis.
R. Schlosser, USBR, Golden, Colo.
D. Stickel, Saginaw-Midland Municipal Water Supply Corp., Bay City, Mich.
S. Sweis, San Diego County Water Authority, San Diego, Calif.

Copyright 2025 by American Water Works Association All Rights Reserved

Contents

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

SEC.		PAGE
Foreword		
I	Introduction	vii
I.A	Background	vii
I.B	History	vii
I.C	Acceptance	vii
II	Special Issues	ix
II.A	Chlorine and Chloramine Degradation of Elastomers	ix
II.B	Gasket Degradation Study	ix
III	Use of This Standard	ix
III.A	Purchaser Options and Alternatives	ix
III.B	Modification to Standard	x
IV	Major Revisions	x
V	Comments	xi
Standard		
1	**General**	
1.1	Scope	1
1.2	Purpose	1
1.3	Application	2
2	**References**	2
3	**Definitions**	4
4	**Requirements**	
4.1	Permeation	6
4.2	Materials of Construction	7
4.3	Design	8
4.4	Fabrication	9
4.5	Coatings	10
4.6	Installation Instructions	10
5	**Verification**	
5.1	Inspection	11
5.2	Quality Assurance	11
5.3	Test Procedures	11
5.4	Notice of Nonconformance	12
6	**Delivery**	
6.1	Marking	12
6.2	Packing and Shipping	12
6.3	Affidavit of Compliance	12
Appendix		
A	Postfabrication Cleaning of Stainless Steels	13
Figure		
1	Typical Fabricated Tapping Sleeve with Tapping Valve and Tapping Machine	5

Copyright 2025 by American Water Works Association All Rights Reserved

This page intentionally blank.

Copyright 2025 by American Water Works Association All Rights Reserved

Foreword

This foreword is for information only and is not a part of ANSI/AWWA C223.*

I. Introduction

I.A. *Background*. Fabricated tapping sleeves are used to provide outlets on piping systems. They are made by several producers and, though details differ, all tapping sleeves provide similar features. They provide a means of attaching a tapping valve and tapping machine and a means of sealing onto or around the existing pipe.

Tapping sleeves are most often connected to tapping valves and therefore require a recess per MSS† SP-60 to be machined or cast into the design of the flange. This recess modifies the flange beyond ANSI/AWWA standards C207 Steel Pipe Flanges for Waterworks Service and C228 Stainless-Steel Pipe Flanges for Water Service; however, flanges fabricated to ANSI/AWWA C207 and ANSI/AWWA C228 with an MSS SP-60 recess have been used successfully on tapping sleeves in the waterworks industry for more than 30 years. The use of an MSS SP-60 recess does not diminish the connection integrity between the flange and the pipe/neck and is substantiated by more than 30 years of successful usage and service records of existing installations. To further substantiate the use of an MSS SP-60 recess in ANSI/AWWA C207 and ANSI/AWWA C228 flanges, the AWWA Stainless-Steel Pipe Committee conducted testing, performed a finite element analysis, and prepared a document of the findings on the integral flange connection. This document, titled "AWWA Steel Slip-On Ring Flange Pipe Insertion Analysis," was presented to the AWWA Steel Pipe Committee on June 12, 2018, and a copy was included in the meeting minutes.

I.B. *History*. The first edition was approved by the Board of Directors on June 16, 2002. Subsequent editions were approved on June 24, 2007; June 9, 2013; and Feb. 1, 2019. This edition was approved on Jan. 23, 2025.

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)

* American National Standards Institute, 1180 Avenue of the Americas, 10th Floor, New York, NY 10036.

† Manufacturers Standardization Society of the Valve and Fittings Industry, 441 North Lee Street, Alexandria, VA 22314.

Copyright 2025 by American Water Works Association All Rights Reserved

and the Conference of State Health and Environmental Managers (COSHEM). 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. Specific policies of the state or local agency.

2. Four standards developed under the direction of NSF:[§] NSF/ANSI/CAN[¶] 60, Drinking Water Treatment Chemicals—Health Effects; NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects; NSF/ANSI/CAN 372, Drinking Water System Components—Lead Content; and NSF/ANSI/CAN 600, Health Effects Evaluation and Criteria for Chemicals in Drinking Water.

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/CAN 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.

NSF/ANSI/CAN 600 (which formerly appeared in NSF/ANSI/CAN 60 and 61 as Annex A, "Toxicology Review and Evaluation Procedures") 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 NSF/ANSI/CAN 600 procedures may not always be identical, depending on the certifier.

ANSI/AWWA C223 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.

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

[§] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

[¶] Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.

[**] Both publications available from The National Academies Press, 500 Fifth Street, NW, Washington, DC 20001.

Copyright 2025 by American Water Works Association All Rights Reserved

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. *Chlorine and Chloramine Degradation of Elastomers.* The selection of materials is critical for water service and distribution piping in locations where there is a possibility that elastomers will be in contact with chlorine or chloramines. Documented research has shown that elastomers such as gaskets, seals, valve seats, and encapsulations may be degraded when exposed to chlorine or chloramines. The impact of degradation is a function of the type of elastomeric material, chemical concentration, contact surface area, elastomer cross section, environmental conditions, and temperature. Careful selection of and specifications for elastomeric materials and the specifics of their application for each water system component should be considered to provide long-term usefulness and minimum degradation (swelling, loss of elasticity, or softening) of the elastomer specified.

II.B. *Gasket Degradation Study*. A pipe gasket, having the hardness of a compressed elastomer with a large mass relative to the small, exposed surface area, experiences minimal degradation. This was validated in a research paper reported in *Journal AWWA,*[††] where the pipe gasket degradation in a 110 mg/L chloramine solution was found to degrade just the exposed surface.

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 C223, Fabricated-Steel and Stainless-Steel Tapping Sleeves, of latest revision.

2. Whether compliance with NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects, is required.

3. Quantity.

4. Type of pipe(s), including specification to which the pipe(s) is made, or specification and tolerance of outside diameter.

5. Nominal pipe size(s).

[††] Bonds, R.W. 2004. "Effect of Chloramines on Ductile-iron Pipe Gaskets of Various Elastomer Compounds." *Journal AWWA,* 96(4):153–160.

Copyright 2025 by American Water Works Association All Rights Reserved

6. Wall thickness or class of pipe.

7. Type of service (i.e., line content, aboveground or belowground, etc.).

8. Working pressure, transient pressure, and test pressure.

9. Operating temperature range.

10. Flange specification, including dimensions for accommodating tapping valve fit-up (Sec. 4.2.3.1 and Sec. 4.2.3.2).

11. Tapping sleeve and tapping-sleeve flange material.

12. Documentation requirements.

13. Requirements for test connections and postinstallation pressure testing.

14. Outlet size and type (flanged, MJ adaptor, etc.).

15. Actual outside diameter of pipe, including any coatings and pipe length available for installation of tapping sleeve (Section 3).

16. Details of federal, state, provincial, territorial, and local requirements (Sec. 4.2.1).

17. Special requirements, such as coatings, gasket material, and bolting (Sec. 4.3.1).

18. Inspection by the purchaser (Sec. 5.1.2).

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 revision include the following:

1. In the foreword, Sec. I.A Background, second paragraph, the wording was changed from "significantly affect the integral connection between …" to "diminish the connection integrity between …"

2. Updated Sec. I.C Acceptance in the foreword with the latest Standards Council language reflecting the addition of references to NSF/ANSI/CAN 372 and NSF/ANSI/CAN 600.

3. The definition for *nominal pipe size* was changed to *nominal diameter;* the definition for *shop test pressure* was changed to *test pressure* and the typical working pressure multiplier was included.

4. Updated Sec. 4.2.1 Materials with the latest Standards Council boilerplate language.

5. In Sec. 4.2.3.4, the use of the term *flanges* was changed to *outlet connections.*

6. In the second paragraph of Sec. 4.3.2 Body Thickness, Flange Gaskets, and Flange Class and Drilling, the words *drilling dimensions* and *flange* were omitted to be more concise.

Copyright 2025 by American Water Works Association All Rights Reserved

7. Sec. 4.5.3 Stainless-Steel Tapping Sleeves was revised and a new paragraph added to be consistent with other stainless-steel standards.

8. Previous foreword Sec. III.B Purchaser's Proof Test was moved to Sec. 5.3.1 in the standard, and the term *maximum* was removed from the text.

9. Additional information was added to Sec. 6.1 Marking to be consistent with other stainless-steel standards.

10. Added Appendix A, Postfabrication Cleaning of Stainless Steels.

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711, write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098, or email standards@awwa.org.

Copyright 2025 by American Water Works Association All Rights Reserved

This page intentionally blank.

Copyright 2025 by American Water Works Association All Rights Reserved

American Water Works Association

ANSI/AWWA C223-25
(Revision of ANSI/AWWA C223-19)

AWWA Standard

Fabricated Steel and Stainless-Steel Tapping Sleeves

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes fabricated steel and stainless-steel tapping sleeves used to provide outlets and branches on existing pipe with or without interruption of service. They are intended for pipe sizes 4 in. (100 mm) through 48 in. (1,200 mm) with branch outlets through 36 in. (900 mm). This standard includes requirements for materials, dimensions, tolerances, finishes, and testing. This standard is for tapping sleeves that are bolted to in-service pipelines and is not intended to apply to tapping sleeves welded to pipe. Fabricated tapping sleeves are intended for the transmission and distribution of water, reclaimed water, and wastewater, and for use in other water-supply system facilities. For outlets and main sizes greater than those specified, consult the manufacturer.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for fabricated tapping sleeves for various pipe materials, including components, testing, and marking requirements.

Copyright 2025 by American Water Works Association All Rights Reserved