



**American Water Works  
Association**

ANSI/AWWA C228-08  
(First Edition)

The Authoritative Resource for Safe Water®

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*AWWA Standard*

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# Stainless-Steel Pipe Flanges for Water Service—Sizes 2 In. Through 72 In. (50 mm Through 1,800 mm)



Effective date: Oct. 1, 2008.

This first edition approved by AWWA Board of Directors Jan. 27, 2008.

Approved by American National Standards Institute May 2, 2008.

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## Committee Personnel

The Steel Water Pipe Manufacturers Technical Advisory Committee (SWPMTAC) Task Group on C228, which developed this standard, had the following personnel at the time:

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

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Kent Taylor, *Secretary*

*General Interest*

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M. Garcia, Denver Water, Denver, Colo.	(AWWA)
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\* Liaison, nonvoting

† Alternate



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# Foreword

*This foreword is for information only and is not a part of ANSI/AWWA C228.*

## **I. Introduction.**

I.A. *Background.* Stainless steel is a standard material used to construct piping and flanges. It offers very low corrosion rates, which makes it suitable for the handling of potable water while maintaining purity and quality.

I.B. *History.* In 1945, at the request of the American Society of Mechanical Engineers (ASME), a committee having representatives from both ASME and AWWA was formed. The ASME/AWWA committee was charged with establishing standards for steel flanges having dimensions and pressure ratings commensurate with the pressures commonly used in water service. The standards were necessary because the lowest pressure ratings for steel flanges at that time were those having cold-water pressure ratings of 275 psi (1,896 kPa) (ASME\* B16.5, Pipe Flanges and Flanged Fittings) or 150-psi (1,034-kPa) primary pressure ratings. The ratings were far higher than those ordinarily needed for water service.

The generally accepted rules for the design of bolted flanged connections embraced all fields of usage and a wide range of pressure and temperature applications. It is not within the scope of this standard to deal with temperatures greater than the atmospheric range, and it is possible to restrict consideration to joints with softer gaskets and to flanges that are flat-faced. The designs were prepared in conformity with these limitations for carbon steel and first adopted in 1952. In 1999, AWWA developed a new standard for stainless-steel pipe, which then required a new standard for stainless-steel flanges.

In 1999, the AWWA Standards Council directed the Standards Committee on Steel Pipe to develop a standard for stainless-steel flanges used in water treatment and conveying facilities. In 2003, Standards Council approved the formation of the Standards Committee on Stainless Steel Pipe, which assumed responsibility for the development of this standard. This is the first edition of this standard. It was approved by the AWWA Board of Directors on Jan. 27, 2008.

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\*ASME International, Three Park Avenue, New York, NY 10016.

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 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

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

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

‡Both publications available from National Academy of Sciences, 500 Fifth Street, N.W., Washington, DC 20001.



(noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C228 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 parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

**II. Special Issues.** Ring flanges included in this standard are for integral use on stainless-steel pipe only, and not for use as a loose backup flange. The thicknesses shown in the ring flange tables are based on the LaTour Barnard Analysis as presented in the *Steel Ring Flanges for Steel Pipe—Armco Bulletin 47A* (1947), and have been used successfully in the waterworks industry for more than 50 years. The flange thickness design using the LaTour Barnard Analysis is based on limiting flange stress to 22,500 psi (155 MPa) at the rated pressure. Thickness design of blind flanges has been based on the ASME Boiler and Pressure Vessel Code Design Method in Section VIII, Division 1, UG-34.

**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, Stainless-Steel Pipe Flanges for Water Service—Sizes 2 In. through 72 In. (50 mm Through 1,800 mm), of latest edition.
2. Whether compliance with NSF/ANSI 61 Drinking Water System Components—Health Effects, is required.
3. Details of other federal, state or provincial, and local requirements.
4. Mill test certification (Sec. 4.1.2.4).
5. Class of flange required (Tables 2, 3, and 4).
6. Inside diameter of flanges (Tables 2 and 3).
7. Gaskets—rubber or nonasbestos (Sec. 4.1.4) and gasket thickness.

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.** This is the first edition of this standard.

**V. Comments.** If you have any comments or questions about this standard, please call AWWA Volunteer and Technical Support Group at 303.794.7711, FAX 303.795.7603, write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail at [standards@awwa.org](mailto:standards@awwa.org).



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**SECTION 1: GENERAL**

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**Sec. 1.1 Scope**

This standard describes stainless-steel ring-type slip-on flanges and blind flanges for use in conjunction with stainless-steel pipe used in facilities of waterworks service.

**Sec. 1.2 Purpose**

The purpose of this standard is to provide minimum material requirements and dimensions for a variety of stainless-steel flanges for attachment to stainless-steel piping systems.

**Sec. 1.3 Application**

1.3.1 *Intended use.* Flanges in this standard are described in the following tables:

1. Table 2 and Table 3, ring-type slip-on flanges.
2. Table 4, blind flanges.