ANSI/AWWA C207-07
(Revision of ANSI/AWWA C207-01)

American Water Works Association

The Authoritative Resource on Safe Water®

AWWA Standard

Steel Pipe Flanges for Waterworks Service—Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)

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AWWA Standard

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AWWA unites the entire water community by developing and distributing authoritative scientific and technological knowledge. Through its members, AWWA develops industry standards for products and processes that advance public health and safety. AWWA also provides quality improvement programs for water and wastewater utilities.

Committee Personnel

The Steel Water Pipe-Manufacturers Technical Advisory Committee (SWPMTAC) Task Group on updating AWWA C207, which developed this standard, had the following personnel at the time:

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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 C207.

I. Introduction.

I.A. *Background.* Steel flanges have been used with steel pipe in the waterworks field since the first riveted steel water-supply lines were installed with flanges attached by riveting. Flanges manufactured according to unofficial flange standards, such as the riveted-pipe manufacturer's standards, were in common use for 50 years or more before the advent of ANSI/AWWA C207. Steel-plate ring flanges and rolled-angle flanges, to match the drilling of existing cast valves and cast fittings, were also used extensively.

The greatly increased usage of steel pipe for waterworks service during the 1930s made standardization of flanges desirable. The first step toward standardization was taken in 1942 when a paper* proposing standards for slip-on steel-ring flanges for welding to steel water pipe was presented at the annual conference of the American Water Works Association (AWWA).

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 waterworks 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) (150-psi [1,034-kPa] primary pressure rating). 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. In waterworks practice, it is not necessary, 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.

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*Hill, H.O., et al., Fabricated Steel Ring Flanges for Water Pipe Service for Low Pressure and Low Temperatures, *Jour. AWWA* 36(9):968 (September 1944).

† ASME International, Three Park Avenue, New York, NY 10016.

The ASME/AWWA committee gave careful consideration to the following: (1) the effect of new standards on existing equipment; (2) the fact that cast valves and fittings will always have flanges of large outside diameter, which cannot be reduced because of the wall thickness of this equipment; (3) the need for interchangeability of equipment through the medium of common drilling templates; and (4) the fact that standards could be based on the successful usage and good service records of existing installations.

A survey of water utility users indicated that it was desirable to maintain the outside diameter and drilling of flanged fittings and valves given in ANSI/AWWA C500, Gate Valves for Water and Sewage Systems, and ANSI/AWWA B16.1, Cast Iron Pipe Flanges and Flanged Fittings (for classes 25, 125, 250, and 800). The committee decided to follow this practice for sizes 6 in. through 48 in. (150 mm through 1,200 mm).

In its extensive deliberations, the ASME/AWWA committee had available the results of special research and testing conducted by Armco Steel Corporation, Bethlehem Steel Company, and Taylor Forge and Pipe Works. The various design methods and test results are given in "Steel Ring Flanges for Steel Pipe," Bulletin 47-A (1947), from the American Rolling Mill Company, Middletown, Ohio. The design of flanges for waterworks service, with the results of the preceding report, was published in *Journal AWWA* in October 1950, pp. 931–944. A discussion in the paper by Taylor Forge, participants in the ASME/AWWA committee, states the reasons why a waterworks flange is not an ASME/Taylor Forge flange. Concern about high secondary stresses at the attachment, e.g., thick material to thin wall pipe, is covered here along with the published "Design of Wye Branches" (*Journal AWWA* June 1955, appendix C, pp. 581–630).

Tables 1 through 6 are based on historical dimensions and are presented without additional calculations.

I.B. *History.* The report of the ASME/AWWA committee was approved in 1951, and the first edition of this standard, designated AWWA C207-52T, was published under the title "Tentative Standard Specifications For Steel Pipe Flanges" in 1952. That edition covered diameters from 6 in. to 48 in. (150 mm to 1,200 mm) and pressures through 150 psi (1,034 kPa). In 1954, a committee composed of Taylor Forge, Armco, Bethlehem, and consulting engineers revised the existing standard to include diameters through 96 in. (2,400 mm) and pressures to 275 psi (1,896 kPa). This revision was published under designation AWWA C207-55,

Standard Specifications/Standard For Steel Pipe Flanges. The standard was further revised and the next edition published in 1978 as ANSI/AWWA C207, Steel Pipe Flanges For Waterworks Service—Sizes 4 In. Through 144 In. The next edition, designated C207 with the same title, was published in 1986 and revised the maximum test pressure to 125 percent of the flange rating, added segmentation of flanges, blind flanges, class E ring flanges, class F ring and hub flanges, and tolerances for flange draft or layback. This previous edition was approved by the AWWA Board of Directors on June 17, 2001. This edition was approved on Jan. 21, 2007.

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.

*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.

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 C207 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. It should be noted that thickness and dimensional design of ring and hub flanges have been based on references given in the background section of this foreword, as well as industry standard and other empirical data. Thickness design of the blind flanges has been based on the ASME Code Design Method.

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.* When purchasing steel flanges for steel water pipe, the purchaser shall specify the following:

[*]Both publications available from National Academy of Sciences, 500 Fifth St., N.W., Washington, DC 20001.

1. Standard used—that is, ANSI/AWWA C207, Steel Pipe Flanges for Waterworks Service—Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm), of latest edition.

2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required, in addition to the requirements of the Safe Drinking Water Act.

3. Type of flanges required—ring or hub type (Sec. 1.1).

4. Details of other federal, state, or provincial, and local requirements (Sec. 4.1.1).

5. Gaskets—rubber or nonasbestos (Sec. 4.1.5) and gasket thickness for diameters up to and including 24 in. (610 mm).

6. Coating selection (Sec. 4.4).

7. Pressure rating required (Tables 2 through 7).

8. Class of flange required (Tables 2 through 7).

9. Inside diameter of flanges (Tables 2 through 7).

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

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

1. Added Standards Council materials language (Sec. 4.1.1).

2. Added Standards Council permeation language (Sec. 4.1.2).

3. Added equivalent stainless steel material language (Sec. 4.1.4).

4. Added alternative language for unavailable y value rubber gaskets (Sec. 4.1.5).

5. Added Sec. 4.2.2.2 on flange face condition.

6. Added new language about fillet weld sizing for flange attachment (Sec. 4.3.1).

7. Added "impression" in Sec. 6.1.

8. Deleted 138 in. flange information in Tables 2 and 5.

9. Changed flange bore tolerances in Tables 2, 5, and 6.

10. Deleted flange ID (B) values for sizes 26 in. through 48 in. in Table 6.

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

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ANSI/AWWA C207-07
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AWWA Standard

Steel Pipe Flanges for Waterworks Service—Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes two types of slip-on flanges, ring-type and hub-type, that may be used interchangeably if the dimensions given in the standard are used. The standard also describes blind flanges. The flange types and the tables that describe them are

1. Ring-type, slip-on flanges (see Tables 2, 5, and 6).
2. Hub-type, slip-on flanges (see Tables 3 and 4).
3. Blind flanges (see Table 7).

Unless otherwise specified by the purchaser, the manufacturer shall select the type to be used.

Sec. 1.2 Purpose

The purpose of this standard is to provide minimum material requirements and dimensions for a variety of steel flanges for attachment to steel water pipe and fittings.