

American Water Works Association

ANSI/AWWA C208-96

(Revision of C208-83[R89])



AWWA STANDARD
FOR
**DIMENSIONS FOR FABRICATED
STEEL WATER PIPE FITTINGS**



Effective date: Mar. 1, 1997.

First edition approved by Board of Directors Jan. 26, 1959.

This edition approved June 23, 1996.

Approved by American National Standards Institute Nov. 29, 1996.

AMERICAN WATER WORKS ASSOCIATION

6666 West Quincy Avenue, Denver, Colorado 80235

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Committee Personnel

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

James R. Davenport, <i>Chair</i>	
Clifford J. Anderson	Marvin Mintz
Kenneth Caldwell	Ram N. Satyarthi
Robert J. Card	Kirby L. Shaddixi
Delbert H. Eaton	John C. Taylor
Samuel W. Eskew	Donald R. Wagner
Clifford R. McCormick	

The Standards Committee on Steel Pipe, which developed this standard, had the following personnel at the time of approval:

George J. Tupac, *Chair*
 John H. Bambei Jr., *Vice-Chair*
 Dennis Dechant, *Secretary*

Consumer Members

G.A. Andersen, NYC Bureau of Water Supply, Corona, N.Y.	(AWWA)
Ergun Bakall, San Diego County Water Authority, San Diego, Calif.	(AWWA)
J.H. Bambei Jr., Denver Water Department, Denver, Colo.	(AWWA)
J.L. Doane, Portland Water Bureau, Portland, Ore.	(AWWA)
R.V. Frisz, US Bureau of Reclamation, Denver, Colo.	(USBR)
W.M. Kremkau, Washington Suburban Sanitation Commission, Laurel, Md.	(AWWA)
T.A. Larson, Tacoma Water Division, Tacoma, Wash.	(AWWA)
R.T. Menlove, Los Angeles Department of Water & Power, Los Angeles, Calif.	(AWWA)
G.M. Snyder, Metropolitan Water District of Southern California, Los Angeles, Calif.	(AWWA)
M.L. Young, East Bay Municipal Utility District, Stockton, Calif.	(AWWA)

General Interest Members

G.E. Block Jr., Rizzo Associates Inc., Natick, Mass.	(NEWWA)
W.R. Brunzell, Brunzell Associates Ltd., Skokie, Ill.	(AWWA)
B.R. Bullert,* Council Liaison, City of St. Paul Water Utility, St. Paul, Minn.	(AWWA)

*Liaison, nonvoting

R.L. Coffey, R.W. Beck and Associates, Seattle, Wash.	(AWWA)
B.R. Elms,* Standards Engineer Liaison, AWWA, Denver, Colo.	(AWWA)
L.J. Farr, CH2M Hill Inc., Redding, Calif.	(AWWA)
S.N. Foellmi,† Black & Veatch Engineers, Irvine, Calif.	(AWWA)
J.W. Green, Alvord Burdick & Howson, Chicago, Ill.	(AWWA)
K.D. Henrichsen, HDR Engineering Inc., Denver, Colo.	(AWWA)
G.K. Hickox, Engineering Consultant, Houston, Texas	(AWS)
M.B. Horsley, Black & Veatch Engineers, Kansas City, Mo.	(AWWA)
J.K. Jeyapalan, American Ventures Inc., Bellevue, Wash.	(AWWA)
R.Y. Konyalian, Engineering Consultant, Irvine, Calif.	(AWWA)
Earl Smock,† J.M. Montgomery Construction Engineers, Walnut Creek, Calif.	(AWWA)
R.V. Stokes, J.M. Montgomery Engineers, San Diego, Calif.	(AWWA)
H.R. Stoner, Henry R. Stoner Associates Inc., North Plainfield, N.J.	(AWWA)
Chris Sundberg,† CH2M Hill Inc., Bellevue, Wash.	(AWWA)
G.J. Tupac, G.J. Tupac & Associates, Pittsburgh, Pa.	(AWWA)
L.W. Warren, KCM Inc., Seattle, Wash.	(AWWA)
W.R. Whidden, Post Buckley Schuh & Jernigan, Winter Park, Fla.	(AWWA)
R.E. Young, Robert E. Young Engineers, Sacramento, Calif.	(AWWA)

Producer Members

H.H. Bardakjian, Ameron Pipe Products Group, Rancho Cucamonga, Calif.	(AWWA)
T.R. Brown, Smith-Blair Inc., Uniontown, Pa.	(AWWA)
J.H. Burton, Baker Coupling Company Inc., Los Angeles, Calif.	(SPFA)
R.J. Card, Thompson Pipe & Steel Company, Englewood, Colo.	(AWWA)
J.R. Davenport, California Steel Pressure Pipe, Riverside, Calif.	(AWWA)
Dennis Dechant, Northwest Pipe & Casing Co., Portland, Ore.	(AWWA)
G.M. Harris, Harris Corrosion Specialists, Longboat Key, Fla.	(AWWA)
J.R. Pegues, American Cast Iron Pipe Co., Birmingham, Ala.	(MSS)
Bruce Vanderploeg,† Northwest Pipe & Casing Co., Portland, Ore.	(AWWA)
J.A. Wise, Canus Industries Inc., Burnaby, B.C.	(AWWA)

*Liaison, nonvoting

†Alternate

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Foreword

This foreword is for information only and is not a part of AWWA C208.

I. Introduction

I.A. *Background.* Steel pipe has been used for waterlines in the United States since the 1850s. With the development of the Bessemer process in 1855 and the open hearth process in 1861, steel, the strongest and most versatile refinement of iron, became available for water pipe.

Available records disclose installations of steel water pipe as early as 1858. The pipe was first manufactured by rolling steel sheets or plates into shape and riveting the seams. This method of fabrication continued with improvements into the 1930s. In 1905, lock-bar pipe was introduced and, by 1930, had nearly supplanted riveted pipe. By the early 1930s, both riveted and lock-bar methods were gradually phased out and welding dominated the pipe-making process. As welding became more universal in pipeline construction and manufacturing, varying steel shapes able to accommodate pipeline hydraulics and locations became more prevalent. Over the years, rigid specifications have been developed and new product developments and improvements in manufacturing techniques and processes have been established to ensure the purchaser a product of high standards.

I.B. *History.* This standard was first proposed in 1955 to provide standard dimensions for steel water pipe fittings. It was approved as a "tentative" standard on July 14, 1955. Revisions in the text were approved on Dec. 31, 1957, and were incorporated in the fourth and later printings. The revisions consisted of the addition of an explanatory paragraph, changes in the table for fittings for service in transmission and distribution mains, and clarification of the figures detailing the various fittings. The standard was approved without further revision on Jan. 26, 1959.

Revisions to the text were approved on June 21, 1983, and incorporated in the sixth and later printings. These revisions include the following:

1. Addition of a foreword to provide the history of a standard and major revisions.
2. Revision of Table 1, deleting 4-in. pipe size and extending pipe sizes to 144 in.
3. Revision of Table 2.
4. Expansion of Figure 3 to include sizes to 144 in.
5. Deletion of Table 4.
6. Deletion of alternate Table 3.
7. Deletion of Table 5.
8. Addition of reducing tees and deletion of smooth 90° elbow category from Figure 1 and Table 1.

The information in Table 1 was changed from a tabular format to a formula format in order to ascertain dimensions for tees, crosses, wyes, laterals, and reducers. A factor f was introduced in the new Table 1 to facilitate the use of formulas for computing fitting dimensions and furnished formulas for elbow layout to facilitate the design of elbows not tabulated.

Addendum C208-84 was approved on June 4, 1984. The addendum added a note of caution to Tables 2A through 2D concerning hoop tension concentration in elbows with a radius of less than 2.5D. ANSI/AWWA C208-83, including C208-84, was reaffirmed without revision on June 18, 1989. ANSI/AWWA C208-96 was approved by the Board of Directors on June 23, 1996.

I.C. *Acceptance.* This standard has no applicable information for this section.

II. **Special Issues.** This standard has no applicable information for this section.

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 C208, Standard for Dimensions for Fabricated Steel Water Pipe Fittings, of latest revision.
2. Type of fitting required (i.e., elbow, tee, reducer, wye, lateral, etc.).
3. Radius of elbows (i.e., 1D, 1.5D, 2.5D, or other).
4. Number of pieces or segments for elbows.
5. Design pressure and specifications for pipe to which the steel fitting will connect (i.e., ANSI/AWWA C200, AWWA M11).
6. Type of end connection required (i.e., plain, beveled end for field butt welding, bell or spigot for field lap welding, bell or spigot O-ring, and flanged or mechanical coupling).
7. Submittal of shop detail and assembly drawings.
8. Special handling, inspection, or testing requirements.
9. Lining and coating required.

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 this standard in this edition include the following:

1. The format has been changed to AWWA standard style.
2. The definitions of parties (Sec. 3) have been revised to approved wording.
3. Sec. 1.1.1, Conditions Not Covered (previously Sec. 1.2), has been revised to clarify that this standard is a dimensional guide only and that all design of fittings should be made in accordance with the applicable sections of AWWA Manual M11.
4. Sec. 4.1.2 has been added and includes all symbols used in tables and formulas within the standard.
5. Sec. 4.1.3, Tees and Crosses (previously Sec. 2.2), has been revised to include a formula for calculating dimensions for any pipe outside diameter.
6. Sec. 4.1.4, Reducing Tees and Reducing Crosses (previously Sec. 2.3), has been revised to include reducing crosses.
7. Sec. 4.1.5, Laterals (previously Sec. 2.4), has been separated into Sec. 4.1.5 for Case I (equal diameters) and Sec. 4.1.6 for Case II (unequal diameters) with new symbols G_r and G_o and new formulas added.
8. Sec. 4.1.7, Wyes (previously Sec. 2.5), now includes dimensions for 90° wyes, which are given in Table 1, and formulas to calculate other diameters and degrees.
9. Sec. 4.1.9, Tangential Outlets (previously Sec. 2.8), has been revised and Table 3 has been replaced with a formula and a caution about keeping dimension L short to avoid damage in handling and shipping.
10. Sec. 4.1.10, Miter End Cuts, has been added.
11. Sec. 4.1.11, Elbows (previously Sec. 2.7), has been changed; dimensional tables have been deleted and formulas have been added for calculating dimensions

for any diameter. Current philosophy for fabricating elbows into pipe lengths instead of individual short pieces is also discussed.

12. Figure 2 has been added to present recommended dimensions for water pipe elbows, including two-piece elbows (0° to 22.5°), three-piece elbows (more than 22.5° to 45°), four-piece elbows (more than 45° to 67.5°), and five-piece elbows (more than 67.5° to 90°).

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, Colorado 80235.



AWWA STANDARD FOR DIMENSIONS FOR FABRICATED STEEL WATER PIPE FITTINGS

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard provides overall dimensions for fabricating steel water pipe fittings for sizes 6 in. through 144 in. (150 mm through 3,600 mm)* for water transmission and distribution facilities.

Many configurations of fittings are possible and alternatives to this standard may be agreed upon between the purchaser and manufacturer. The fitting dimensions shown in Figures 1, 2, 3, 4, and 6 and in Table 1 are the minimum dimensions for fittings with plain ends. In practice, fittings are seldom furnished as individual pieces as shown, but are shop fabricated into full or special lengths of pipe or fabricated into assemblies, combining a number of fittings.

1.1.1 Conditions not covered in this standard. This standard is intended to serve as a dimensional guide only. It is not intended to be a standard for wall thickness, pressure ratings, and structural or hydraulic design. Reinforcement of fittings, which may include increased wall thickness, collars, wrapper plates, or crotch plates, is not covered in this standard. The design of fittings should be made in accordance with the applicable section in AWWA Manual M11, *Steel Pipe—A Guide for Design and Installation*.

*Metric conversions given in this standard are direct conversions of US customary units and are not those specified in International Organization for Standardization (ISO) standards.