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(Revision of ANSI/AWWA C507-99)

American Water Works Association

The Authoritative Resource on Safe Water℠

AWWA Standard

Ball Valves, 6 In. Through 48 In. (150 mm Through 1,200 mm)

ANSI American National Standards Institute

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6666 West Quincy Avenue
Denver, CO 80235-3098
T 800.926.7337
www.awwa.org

AWWA Standard

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Committee Personnel

The AWWA Standards Committee on Ball Valves, which revised and approved this standard, had the following personnel at the time of approval:

Bayard E. Bosserman, *Chair*

Consumer Members

V.Q. Le, Los Angeles Water and Power, Los Angeles, Calif. (AWWA)

W.F. Reeves, Cincinnati, Ohio (AWWA)

I.M. Schuraytz, Detroit, Mich. (AWWA)

D.C. Stone, Denver Water Department, Denver, Colo. (AWWA)

L.D. Thomas, The Metropolitan District, Hartford, Conn. (AWWA)

General Interest Members

B.E. Bosserman, Mission Viejo, Calif. (AWWA)

Tom Chadwick, Earth Tech, San Diego, Calif. (AWWA)

W.D. Ensor, Ringwood, N.J. (AWWA)

R.E. Herriott, Malcolm Pirnie Inc., Columbus, Ohio (AWWA)

J.R. Holstrom, Naperville, Ill. (AWWA)

M.B. Horsley, Overland Park, Kan. (AWWA)

W.A. Hunt, Bozeman, Mont. (AWWA)

T.J. McCandless,* Standards Engineer Liaison, AWWA, Denver, Colo. (AWWA)

H.E. Spindler, Nodaway Valley Engineering, Barnard, Mo. (AWWA)

Producer Members

J.V. Ballun, Val-Matic Valve & Manufacturing Corporation, Elmhurst, Ill. (AWWA)

Malcolm Dixon, Henry Pratt Company, Aurora, Ill. (AWWA)

Keith Hall, APCO Willamette Valve & Primer, San Clemente, Calif. (AWWA)

T.A. Hartman, Hartman Valve Corporation, St. Louis, Mo. (AWWA)

*Liaison, nonvoting

T.J. McAndrew, Rodney Hunt Company, Orange, Mass. (AWWA)

F.W. Peirce,* G.A. Industries Inc., Mars, Pa. (AWWA)

W.B. Scobie,* Mueller Company, Smithfield, R.I. (AWWA)

C.M. Stutsman, NIBCO Inc., Elkhart, Ind. (AWWA)

*Alternate

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C507.

I. Introduction.

I.A. *Background.* Ball valves have been used in pipelines carrying water for at least 45 years. Manufacturers of ball valves have developed tight-seating ball valves using metal-to-metal seats and also metal-to-resilient seats.

I.B. *History.* The first edition of ANSI/AWWA C507, Standard for Ball Valves, Shaft- or Trunnion-Mounted—6 In. Through 48 In.—for Water Pressures up to 300 psi, was approved on Sept. 14, 1973. The second edition of ANSI/AWWA C507, Standard for Ball Valves, 6 In. Through 48 In., was approved by the AWWA Board of Directors on June 23, 1985. The fourth edition was approved by the AWWA Board on Jan. 24, 1999. This fifth edition was approved by the AWWA Board on Jan. 16, 2005.

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.

*Persons outside the US should contact the appropriate authority having jurisdiction.

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.

ANSI/AWWA C507 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.

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. *General.* This standard covers only ball valves of the shaft- or trunnion-supported type. Generally, the valves are of cast construction in 150-psi (1,050-kPa), 250-psi (1,750-kPa), and 300-psi (2,100-kPa) pressure classes, with bodies having flanged ends. The actuating forces required to operate a ball valve of a given size vary considerably and depend on the size of the valve, the differential operating pressure, the quantity of water flow, the configuration of waterway passages, and the seal

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

† American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036.

‡ Both publications available from National Academy of Sciences, 2101 Constitution Ave. N.W., Washington, DC 20418.

design used. This standard covers the design of these valves and their actuators operating at a maximum differential pressure equal to or less than the design pressure and a maximum port fluid velocity of 35 ft/sec (10.7 m/sec). Ball valves capable of operating under pressure–velocity conditions exceeding these ratings are available but are outside the scope of this standard.

This standard uses the terms *differential pressure* and *design pressure*. These terms are defined in Sec. 3, Definitions. As an example, a valve could be in a service in which the design pressure is 100 psi (690 kPa), but the differential pressure is only 50 psi (345 kPa). That is, the pipeline pressure could be 100 psi (690 kPa), but with the valve closed, the differential pressure between the two sides of the closed ball is 50 psi (345 kPa).

II.B. *Considerations for Throttling Service.* If a valve is to be installed for throttling service, the purchaser must carefully evaluate the full range of differential pressures across the valve versus the downstream pressures in order to avoid damage by cavitation. Differential pressures across the valve versus downstream pressures for all angles of the ball, together with the hydraulic characteristics of the valve, must be determined and evaluated to ensure a successful installation.

Although fluid port velocities greater than 35 ft/sec (10.7 m/sec) have a higher probability of causing cavitation in piping systems, especially if valves are used to throttle flows, the 35-ft/sec (10.7-m/sec) port velocity is not an upper limit to the flow that can be satisfactorily handled by ball valves. Piping systems capable of producing higher velocities should be studied by the purchaser and manufacturer to ensure the most appropriate valve selection.

II.C. *Valve and Piping Supports.* According to Sec. 4.3.2.1.4 in this standard, valve bodies are required to have support legs or pads. These body support legs or pads should also rest on foundations, piers, or plate bearings without being anchored to the supports. The purpose of the body support legs or pads is to support the weight of the valve and actuator assembly when the valve is installed in a horizontal pipeline. These support legs or pads are not intended to be anchored to foundations that would require the valve to withstand loads caused by thermal expansion of piping or to support piping loads with the valve body. It is recommended that the purchaser take the responsibility of providing adequate supports for the piping. Ball valves installed in vertical pipelines may be supported by the flanged connections between the body and the pipeline.

Valves should be handled, stored, and installed in accordance with the manufacturer's instructions. It is strongly recommended that instruction manuals supplied by the valve manufacturer be reviewed before installing the ball valve.

To maintain the integrity of the valve, it is important to avoid subjecting the valve to pipe loads or external loads that drive the valve out of round, such as the use of valve foundations or supports without proper pipe supports. The valve should be supported independently of the adjacent piping, and the adjacent piping should be supported independently of the valve. Piping to and from the valve should be adequately supported and controlled. Valve inlet and outlet piping should be supported as near to the valve as practical. This removes most of the static load and allows identification of piping fit problems during installation and easier removal of the valve for maintenance. Design considerations should include allowable flange loadings, thermal expansion and contraction, and differential settlement.

Many types of buried pipes are designed to deflect 2 percent to 5 percent of pipe diameter, which is harmful to valve integrity. Adjacent piping should be supported or stiffened to provide a round mating connection to the valve in service.

II.D. *Effects of Pressure on Seat Performance.* Some ball valve seat designs are pressure sensitive, and the ability of these designs to meet the shop seat-leakage test requirements, as outlined in Sec. 5.1.1, depends on the specified differential pressure. The ball valves described in this standard do not have leakage requirements other than at the described differential pressure range. Operation of a valve at differential pressures less than the specified differential pressure range may result in increased seat-leakage rates. If operation at differential pressures lower than the specified differential pressure range is critical, the user should consult with the manufacturers and specify allowable leakage rates at the lower pressures. Operation of a valve at differential pressures greater than the specified differential pressure may result in accelerated seat wear or the inability of the valve to seat or unseat properly, or both. The purchaser should provide the manufacturer with the actual operating differential pressure or range of differential pressures to ensure optimum seat performance.

Sec. 5.1.1.4 through 5.1.1.6 describe allowable leakage rates at various differential pressure ranges. These leakage rates vary from 1–3 oz/hr/in. (1.2–3.6 mL/hr/mm) diameter of the valve. Valves having a leakage rate as low as 1 oz/hr/in. (1.2 mL/hr/mm) diameter over the entire differential pressure range are available. The purchaser should specify whether valves having these lower leakage rates are desired.

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 considered in the purchase documents:

1. Standard used—that is, ANSI/AWWA C507, Standard for Ball Valves, 6 In. Through 48 In. (150 mm Through 1,200 mm), latest edition.
2. Requirement (see Sec. 4.1) that the manufacturer submit drawings showing the principal dimensions, general construction, and materials used for all parts of each valve, and that all work to be done and all valves to be provided are in accordance with such drawings.
3. Whether the manufacturer is to provide instructions, parts manuals, recommended spare parts lists, and maintenance procedures.
4. Size of the valve, pressure class, and quantity required (Sec. 1).
5. Type of installation—buried, submerged, in-plant, in-vault, or outdoor.
6. Valve and actuator arrangement and position.
7. Body materials, if there is a preference (Sec. 4.3.2.1.1).
8. Type of valve support, if different from the standard (Sec. 4.3.2.1.4).
9. Ball material, if there is a preference (Sec. 4.3.2.2.1).
10. Whether a double- or single-seated valve is desired and preference of seat materials, if any (Sec. 4.3.2.3).
11. Resilient seat location (body or ball), if there is a preference (Sec. 4.3.2.3).
12. Bearing material, if there is a preference (Sec. 4.3.2.4.6).
13. Shaft material, if there is a preference (Sec. 4.3.2.5.2).
14. Type of shaft seals, if there is a preference (Sec. 4.3.2.6.2). This standard does not require that seal materials be resistant to permeation by organic compounds such as organic solvents and vapors that are petroleum-based products. If the purchaser's application involves such service conditions (usually in buried applications), the purchaser should consult with valve manufacturers to specify the proper shaft seals.
15. Whether or not shaft seals shall be designed for replacement under line pressure (Sec. 4.3.2.6.4).
16. Direction to open manual actuators—clockwise or counterclockwise rotation of handwheel, chainwheel, crank, or key (Sec. 4.3.2.7.13).

17. Valve operating mechanism or actuator housing material, if there is a preference (Sec. 4.3.2.7.2).

18. If valves with custom-designed actuators (Sec. 4.3.2.7.6) operate the valve at differential pressures less than the design pressure or at a maximum port velocity less than 35 ft/sec (10.7 m/sec), or both, are desired, the purchaser shall designate.

a. Maximum differential pressure (pounds per square inch [kilopascals]) (Sec. 3[9]).

b. Maximum port fluid velocity (feet [meters] per second) (Sec. 3[11]).

19. If the valve is to be used for regulating or throttling service, a complete description of maximum and minimum flow conditions with related upstream versus downstream pressures shall be provided. The range of regulating or throttling conditions shall be supplied by the purchaser, if required by the manufacturer.

20. Type of actuator required—handwheel, chainwheel, lever, crank, key operating nut, electric motor, air cylinder, water cylinder, or oil cylinder. Complete information for motor or cylinder actuators, including available electric power characteristics for the actuator; maximum and minimum air, water, or oil pressure for the cylinders; any control scheme; special devices, such as positioners, position indicators, or adjustable cushions; and complete information for any extension stems, floor stands, or similar appurtenances (Sec. 4.3.2.8). Requirements for power actuators are covered in ANSI/AWWA C540, Standard for Power-Actuating Devices for Valves and Sluice Gates.

21. Time of operation for the power actuators (Sec. 4.3.2.8.5).

22. Special protective coatings, if other than specified as standard in Sec. 4.4.3.

23. Whether or not records of certified tests are required (Sec. 5.1 and 5.2).

24. Sec. 5.1.2 requires the manufacturer to leak test the valve at the specified differential pressure of the valve. It is important to specify the operating differential pressure for the valve. Some ball valves rely on line pressure to seal and may have a higher leak rate at lower pressures if adjusted to seal at the rated pressure of the valve. Sec. 5.1.1.7 requires the manufacturer to test the valve for leakage at 100% of the specified differential pressure. The purchaser should specify any other required differential pressures at which the valves are to be tested for leakage.

25. Affidavit of compliance, if required (Sec. 6.3).

26. Warranty provisions, if they are required. AWWA standards do not cover warranties.

27. If shop inspection is required, the extent of such inspection should be defined.

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

IV. Major Revisions. The major changes made in this revision of the standard include the following:

1. Added paragraph to Part II.C, Special Issues, in the Foreword, concerning the need for adequate valve and pipe supports.
2. Revised the allowable leakage rates in Sec. 5.
3. Revised material references to use the Unified Numbering System (UNS) designations.
4. Changed the allowable materials of construction for Classes 250 and 300 valves (Sec. 4.3).

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 (303) 795-7603, or write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail at standards@awwa.org.

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ANSI/AWWA C507-05
(Revision of ANSI/AWWA C507-99)

AWWA Standard

Ball Valves, 6 In. Through 48 In. (150 mm Through 1,200 mm)

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard covers gray-iron, ductile-iron, and cast-steel, flanged-end, tight-shutoff, shaft- or trunnion-mounted, full-port, double- and single-seated ball valves for pressures up to 300 psi (2,100 kPa) in sizes from 6-in. through 48-in. (150-mm through 1,200-mm) diameter for use in water systems having fresh water with a pH greater than 6 and less than 12 and with temperatures greater than 32° F (0° C) and less than 125° F (52° C).

1.1.1 *Design fluid velocity.* The valve assembly and components shall be structurally suitable for a port fluid velocity of 35 ft/sec (10.7 m/sec) at design pressure and shall be within the allowable stresses noted in Sec. 4.3.1.1.

1.1.2 *Pressure class and rated/design pressure.* The classes of valves discussed in this standard shall be designed for the following maximum rated pressure. Rated pressure is defined as the design pressure at 100° F (38° C).

Pressure Class	Rated/Design Pressure
150	150 psi (1,050 kPa)
250	250 psi (1,750 kPa)
300	300 psi (2,100 kPa)