ANSI/AWWA C507-11
(Revision of ANSI/AWWA C507-05)

American Water Works Association

The Authoritative Resource on Safe Water®

AWWA Standard

Ball Valves, 6 In. Through 60 In. (150 mm Through 1,500 mm)

Effective date: March 1, 2011.
First edition approved by AWWA Board of Directors Sept. 14, 1973.
This edition approved Jan. 23, 2011.
Approved by American National Standards Institute Dec. 2, 2010.

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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 more than 50 years. Manufacturers of ball valves have developed ball valves using metal-to-metal seats and also metal-to-resilient seats. This standard covers only ball valves of the shaft- or trunnion-supported type. Generally, the valves are of cast construction with bodies having flanged ends.

I.B. *History.* The first edition of ANSI/AWWA C507, Ball Valves, Shaft- or Trunnion-Mounted—6 In. Through 48 In.—for Water Pressures up to 300 psi, was approved on Sept. 14, 1973. Subsequent revisions to ANSI/AWWA C507 were prepared by the AWWA Standards Committee and approved by the AWWA Board of Directors on June 23, 1985, January 24, 1999, and January 16, 2005. This edition of ANSI/AWWA C507 was approved on Jan. 23, 2011.

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; now Water Research Foundation) 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, provincial, or local agency.

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* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.
† Persons outside the United States 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, provincial, 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.* 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 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 those found in this standard are available but are outside the scope of this standard. Fluid port velocities greater than 35 ft/sec (10.7 m/sec) have a higher probability of causing cavitation in piping

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

† Both publications available from National Academy of Sciences, 500 Fifth Street NW, Washington, DC 20001.

systems, especially if valves are used to throttle flows. The 35-ft/sec (10.7-m/sec) port fluid 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.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.

II.C. *Valve and Piping Supports.* 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. 5.1.2.2, 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. 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.

Sec. 5.1.2.3 describes allowable leakage rates at various differential pressure ranges. These leakage rates vary from 1–18 fl oz/hr/in. (1.2–21.6 4 mL/hr/mm) diameter of the valve. Valves with resilient seats having a leakage rate as low as 1–3 fl oz/hr/in. (1.2–3.6 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.

II.E. *Permeation.* The selection of materials is critical for water service and distribution piping in locations where there is likelihood the pipe will be exposed to significant concentrations of pollutants composed of low-molecular-weight petroleum products or organic solvents or their vapors. Research has documented that pipe materials, such as polyethylene, polybutylene, polyvinyl chloride, and asbestos cement; and elastomers, such as used in jointing gaskets and packing glands, are subject to permeation by lower-molecular-weight organic solvents or petroleum products. If a water pipe must pass through such a contaminated area or an area subject to contamination, consult with the manufacturer regarding permeation of body walls, jointing materials, etc., *before* selecting materials for use in that area.

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 or information should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C507, Standard for Ball Valves, 6 In. Through 60 In. (150 mm Through 1,500 mm), of latest revision.
2. Type of installation—buried, submerged, in-plant, in-vault, or outdoor—and permeation requirements (Sec. II.E).
3. Size of the valve, pressure class, and quantity required.
4. Valve and actuator arrangement and position.
5. Whether the manufacturer is not required to provide instructions, parts manuals, recommended spare parts lists, operation and maintenance procedures (Sec. 4.1).
6. Details of other federal, state or provincial, and local requirements (Sec. 4.2.1).
7. Physical and chemical requirements (Sec. 4.2.2).
8. Body materials, if there is a preference (Sec. 4.3.5).
9. Flange requirements (Sec. 4.3.5.1).
10. Type of valve support, if different from the standard.
11. Ball material, if there is a preference (Sec. 4.3.6).
12. Whether a double- or single-seated valve is preferred (Sec. 4.3.7).
13. Resilient seat location (body or ball), if there is a preference (Sec. 4.3.7.4).
14. Metal seat material requirements (Sec. 4.3.7.3).
15. Resilient seat material requirements (Sec. 4.3.7.4).
16. Bearing material, if there is a preference (Sec. 4.3.8).
17. Shaft material, if there is a preference (Sec. 4.3.9.1).

18. Type of shaft seals, if there is a preference (Sec. 4.3.9.5).

19. O-ring containment requirements (Sec. 4.3.9.5.2).

20. The purchaser may indicate a desired shaft orientation. Typically, ball valves are constructed and installed such that the shaft is horizontal in horizontal piping. However, valves can be constructed with the shaft orientation vertical when installed in horizontal piping. The purchaser should also consider the application or service conditions of the valve. For example, valves used in wastewater and reclaimed water service should be installed with the shafts horizontal so that solids do not accumulate in the shaft sealing areas.

21. Actuator requirements shall be provided by the purchaser. Requirements may include 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.

22. Actuator housing material, if there is a preference (Sec. 4.3.10.1).

23. If actuators are used to operate the valve at differential pressures less than the design pressure, at a maximum port velocity less than 35 ft/sec (10.7 m/sec), or both, the purchaser shall specify the maximum differential pressure (pounds per square inch [kilopascals]) and the maximum port fluid velocity (feet [meters] per second) (Sec. 3[11]).

24. Direction to open manual actuators (Sec. 4.3.10.10).

25. Actuator handwheel or chainwheel pull requirements. Maximum pull requirements have been found by some operations staff to be a high exertion of effort, and lesser pulls of 40 to 60 lb (18.1 to 24.2 kg) on handwheels and chainwheels have sometimes been found to be beneficial (Sec. 4.3.10.11).

26. 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 may be provided by the purchaser.

27. Time of operation for the power actuators (Sec. 4.3.10.14.2.2).

28. Whether certified copies of actuator proof of design tests are required (Sec. 4.3.10.15.2).

29. Special protective coatings, if other than specified (Sec. 4.4.3). If the user desires a particular valve coating to match that for the plant piping, it should be described clearly in the purchase documents.

30. Whether records of certified tests are required (Sec. 5.1.1).

31. The required differential pressure at which the valve is to be tested (Sec. 5.1.2).

32. Whether proof of design affidavit of compliance is required (Sec. 5.2.2).

33. Affidavit of compliance is not required (Sec. 6.5).

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 sizes 54 in. and 60 in. (1,350 mm and 1,500 mm).
2. Added paragraph 25 in Section III regarding the consideration of requiring pulls less than 80 lb (356 N) for handwheels and chainwheels.
3. Added paragraphs 1.4 on Valve Construction and 1.5 on Description of Operation to Sec. 1, General.
4. Revised Table 1 in Sec. 4.3, Port diameter and minimum body shell thickness, to require that the wall thicknesses of ductile-iron construction be the same wall thicknesses as cast steel construction.
5. Added paragraph 4.3.9.4 on design methodology for the valve shafts.
6. Revised the metal-seat leakage requirements in Sec. 5.1.2.3.
7. Revised coating requirements in Sec. 4.4.3.
8. Added actuator pressure rating and actuator flow rating to nameplate requirements.
9. Added appendix A on Installation, Operation, and Maintenance of Ball Valves.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Engineering and Technical Services 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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(Revision of ANSI/AWWA C507-05)

American Water Works Association

AWWA Standard

Ball Valves, 6 In. Through 60 In. (150 mm Through 1,500 mm)

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard covers gray-iron, ductile-iron, and cast-steel, flanged-end, low-leakage, shaft- or trunnion-mounted, full-port, double- and single-seated ball valves for pressures up to 150 psi (1,050 kPa) in sizes 6-in. through 60-in. (150-mm through 1,500-mm) diameter and 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, wastewater, and reclaimed water systems having 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 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.

1.1.2 *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)