ANSI/AWWA **C504-23**

(Revision of ANSI/AWWA C504-15)

AWWA Standard

Rubber-Seated Butterfly Valves

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American Water Works Association

Approved American National Standard ANSI

STANDARD Since 1881

AWWA Standard

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Committee Personnel

In memory of Mark A. MacConnell
Committed supporter and friend of AWWA and AWWA Standards

The AWWA Standards Subcommittee for C504 Butterfly Valves, which developed and reviewed updates for this standard, had the following personnel:

John Wilber, *Chair*

W. Biery, Victaulic, Center Valley, Pa.
M. Bissauge, VAHN-TECH International Inc., Toronto, ON, Canada
S. Carpenter, B & K Valves, Ramona, Calif.
S.S. Dalton, Val-Matic Valve & Manufacturing Corporation, Elmhurst, Ill.
T.Q. Fallon, Mueller, Aurora, Ill.
A.J. Fontana, Truesdail Laboratory, Irvine, Calif.
J.D. Grant, DeZurik, Inc., Sartell, Minn.
T.C. Harbour, Mueller, Decatur, Ill.
J.R. Holstrom, Val-Matic Valve & Manufacturing Corporation, Addison, Ill.
K. Johnson, M&H Valve Company, Anniston, Ala.
V.Q. Le, Los Angeles Water and Power, Los Angeles, Calif.
B.J. Lewis, Crispin Multiplex Mfg. Co., Berwick, Pa.
A.W. Libke, DeZurik, Inc., Sartell, Minn.
J. Morin, Wedge Rock, Limerick, Maine
J.N. Nakashima, Lockwood, Andrews & Newnam, Inc., Oakbrook Terrace, Ill.
P.J. Ries, Denver Water, Denver, Colo.
D. Swartzentruber, Wedge Rock, Limerick, Maine
J.H. Wilber, American AVK, Littleton, Colo.
S. Wortmann, Victaulic, Easton, Pa.

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

Shelly Hattan, *Chair*

General Interest Members

M.D. Bennett, Stantec, Cleveland, Ohio

B.E. Bosserman, Consultant, Mission Viejo, Calif.

J. Hebenstreit, Underwriters Laboratories Inc., Northbrook, Ill.

F.L. Hinker, Consulting Engineer, Santa Rosa, N.M.

J.A. Hrdlicka (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.

X.J. Irias (*liaison, nonvoting*), Standards Council Liaison, Walnut Creek, Calif.

M.C. Johnson, Utah State University, Logan, Utah

J.C. Limke, HDR, Inc., Denver, Colo.

J.N. Nakashima, Lockwood, Andrews & Newnam, Inc., Oakbrook Terrace, Ill.

U. Sant, Brown and Caldwell, Fort Worth, Tex.

R.A. Ward, Tighe & Bond, Westfield, Mass.

Producer Members

M. Bissauge, VAHN-TECH International Inc., Toronto, Ontario

J. Clifton (*alternate*), McWane, Birmingham, Ala.

J.D. Grant (*alternate*), DeZurik, Inc., Sartell, Minn.

A.C. Granzow, NIBCO, Inc., Elkhart, Ind.

H. Herold, VAG, Mannheim, Germany

J.R. Holstrom, Val-Matic Valve & Manufacturing Corporation, Addison, Ill.

K. Johnson, M&H Valve Company, Anniston, Ala.

C. Keeling, US Valve, Linthicum Heights, Md.

A.W. Libke, DeZurik, Inc., Sartell, Minn.

T. O'Shea (*alternate*), Val-Matic Valve & Manufacturing Corporation, Elmhurst, Ill.

J.H. Wilber, American AVK, Littleton, Colo.

User Members

L. Adams, U.S. Bureau of Reclamation, Denver, Colo.

D.W. Coppes, Massachusetts Water Resources Authority, Boston, Mass.

S. Hattan, Tarrant Regional Water District, Fort Worth, Tex.

R. Kilborn, OBRF-City of Chandler, Chandler, Ariz.

V.Q. Le, Los Angeles Water and Power, Los Angeles, Calif.

S.E. Metzler (*alternate*), Trinity River Authority, Arlington, Tex.

P.J. Ries, Denver Water, Denver, Colo.

S.Y. Tung, City of Houston, Houston, Tex.

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C504.*

I. Introduction.

I.A. *Background.* Butterfly valves are generally used for pipelines carrying liquids and gases. Manufacturers of butterfly valves developed tight-closing, rubber-seated types for cooling water systems and power stations. Since 1940, most new valves installed for this type of service have been rubber-seated butterfly valves.

Since the late 1940s, rubber-seated butterfly valves have gained increased acceptance for use in water treatment plants and water supply and distribution lines because (1) they provide tight shutoff; (2) are relatively easy to operate, even with large pressure differentials across the valves; and (3) require relatively little space for installation.

I.B. *History.* The need for standardization of butterfly valves was recognized by the American Water Works Association (AWWA) in June 1953.

The committee appointed for the task of standardization developed AWWA C504, which was approved as tentative and published in September 1954. Four years later, in 1958, the tentative standard was accepted as a standard.

The 1954 tentative standard was written to describe the then-available types of standard rubber-seated butterfly valves that had been in successful operation for at least five years prior to 1954. The standard established three pressure and two velocity classifications, standards for materials, laying lengths, minimum body and disc designs, and actuator sizes for valves having rubber seats in the valve body.

Since the publication of AWWA C504 in 1954, butterfly-valve designs have been improved and refined. In September 1962, a new committee was charged with the task of reviewing AWWA C504 and recommending revisions to the standard in order to make it compatible with then-current valve designs.

Generally, modern butterfly-valve designs for water service include cast-body construction in 25-psi (172-kPa), 75-psi (517-kPa), 150-psi (1,034-kPa), and 250-psi (1,723-kPa) pressure classes; flanged, mechanical-joint, and wafer bodies; rubber seats in valve bodies or on the valve discs; and operating conditions (limited by the design shutoff pressure and velocities of water flow) that produce torques considered maximum for the shaft size used.

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

Revisions in the 1970 edition were initiated to minimize the corrosion of seating surfaces, to provide more adequate requirements for stainless steel, and to provide for painting of valve interiors with asphalt varnish.

Revisions in 1974 and 1980 provided fine-tuning of the provisions of the standard. Major changes included addition of provisions concerning the connection between shaft and disc and the use of carbon-steel shafts with stainless-steel journals.

Revisions in the 1987 edition included using the word “actuator” rather than “operator” and provided definitions of valve classifications. Major changes included the addition of certain sprayed-metal seat surfaces and nonmetallic cylinder components as acceptable materials. Appendix B (now appendix A), Installation, Operation, and Maintenance of Rubber-Seated Butterfly Valves, was added.

Revisions in the 1994 edition included the deletion of appendix A for calculating torques, the addition of soft metrication, reference to actuator requirements given in ANSI/AWWA C540, Power-Actuating Devices for Valves and Hydrants, introduction of Class 250 valves, and adoption of additional materials and material requirements.

Revisions in the 2000 edition included: revised material references to use the unified numbering system (UNS) designations, added ductile iron as an acceptable material for actuator worm gears in buried service, allowed for the use of the valves from the proof-of-design tests to be rebuilt and used as production valves, and added advisory text on valve and adjacent pipe installation.

The eighth edition of ANSI/AWWA C504 was approved by the AWWA Board of Directors on Feb. 12, 2006. The ninth edition of ANSI/AWWA C504 was approved on June 20, 2010. The tenth edition added updated actuator requirements and was approved on June 7, 2015. This edition was approved on March 13, 2023.

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 Water Research Foundation (formerly 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

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

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. Specific policies of the state or local agency.

2. Two standards developed under the direction of NSF[‡]: NSF/ANSI/CAN 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects.

3. 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/CAN 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/CAN 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 C504 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.

In an alternative approach to inadvertent drinking water additives, some jurisdictions (including California, Maryland, Vermont, and Louisiana) called for reduced lead limits for materials in contact with potable water. Various third-party certifiers have been assessing products against these lead content criteria, and a new ANSI-approved national standard, NSF/ANSI 372, Drinking Water System Components—Lead Content, was published in 2020. On Jan. 4, 2011, legislation was signed revising the

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[‡] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

[§] Both publications available from National Academy of Sciences, 550 Fifth Street, NW, Washington, DC 20418.

definition for "lead free" within the Safe Drinking Water Act (SDWA) as it pertains to "pipe, pipe fittings, plumbing fittings, and fixtures." The changes went into effect on Jan. 4, 2014. In brief, the new provisions to the SDWA require that these products meet a weighted average lead content of not more than 0.25 percent.

II. Special Issues.

II.A. *General.* Conditions under which a valve is to be operated must be evaluated carefully by the purchaser. The evaluations must include the determination of the hydraulic characteristics of the system in which the valve will be installed and the operation of the valve (on–off or throttling), including (1) the maximum transient and static differential pressure across the valve disc and (2) flow through the valve under the most adverse operating conditions.

Torque requirements for valve operation vary considerably with differential pressure across the valve, fluid velocity, fluid temperature, and upstream piping conditions.

Flow direction is important in the installation and use of a butterfly valve. Some valves' performance and sealing characteristics vary with direction of flow. Flow direction can affect the torque requirements and throttling characteristics of valves with offset discs or discs that do not have identical surface configurations on each side. Many butterfly valves have different sealing characteristics on one side versus the other. A manufacturer may have a recommended high-pressure sealing side for long-term reliability.

Hydraulic testing, flow capacities, and valve torques are based on undisturbed uniform flow, upstream of a valve, similar to the flow produced by a long length of constant-diameter straight pipe. Piping configurations that produce a nonuniform or turbulent flow pattern upstream of the valve can increase torque requirements, create damaging vibrations, increase head loss, and increase stresses in valve components.

Some hydraulic systems can produce fluid velocities much higher than the maximum of 16 ft/sec (4.9 m/sec) described in this standard. Typically, high fluid velocities can result from line breaks, during firefighting, or in surge-relief applications. The effects of high velocities and asymmetrical turbulent flow conditions can result in high loads and torque requirements, which are unaccounted for in this standard. These design conditions should be clearly defined by the purchaser when applicable.

II.B. *Buried Valves Larger Than 48 In.* Valves in this standard are provided with flanged ends. In buried applications, the purchaser is advised to consider providing means to accommodate issues such as differential settlement, capability to remove the valve or actuator for maintenance, access to the valve interior for inspection, support of the valve, and controlling the shear loading from the adjacent pipe flanges. Many types of buried pipes are designed to deflect 2–5 percent of pipe diameter, which is harmful to the valve integrity. Adjacent pipe must be supported or stiffened to provide a round mating connection for the valve in service. The valve and pipe should be supported with uniform, well-compacted bedding to minimize differential settlement-induced stresses. Given the potential for changes in geotechnical conditions, especially under a deep valve excavation, the supporting soil structure should be assessed. There should be no other rigid support or structure provided under or around the valve body. Standard valves are designed to withstand an approximate earth load equivalent to 6-ft (1.8-m) burial depth. The purchaser should define the exact earth load in Sec. III.A.24. The butterfly valves larger than 48 in. (1200 mm) described in this standard require more attention during installation than those with a smaller diameter. Owners should consider the following: (1) additional geotechnical investigations after the excavation has been completed to determine the suitability of the subgrade; (2) the extent of any over-excavation should it be required and confirm the backfill bedding requirements; (3) additional inspection during excavation preparation and installation of the backfill bedding for the butterfly valve and adjacent pipe ensuring proper compaction of the bedding material; and (4) check the interior of the valve for indications of being out-of-round after the surrounding backfill material has been compacted.

II.C. *Advisory Information on Product Application.* This standard does not describe all possible applications or manufacturing technologies. The purchaser should identify special requirements and required deviations from this standard and include appropriate language in purchase documents. Refer to Sec. III.A in this foreword. Other advisory information is provided below.

1. The valve classification maximum nonshock shutoff pressure, maximum anticipated fluid velocity through the valve, and water temperature range are used by manufacturers to calculate torque requirements, which then may determine valve operating-component design and actuator sizing. This information should be provided according to items, 6, 7, 8, and 24 of Sec. III.A in this foreword. Note: If this information is not provided, Class B valve classifications will be provided and actuators will be sized for the most severe conditions listed in this standard. This may result in a significant unwarranted expense.

Turbulence is also a factor that may affect torque requirements. Turbulence will be considered only if information on piping conditions is provided according to item 27 of Sec. III.A in this foreword.

2. This standard limits handwheel rim pull but not handwheel diameter. A smaller handwheel may require a more expensive actuator requiring more turns. If a

large diameter handwheel is of concern because of clearance or other limitations, the diameter should be limited to an acceptable dimension in accordance with item 14 of Sec. III.A in this foreword.

3. This standard refers to ANSI/AWWA C541, which permits the use of some plated components in metallic water-hydraulic cylinder actuators. The purchaser should be aware of the possibility of plating failure, particularly when the operating water is corrosive. The purchaser may limit acceptability to cylinders having components that do not depend on platings to resist corrosion in accordance with item 15 of Sec. III.A in this foreword.

4. This standard permits several metallic seating-surface materials. It recommends seating surfaces of stainless steel or nickel-copper alloy in cases where valves are to be operated more frequently than once a month. The purchaser may require these alloys for specific applications according to item 11 of Sec. III.A in this foreword.

5. This standard also accepts sprayed mating-seat surfaces when the surfaces are applied under certain conditions. The suitability of this type of surface depends, to a large extent, on the quality of the manufactured product. The purchaser should be aware of the manufacturer's previous experience with similar applications. The purchaser may limit acceptability to a specific product or application according to item 11 of Sec. III.A in this foreword.

6. This standard does not require a minimum waterway area, nor does it limit head loss across the valve. If this is of concern, limitations should be provided. Refer to item 26 of Sec. III.A of this foreword.

7. This standard allows a party other than the valve manufacturer to mount an actuator to a valve. Sec. 5.1.2.2 requires that the valve and actuator be performance and leak tested as an assembly. The purchaser is cautioned that the valve manufacturer cannot assume responsibility for the valve's sealing and operating performance if the actuator is mounted by a party other than the valve manufacturer. If this is a concern, requirements on actuator mounting should be included in the purchase documents.

8. Electric actuators meeting the requirements of ANSI/AWWA C542 can be supplied with or without an intermediate quarter-turn mechanism. If desired, the purchaser should specify a multiturn actuator coupled to an intermediate mechanism according to ANSI/AWWA C504.

II.D. *Permeation.* The selection of materials is critical for raw water, potable water, wastewater, and reclaimed water service and distribution piping in locations where there is likelihood the pipe will be exposed to significant concentrations of pollutants that comprise low-molecular-weight petroleum products or organic solvents or their vapors. Documented research has shown that piping system materials, such as polyethylene and polyvinyl chloride, and elastomers used in gaskets and packing glands, are subject to permeation by lower-molecular-weight organic solvents or petroleum products. If a potable water, wastewater, or reclaimed water piping system must pass through such a contaminated area or an area subject to contamination, consult with the manufacturer regarding permeation of pipe walls, valve components, jointing materials, and other piping system components, *before* selecting materials for use in that area.

II.E. *Effects of Manual or Power Actuation Stroke Time.* When specifying manual, cylinder, and electric actuators in items 13, 14, 15, 16, and 17 of Sec. III.A, consideration should be given to the effects of valve operating speed on the pipeline hydraulic transients (i.e., surges), especially on long pipelines. The power actuator stroke time values in this standard are based on broad system assumptions and reasonably induced transient pressures in an attached piping system of lengths up to approximately 4,000 diameters of the valve's nominal size. The user is cautioned to evaluate the need for other stroke times (longer or shorter) based on system operational requirements and/or when piping length approaches or exceeds this assumption. Stroke times provided by the manufacturer are theoretical and may vary based on actual valve operating fluid conditions (i.e., pressure, flow, and pipe size) and the power source capacity (i.e., terminal voltage, current capacity, wire size, power fluid pressure, power fluid flow capacity, and power fluid pipe size).

II.F. *Valve Discs and Piping Design*. The discs of butterfly valves, when in the fully open position, protrude into the adjacent upstream and downstream piping or other adjacent devices. This can especially be an issue with wafer-style butterfly valves, where the adjacent pipe has interior linings or where the adjacent transmission pipe is polyethylene. The piping system designer should confirm the valve manufacturers' recommendations on disc clearance for minimum pipe internal diameter and ensure the adjacent pipe internal diameter is sufficient to accommodate the disc when the valve is in the fully open position.

The installation of butterfly valves downstream of turbulence-inducing appurtenances, such as pumps and pipe elbows, requires consideration to avoid various mechanical and hydraulic issues. Turbulence can cause premature wearing of seats, unequal or uneven hydrodynamic loads on the disc that increase torque loadings on valve actuators, unanticipated higher loads and stresses on shaft bearings resulting in premature bearing wear, and higher stresses on the valve shafts. These issues can be especially significant with butterfly valves when installed directly on the discharge flanges of pumps. In some cases, valve shaft orientation downstream of pipe elbows can have a significant effect on the aforementioned mechanical and hydraulic valve issues. Piping system designers should consult with the butterfly-valve manufacturer on the requirements or recommendations for minimum upstream pipe length necessary to provide reasonably smooth flow patterns when approaching the valve disc, including recommendations on shaft orientation. Such recommendations regarding minimum upstream pipe length should preferably be derived from the results of hydraulic testing or be based on relevant and practical experience. If no test data or results are available or if there is no relevant and practical experience available, the purchaser should refer to the section "Effects of Pipe Installations" in AWWA Manual M49.

The installation of butterfly valves upstream of certain appurtenances requires consideration to avoid various mechanical and hydraulic issues, especially when the butterfly valve disc is partially open. For example, a partially open butterfly valve installed adjacent to, or a short distance upstream of, another valve or appurtenance, such as a check valve, can result in issues such as increased and premature wear on the check valve's hinge and shaft support and oscillation ("chattering") of the check valve disc. The turbulence caused by a partially open butterfly valve can also affect the performance and accuracy of other downstream devices such as flow-measuring equipment. Sufficient pipe spacing between the butterfly valve and the downstream appurtenance should be provided to mitigate these issues. Note that the effect of a partially open butterfly valve can occur with valves in throttling or modulating service.

II.G. *Bolting Gray Cast Iron Flanges to Steel Flanges.* The following recommendations are made for the use of high strength bolting used with either ASME or AWWA steel flanges when bolting to low ductility gray cast iron valve flanges. The ASME B16.1 standard gray iron flange is intended to be used with ASTM A307 Grade B bolting. This low strength bolting has coarse unified series threads (UNC) and heavy hex heads. AWWA C207 and ASME B16.5 steel flanges allow or require the use of higher strength bolting such as ASTM A193 grade B7 bolts and ASTM A194 grade 2H nuts. These higher strength materials employ eight threads per inch (8UN) in sizes 1 ⅛ inch and larger. When an iron flange is to be coupled with a steel flange using higher strength bolting, the following precautions are recommended.

1. The information provided by the purchaser to the manufacturer should include the need for tapped flange holes of 1 ⅛ inch and larger bolts to be tapped with the 8-thread series (8UN) tap.
2. The steel flanges should have flat faces.

3. Properly align flange faces before tensioning the bolts.
4. The gaskets should be ring gaskets extending to the bolt-holes per ASME B16.5 Nonmandatory Appendix B, Table B-1, Group No. Ia materials. Use of Ib, IIa, IIb, IIIa, and IIIb gasket materials should be avoided.
5. Use only heavy hex nuts and heavy hex bolts.
6. Tension the bolts in a crossover pattern similar to ASME PCC-1-2013, "Guidelines for Pressure Boundary Bolted Flange Joint Assembly" using the three or more round torque increment approach to the target torque.
7. Control of the bolt target torque should be based on the gasket material load requirements for the system maximum operating pressure so as not to overstress the cast iron flanges.
8. Care should also be exercised to ensure that piping loads transmitted to the cast iron valve and flanges are controlled and minimized.

II.H. *Chlorine and Chloramine Degradation of Elastomers.* The selection of materials is critical for water service and distribution piping in locations where there is a possibility that elastomers will be in contact with chlorine or chloramines. Documented research has shown that elastomers such as gaskets, seals, valve seats, and encapsulations may be degraded when exposed to chlorine or chloramines. The impact of degradation is a function of the type of elastomeric material, chemical concentration, contact surface area, elastomer cross section, environmental conditions as well as temperature. Careful selection of and specifications for elastomeric materials and the specifics of their application for each water system component should be considered to provide long-term usefulness and minimum degradation (swelling, loss of elasticity, or softening) of the required elastomer. Users and designers should refer to the AWWA Manual of Water Practices, M75, *Elastomers for Waterworks: Pipes, Valves, and Fittings*, for information on elastomeric materials, properties, and selection.

II.I. *Finite Element Analysis. Advisory Information on Valve Design.* Calculation tools like FEA software can be used as a supplement to the equations, wall thickness tables, and size tables when listed in this standard for stress design. These calculation tools are able to show detailed stress concentrations on valve components for a given load scenario, which is not indicative of the allowable stress determinations in this standard. Other standards may be used to separately evaluate the localized stress concentrations.

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 information should be provided by the purchaser in the purchase documents:

1. Standard to be used—that is, ANSI/AWWA C504, Rubber-Seated Butterfly Valves, of latest edition.
2. Whether compliance with NSF/ANSI/CAN 61 Drinking Water System Components—Health Effects is required.
3. Size of valve.
4. Quantity required.
5. Type of body: flanged (short body or long body), wafer, or mechanical-joint ends.
6. Maximum nonshock shutoff pressure and maximum nonshock line pressure.
7. Required flow rate through valve.
   a. Under normal conditions.
   b. Under maximum-flow conditions.
      — When opening (consider factors such as fire flow).
      — When closing (consider factors such as line break).
8. Description of connecting piping: material, outside diameter (OD) and inside diameter (ID), and flanged or plain end.
9. Minimum acceptable valve classification (Sec. 1.1.2).
10. Any data or information requested from the valve manufacturer or supplier. This information can include the following:
    a. Valve port diameter.
    b. Clearances required for the actuator and clearances required to remove the actuator.
    c. The number of turns to open and close for manual actuators.
    d. Assembled weight.
    e. Valve-torque data.
    f. Cavitation coefficients.
    g. Preferred-flow direction, if applicable (foreword Sec. II.A, Special Issues).
    h. Valve component body materials (Sec. 4.2.1.6).
    i. Principal dimensions, including laying length (Table 1).
    j. Actuator manufacturer, model, and torque capability (Sec. 4.2.8).
    k. Interior and exterior coating materials (Sec. 4.4.1).

l. Clearance beyond the valve body required for the valve disc to open fully (Sec. A.5.8).

11. Materials.

a. If the purchaser specifies a wetted component that was not tested and certified to NSF/ANSI/CAN 61 or NSF/ANSI/CAN 372 requirements, the certification may not be valid.

b. If one or more of the materials included in this standard are unacceptable, specify the acceptable materials that are included in this standard.

c. If materials included in the standard are not suitable for exposure to line content or are otherwise unacceptable, specify materials that are suitable and acceptable. Refer to Sec. II.H of this foreword.

d. Metallic mating seats: Specify any limitations on acceptability of seat materials or sprayed seats for specific applications or specific products. Refer to Sec. II.C of this foreword.

12. Type of installation: buried, submerged, or nonburied and any permeation requirements (Sec. II.D).

13. Actuator type and service conditions.

a. Type—manual, electric motor, cylinder, vane, or other.

b. Service—open/close, throttling, or modulating.

14. Manual actuator.

a. Type—handwheel, chainwheel, or wrench nut.

b. Direction to turn the handwheel, chainwheel, or wrench nut to open valves if other than counterclockwise.

c. Position indicator:

— If required.

— Configuration for buried, submerged, or nonburied service.

d. Special devices or features if required: extension shaft, floor stand, handwheel diameter, or position transmitter.

e. Actuator handwheel or chainwheel pull requirements. Maximum pull requirements have been found by some operator staff to be a high exertion of effort, and lesser pulls of 40 to 60 lb (178 to 267 N) on handwheels and chainwheels have sometimes been found to be beneficial (Sec. 4.2.8.3.1). This may require more turns or larger handwheels and perhaps more expensive actuators.

15. Cylinder actuator.

a. Operating medium: air, water, or oil.

b. Medium pressure: maximum and minimum.

c. Characteristics: control scheme, opening and closing speed ranges, if different from Sec. 4.2.8.5.5.

d. Position indicator:

— If required.

— Configuration.

e. Special requirements:

— Specify any limitations on acceptability or any special construction required.

— If the ratio of maximum supply pressure to minimum supply pressure is greater than 1.8, a pressure regulator or pressure-reducing valve is recommended for safety and stroke time consistency.

16. Electric actuator (Sec. 4.2.8.4).

a. Type: multiturn actuator coupled to an intermediate mechanism or integral quarter-turn unit.

b. Characteristics: operating voltage, control scheme, and time of operation if different from Sec. 4.2.8.4.3.

c. Position indicator: configuration.

d. Special considerations: type of service environment should be stated and appurtenances required.

17. Other actuators: actuators other than those described in this standard, ANSI/AWWA C541, or ANSI/AWWA C542 shall be defined by the purchase documents in detail.

18. Valve and actuator arrangement and position. The purchaser may indicate a desired shaft orientation. Typically, butterfly valves are constructed and installed such that the shaft is horizontal in horizontal piping. Valves can be installed with the shaft orientation vertical in horizontal piping; however, the purchaser should consider the application or service conditions of the valve. For example, valves used in raw (untreated) water and reclaimed water service should generally be installed with the shafts horizontal so that solids do not accumulate in the shaft sealing areas. Shaft orientation on valves installed upstream of pump suction nozzles can affect the performance of some types of pumps. Shaft orientation can affect valve head loss when the valve is installed downstream of elbow or tee branch fittings.

19. If an affidavit of compliance is required with the provisions of ANSI/AWWA C541 or C542 signed by the actuator manufacturer.

20. If the flow resistance coefficient for a fully open valve calculated in accordance with AWWA Manual M49, *Butterfly Valves: Torque, Head Loss, and Cavitation Analysis*, is required.

21. If valve position versus flow resistance curves is required, they should be referenced to procedures described in AWWA Manual M49.

22. If shop inspection by the purchaser is required.

23. Maximum transient pressure and characteristics, if known.

24. Water temperature range.

25. If a leakage test in both directions is required (Sec. 5.1.2.5.3).

26. If a maximum head loss is required. This information should be provided for each size and class of valve. NOTE: Not all manufacturers may use the same test methods for measuring head loss. This should be discussed by the purchaser and the manufacturer. It is recommended that the purchaser reference AWWA Manual M49 if a maximum head loss is required.

27. A drawing or description of the piping arrangement sufficient to describe significant turbulent line flow conditions to which the valve disc may be subjected.

28. Considerations relating to anticipated problems with rubber components (Sec. 4.2.5.2) exposed to line content containing chlorine, chloramines, or other chemicals. If these problems are anticipated, the purchaser should identify the maximum expected concentrations of these chemicals and other factors, such as pH and temperature ranges, which may affect the corrosivity of these chemicals. The purchaser should consult with the manufacturers and, if appropriate, specify special requirements for these components.

29. This standard requires flat-faced flanges (Sec. 4.2.2.1). If other facings are desired, they must be required by the purchase documents.

30. If purchase documents require shop inspection or test observations to be performed by the purchaser, the extent of such inspections and observations should be defined.

31. Details of other federal, state, provincial, territorial, and local requirements (Sec. 4.1.1).

32. The provision of records for tests that are required according to Sec. 4.1.3, Sec. 5.1.1, Sec. 5.1.2, Sec. 5.1.3, and Sec. 5.1.4 of this standard. Test records required for power actuators under ANSI/AWWA C541 or C542 may also be requested. The purchaser may require all records or may stipulate a breakdown of production test records or proof-of-design test records.

33. Detailed description of nonstandard end connections (Sec. 4.2.2).

34. If valves are intended for operation more than once a month (Sec. 4.2.5.3.3).

35. Whether the shaft seals should use a stuffing box with pull-down glands (Sec. 4.2.7.5).

36. Type of shaft seal (Sec. 4.2.7). This standard does not require that seal materials be resistant to permeation by organic compounds such as organic solvents or petroleum-based products. If the purchaser's application involves such source conditions (usually in buried applications), the purchaser should consult with valve manufacturers to specify the proper shaft seals.

37. Protective coatings, if other than required (Sec. 4.4). If the user desires a particular valve coating to match that for the plant piping, it should be described clearly in the purchase documents. Specify in the purchase documents if interior or exterior surface coatings are required to be NSF/ANSI/CAN 61 certified and if the interior or exterior surfaces of the valve shall be holiday tested and shall be holiday-free (Sec. 4.4.1 and 4.4.5).

38. If an affidavit of compliance (Sec. 6.3) is required with the provisions of this standard signed by the valve manufacturer.

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

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

1. Update to information on large, buried valves in Foreword II.B.
2. Addition of information on connecting steel and gray cast iron flanges in Foreword II.G.
3. Addition of chlorine and chloramine degradation on elastomers in Foreword II.H.
4. Addition of an advisory statement on FEA as a supplement to the stress determination methods in Foreword II.I.
5. Addition of 54- to 72-inch (1350-1800 mm) Class 250B valve design requirements.
6. Clarification and expansion of definitions in Sec. 3.
7. Updates to design information for shaft sizing (Sec. 4.2.3), seats (Sec. 4.2.5), shaft seals (Sec. 4.2.7), and actuators (Sec. 4.2.8).
8. Clarification to maximum coating thickness in Sec. 4.4.7.
9. Update to installation of valves in buried applications in Appendix A.5.4.

V. Comments. If you have any comments or questions about this standard, please contact AWWA Engineering and Technical Services at 303.794.7711; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email at standards@awwa.org.

ANSI/AWWA C504-23
(Revision of ANSI/AWWA C504-15)

American Water Works Association

Dedicated to the World's Most Vital Resource®

AWWA Standard

Rubber-Seated Butterfly Valves

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard establishes minimum requirements for rubber-seated butterfly valves, 3 in. (75 mm) through 72 in. (1,800 mm) in diameter, with various body and end types, for raw water, potable water, wastewater, and reclaimed water having a pH range from 6–12 and a temperature range from 33°–125°F (0.6°–52°C). This standard covers rubber-seated butterfly valves suitable for a maximum steady-state fluid working pressure of up to 250 psig (1,723 kPa), a maximum steady-state differential pressure of up to 250 psi (1,723 kPa), and a maximum full open fluid velocity of up to 16 ft/sec (4.9 m/sec) based on nominal valve size.

1.1.1 *Body types, classes, and sizes.* Valves described in this standard are provided in four body types and in classes as follows:

1.1.1.1 Wafer valves. Class 150B, in sizes 3–20 in. (75–500 mm).

1.1.1.2 Short-body and long-body flanged valves. Class 25A, Class 25B, Class 75A, Class 75B, Class 150A, Class 150B, and Class 250B, in sizes 3 in.–72 in. (75 mm–1,800 mm).

1.1.1.3 Mechanical-joint-end valves. Class 150B and Class 250B, in sizes 3 in.–24 in. (75 mm-600 mm), and Class 25A, Class 25B, Class 75A, Class 75B, Class 150A, Class 150B, and Class 250B, in sizes 30 in.–48 in. (750 mm–1,200 mm).