

Australian Standard[®]

**Butterfly valves for waterworks
purposes**



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- Australian Chamber of Commerce and Industry
 - Australian Industry Group
 - Engineers Australia
 - Master Plumbers Australia
 - Plastics Industry Pipe Association of Australia
 - Victorian Employers Chamber of Commerce
 - Water Industry Alliance
 - Water Services Association of Australia
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Australian Standard[®]

Butterfly valves for waterworks purposes

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PREFACE

This Standard was prepared by the Joints Standards Australia/Standards New Zealand Committee WS-022, Valves for Waterworks Purposes, to supersede AS 4795—2002.

The objective of this Standard is to provide material requirements and performance tests for butterfly valves used in water supply systems, including potable water, recycled water and screened wastewater systems, together with default compliance requirements for the use of manufacturers and certification bodies.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

Support and contribution is acknowledged from the Water Services Association of Australia (WSAA) and manufacturers.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard
Butterfly valves for waterworks purposes

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for Classes 10, 16, 21 and 35 manually operated resilient-seated wafer, tapped lugged, and flanged butterfly valves for waterworks purposes, with a maximum operating temperature of 40°C.

This Standard covers the following:

- (a) Manual actuators, gearboxes and standard spindle caps.
- (b) Water supply applications that include drinking water and recycled water as well as screened wastewater.
- (c) Valves of the following nominal sizes:
 - (i) Seal-on-disc: DN 300 to DN 2000.
 - (ii) Seal-in-body: DN 80 to DN 2000.
 - (iii) Seal-on-body: DN 80 to DN 2000.
- (d) The capability of the valves to be fitted with electric, hydraulic or pneumatic actuators and to be operated using portable actuators.

NOTE: Purchasing requirements that should be agreed upon at time of inquiry or order are given in Appendix B.

1.2 APPLICATION

Means for demonstrating compliance with this Standard are given in Appendix A.

1.3 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix C.

1.4 DEFINITIONS**1.4.1 Allowable operating pressure (AOP)**

The allowable internal pressure, excluding surge, that a component can safely withstand in service.

1.4.2 Allowable site test pressure (ASTP)

The maximum internal hydrostatic pressure that can be applied on site to a component in a newly installed pipeline.

1.4.3 Bonded

Glued or adhered where it can be removed.

1.4.4 Bulkhead test

A test where the testing machine provides external restraint to make a watertight joint at each end of the valve.

1.4.5 Disc clearance dimension

The dimension equivalent to the minimum internal diameter of an adjacent pipe or flange, which will allow the disc to open fully without interference or damage to the disc sealing edge.

1.4.6 Free-end seat test

A test where one side of the valve is pressurized with the disc in the closed position and the other side is unrestrained so that the valve liner is not externally compressed on the downstream end, which simulates a valve in a terminal position fastened at the upstream end only.

1.4.7 Maximum allowable operating pressure (MAOP)

The maximum internal pressure, including surge, which a component can safely withstand in service.

1.4.8 Nominal size (DN)

An alphanumeric designation of size for components of a pipework system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number, which is indirectly related to the physical size, in millimetres, of the bore, or outside diameter of the end connections.

1.4.9 Pressure class (PN)

A classification of valves by a PN number based on the allowable operating pressure expressed in hundreds of kilopascals.

1.4.10 Seal on disc

A seal that is attached to the perimeter of the disc of the valve.

1.4.11 Seal in body

A seal that is either clamped or retained integrally in the body of the valve.

1.4.12 Seal on body

A seal that encapsulates the wetted part of the body and is also an integral part of the flange face, replacing the need for a gasket.

1.4.13 Type test

A set of tests carried out to demonstrate performance and repeated at a frequency nominated in Table A1.

1.4.14 Vulcanize

To adhere the seal to the body by application of high temperature and the use of an agent.

1.5 DESIGNATION OF SIZE

Valve size shall be designated by the nominal size as follows:

- (a) Seal-on-disc: DN 300, 350, 400, 450, 500, 600, 700, 750, 800, 900, 1000, 1200, 1400, 1600, 1800 and 2000.
- (b) Seal-in-body: DN 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 750, 800, 900, 1000, 1200, 1400, 1600, 1800 and 2000.
- (c) Seal-on-body: DN 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 750, 800, 900, 1000, 1050, 1200, 1400, 1500, 1600, 1800 and 2000

1.6 ALLOWABLE OPERATING PRESSURES

Allowable operating pressures shall be as given in Table 1.1.

TABLE 1.1
CLASSIFICATION AND RATING

PN	AOP kPa	MAOP kPa	ASTP kPa	Maximum flow velocity m/s	
				Rated	Emergency
10	1 000	1 200	1 250	5	7.5
16	1 600	1 920	2 000	5	7.5
21	2 100	2 520	2 525	5	7.5
35	3 500	4 200	4 375	5	7.5

SECTION 2 MATERIALS AND COMPONENTS

2.1 GENERAL

The basic materials that shall be used for the manufacture of the valve components are listed in Table 2.1. The materials listed are the minimum acceptable standard materials.

Alternative materials to those listed in Table 2.1 may be used, provided they are equivalent in performance, particularly with respect to strength, corrosion-resistance, valve operation and durability. Other permitted alternative materials, as listed in Appendix D, may be specified by the purchaser.

Non-metallic materials used in the componentry of valves shall be fit for the intended purpose and shall exhibit dimensional stability after extended periods of time immersed in water and wastewater.

NOTE: Material equivalence will be considered by a ruling committee of purchasers and suppliers selected by the Water Services Association of Australia (WSAA) from standing members of Committee WS-022.

2.2 CORROSION-RESISTANT MATERIALS

For the purposes of this Standard, the following materials are deemed to be corrosion-resistant:

- (a) Copper alloys complying with AS 1565, AS/NZS 1567 or AS/NZS 1568 and complying with AS 2345.
- (b) Austenitic stainless steel complying with ASTM A276, series 300 containing not less than 8% nickel, except that Grade 303 is not permitted, and duplex (ferritic-austenitic) stainless steels UNS S32750, S32304, S31803 and S31500.
- (c) Stainless steel complying with ASTM A313.
- (d) Phosphor bronze complying with AS 2738, C51000.
- (e) Copper nickel alloy complying with AS 2738 C70610 or C71630.

Other materials may be considered based on published corrosion resistance data.

2.3 CONTAMINATION OF WATER

Valves shall comply with AS/NZS 4020. A scaling factor of 0.01 shall be applied.

2.4 O-RINGS (ELASTOMERIC TOROIDAL SEALING RINGS)

O-rings shall be made of elastomer that is not injuriously affected by the fluid, temperature or environmental conditions to which the O-rings will be subjected in service.

TABLE 2.1
BASIC MATERIAL REQUIREMENTS

Component	Basic material		
	Material	Standard	Grade
Body	Ductile cast iron*	AS 1831	500–7† 400–15
Disc (seal-in-body, seal-on-body, seal-on-disc)	Ductile cast iron*	AS 1831	500–7† 400–15
	Aluminium bronze	AS 1565	C95810
	Ductile cast iron*	AS 1831	500–7† 400–15
	Stainless steel	ASTM A743	CF8M
Shaft and shaft extension	Stainless steel	ASTM A276	316 or 431
	Monel™	ASTM B164	
Shaft bearings (upper and lower)	Leaded tin bronze	AS 1565	C92710, C93500, C93700
	PTFE, steel-lined		
Internal seal clamp ring and seal-facing ring	Stainless steel	ASTM A276	316 or 420
Liner, seals and O-rings	Synthetic elastomer	AS 1646.2 or AS 1646.3	CR, SBR, NBR EPDM
Flat gasket	Reinforced elastomer	BS 5292‡	
Fasteners	Stainless steel	ASTM A276	316
Disc pins	Stainless steel§	ASTM A276	316 or 431
External spindle tube	Hot-dip-galvanized steel	AS/NZS 4680	
External fasteners and eyebolts	Hot-dip-galvanized steel	AS 1214	

* To be coated in accordance with Section 4.

† Higher tensile strength ductile irons in accordance with AS 1831 are acceptable.

‡ Materials other than those in BS 5292 may be used for greater than Class 10.

§ Pins may be plated.

SECTION 3 DESIGN

3.1 GENERAL

Valves shall be designed and sized to give satisfactory performance in meeting the specified operating conditions (see Note). All valve components and spare parts shall be interchangeable between valves of the same size, type and manufacture.

NOTE: For information that should be supplied by the purchaser, see Appendix B.

Valves shall be designed—

- (a) for installation with the shafts horizontal, for use as isolating valves in water mains and screened wastewater mains, with the disc opening in the direction of the flow from the bottom;
- (b) for a minimum operating life of 50 years in buried installations;
- (c) for operation under full unbalanced head (maximum differential head) and opening and closing against maximum specified flows, including emergency flows in either direction;
- (d) for operation by hand-held portable actuators for valves larger than DN 300, which may impose torques on the spindle or gearbox input shaft as described in Clause 3.5.1;
- (e) for the capability to be fitted with electric, hydraulic or pneumatic actuators and to be operated using portable actuators; and
- (f) for drop-tight sealing at AOP or a derated AOP in the closed position without the need for downstream flanges in lugged and double-flanged body patterns.

NOTES:

- 1 Where the purchaser nominates that a lined valve be capable of acting as an ‘end-of-line fitting’, agreement needs to be reached between the purchaser and supplier as to whether—
 - (a) a lined double-flanged or lugged bodied valve capable of maintaining drop tight sealing at AOP without the need for downstream flanges to secure the liner be supplied; or
 - (b) where the operating conditions permit, a lined double-flanged or lugged bodied valve de-rated in accordance with Clause 5.2.6 be supplied.
- 2 De-rated, lined, double-flanged or lugged-bodied valves are only recommended for end-of-line use at operating pressures of 500 kPa or less.

Calculations showing the stresses and deformations of valve components occurring under the most adverse conditions specified shall be provided on request (see Note).

The head loss coefficient (K_v) shall be not greater than 0.8 when calculated by the following equation:

$$K_v = \frac{\Delta H}{V^2 / 2g}$$

where

ΔH = total head loss, in metres

V = velocity of flow, in metres per second

g = acceleration due to gravity, in metres per second squared

Head loss coefficient (K_v) shall be based on hydraulic model or prototype testing. Details of the testing and calculation of the coefficient shall be provided if requested.

3.2 END CONNECTIONS

3.2.1 General

Valve bodies and end connections shall be flanged, wafer or tapped lugged.

3.2.2 Flanged

Valves shall be flanged in accordance with AS 4087 and as given in Table 3.1, except that flanges may be flat faced. The purchaser may specify alternative flange standards or dimensions, provided the flange is not rated greater than the allowable operating pressure of the valve. The backs of all flanges shall be machined or spot-faced if the rake angle is greater than 2°, to provide a satisfactory bearing for bolt heads and nuts. Flanges shall be suitable for full-face gaskets or integral gaskets.

NOTE: Tapped holes may be used where through bolting is not possible.

TABLE 3.1
FLANGES

Class of valve	AS 4087 flange
10	Figure B2
16	Figure B5
21	Figure B6
35	Figure B6

3.2.3 Wafer

Wafer style valve bodies shall fit inside the relevant valve nominal diameter (DN) bolt circle of flanges complying with AS 4087 and shall incorporate at least two locating lugs at the top of the valve.

The purchaser may specify alternative flange standards or dimensions provided the flange is not rated less than the allowable operating pressure of the valve.

3.2.4 Tapped lugged

Tapped lugged style bodies shall comply with the number of holes, bolt sizes and flange bolt pitch circle diameters complying with AS 4087 for the equivalent nominal size (DN) of valve. Lugholes shall be drilled and tapped to suit bolt sizes given in AS 4087. Tapped holes shall accommodate setscrews complying with Clause 3.7 and shall be free of coating, to facilitate installation.

The purchaser may specify alternative flange standards or dimensions, provided the flange is not rated less than the allowable operating pressure of the valve.

3.3 COMPONENT DESIGN

3.3.1 Welding and post-weld heat treatment

All construction welding of steel or cast steel valve components shall be in accordance with AS/NZS 1554.1, Category SP. All welded valve bodies and machined internal parts shall be given post-weld heat treatment in accordance with AS 1210. No welding shall be permitted on cast iron components.

3.3.2 Castings

Castings shall be sound and free from laps, blowholes and pitting. External and internal surfaces shall be clean and free from sand. Structural defects in cast iron valve components shall not be repaired.

3.3.3 External drainage holes

Drainage holes shall be provided in any external pockets on the valve body or associated equipment, to prevent moisture ponding.

3.3.4 Face-to-face dimensions

The face-to-face dimensions of valves shall be as follows:

- (a) For PN 10 and PN 16 wafer, lugged and short-bodied wafer/double-flanged valves in accordance with ISO 5752 Series 20 or EN 558 Series 20.
- (b) For PN 10 to PN 35, double-flanged valves inclusive in accordance with ISO 5752 Series 13 or EN 558 Series 13.

Where valve design in PN 21 and PN 35 valves does not allow manufacture within this face-to-face limitation, face-to-face dimensions of valves may be in accordance with ISO 5752 Series 14 or EN 558 Series 14.

Other face-to-face dimensions of valves may be agreed between purchaser and supplier.

3.3.5 Supports

Unless otherwise specified, double-flanged valves shall be supplied with feet or include lugs to allow for the mounting of feet and attachment of anchor bolts.

3.3.6 Seal options

One of the following sealing arrangements shall be provided:

- (a) *Seal-on-disc* The resilient seal shall be held in place on the disc by a clamp ring with socketed or countersunk retaining screws.

For sizes DN 750 and above, the clamp ring shall be in sections or of 1 piece construction and shall be able to be removed without the need to dismantle, other valve components, in order to gain access for seat replacement.

The resilient seal on the disc shall seal against a seal-facing ring fitted to the valve body utilizing socketed or countersunk retaining screws.

Other methods, including weld deposition (integral) body seats, are permitted, provided the material is dissimilar from the body material and is corrosion resistant. A coated seating surface utilizing the body material alone shall not be used.

The fasteners securing the clamp or seal-facing rings in ductile or cast iron components shall be protected against the ingress of water with a sealant or thread seal.

- (b) *Seal-in-body* The resilient seal shall be held in place, in the body of the valve, by a clamp ring with socketed or countersunk retaining screws, or retained by a V-groove in the body and epoxy bonded in the groove behind the seat.

For sizes DN 750 and above, the clamp ring shall be in sections, to facilitate seal replacement without removing the valve from the pipeline.

For ductile cast iron discs, the sealing edge shall incorporate corrosion and erosion-resistant material having properties equivalent to or better than stainless steel Grade 316, to ensure continuing sealing properties for the mating resilient seal over the life of the valve.

Where internal, wetted fasteners are used in association with cast iron or steel components, seals and/or thread sealant shall be used to eliminate the ingress of water.