

AS/NZS 2845.1:2022



Australian/New Zealand Standard™

Water supply — Backflow prevention devices

Part 1: Materials, design and performance requirements



AS/NZS 2845.1:2022

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- Backflow Prevention Association of Australia
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- Department for Energy and Mining (SA)
- Engineers Australia
- Environment and Planning Directorate (ACT)
- Master Plumbers Australia and New Zealand
- Master Plumbers, Gasfitters and Drainlayers New Zealand
- Plastics Industry Pipe Association of Australia
- Plumbing Products Industry Group
- Queensland Brassware Association
- Victorian Building Authority
- Water New Zealand
- Water Services Association of Australia

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Australian/New Zealand Standard™

Water supply — Backflow prevention devices

Part 1: Materials, design and performance requirements

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Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS-023, Backflow Prevention Devices for Water Supply, to supersede AS/NZS 2845.1:2010.

The objective of this Standard is to provide health and safety and protection of the environment by providing suitable devices that qualify with established type testing.

This revision includes changes to detector assemblies which improve performance, resulting in less head loss in fire installations to provide greater water pressure to fight fires.

Illustrations used in this Standard are diagrammatic only and have been chosen without prejudice.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

Contents

Preface	ii
1 Scope and general	1
1.1 Scope, demonstration of conformance and application	1
1.1.1 Scope	1
1.1.2 Product conformity evaluation	1
1.1.3 Application	1
1.2 Normative references	2
1.3 Terms and definitions	4
1.4 Testing apparatus, testing sequence and instrumentation	6
1.5 Designation of size	6
1.6 Classification	6
1.7 Allowable pressures	6
2 Materials	6
2.1 General	6
2.2 Stainless steel	7
2.3 Filler metals for brazing or soldering	7
2.4 Nickel-copper-iron	7
2.5 Ferrous materials	7
2.5.1 General	7
2.5.2 Coating design	7
2.6 Copper	7
2.7 Copper alloy	8
2.8 Aluminium alloys	8
2.9 Corrosion-resistant metallic materials	8
2.10 Elastomeric materials	8
2.11 Plastics	8
2.11.1 General	8
2.11.2 Plastics-bodied devices	9
2.11.3 Acetal	9
3 Common design and performance requirements	9
3.1 General	9
3.2 Effect on water	9
3.3 Pressure and temperature ranges	9
3.4 Design	9
3.4.1 Serviceability	9
3.4.2 Release of trapped air	9
3.4.3 Flexible valve seats and diaphragms	10
3.5 End connections	10
3.5.1 General	10
3.5.2 Hose connections	10
3.5.3 Test tap outlets	10
3.5.4 Water meter connection ends	10
3.6 Valve seating	10
3.7 Structural tests	11
3.7.1 General	11
3.7.2 Torque	11
3.7.3 Heated water	11
3.7.4 Positive pressure	11
3.7.5 Reverse pressure	11
3.7.6 Endurance	11
3.7.7 Non-testable devices (low hazard)	11
3.8 Sampling and frequency plans	11
4 Atmospheric vacuum breaker (AVB)	11

4.1	General	11
4.2	Components	12
4.2.1	Ventilation valve	12
4.2.2	Non-return valve	12
4.3	Specific design requirements	12
4.3.1	Air port shields	12
4.3.2	Critical level (CL) mark	13
4.4	Performance tests	13
4.4.1	Procedures	13
4.4.2	Air port opening area	13
4.4.3	Water rise	13
4.4.4	Rated flow and pressure loss	13
4.4.5	Ventilation valve leakage	13
4.4.6	Critical level	13
4.4.7	Endurance	14
4.4.8	Ability to resist adhesion between the ventilation valve sealing elements	14
4.5	Sampling and frequency plans	14
5	Hose connection vacuum breaker (HCVB)	14
5.1	General	14
5.2	Components	14
5.2.1	Ventilation valve	14
5.2.2	Non-return valve	14
5.3	Specific design requirements	15
5.3.1	Air ports locations	15
5.3.2	Air ports opening area	15
5.3.3	Security	15
5.4	Performance tests	15
5.4.1	Procedures	15
5.4.2	Leakage from air ports	15
5.4.3	Resistance to bending	16
5.4.4	Ability to resist and relieve backpressure	16
5.4.5	Backpressure	16
5.4.6	Back-siphonage	16
5.4.7	Rated flow and pressure loss	16
5.4.8	Endurance	16
5.5	Sampling and frequency plans	16
6	Dual check valve with atmospheric port (DCAP)	17
6.1	General	17
6.2	Components	17
6.2.1	Ventilation valve	17
6.2.2	Non-return valves	17
6.3	Specific design requirements	17
6.3.1	Airflow passage, cross-sectional area	17
6.3.2	Air port outlet	17
6.4	Performance tests	18
6.4.1	Procedures	18
6.4.2	Non-return valve closing pressure	18
6.4.3	Leakage from air ports	18
6.4.4	Backflow through upstream non-return valve	18
6.4.5	Ventilation valve opening pressure	18
6.4.6	Back-siphonage	18
6.4.7	Back-siphonage under backpressure	18
6.4.8	Rated flow and pressure loss	18
6.4.9	Flow with low supply pressure	18
6.4.10	Endurance	19
6.5	Sampling and frequency plans	19
7	Dual check valve (dual CV)	19

7.1	General	19
7.2	Components	19
7.3	Performance tests	19
7.3.1	Procedures	19
7.3.2	Non-return valve closing pressure	19
7.3.3	Rated flow and pressure loss	20
7.3.4	Endurance	20
7.4	Sampling and frequency plans	20
8	Dual check valve with intermediate vent (Du CV)	20
8.1	General	20
8.2	Components	21
8.2.1	Ventilation valve	21
8.2.2	Non-return valves	21
8.3	Specific design requirements	21
8.3.1	Air port locations	21
8.3.2	Air ports opening area	21
8.4	Performance tests	21
8.4.1	Procedures	21
8.4.2	Non-return valve closing pressure	22
8.4.3	Minimum flow capacity and pressure loss	22
8.4.4	Intermediate vent device leakage	22
8.4.5	Back-siphonage	22
8.4.6	Endurance	22
8.5	Sampling and frequency plans	22
9	Pressure type vacuum breaker (PVB)	22
9.1	General	22
9.2	Components	22
9.2.1	Ventilation valve	22
9.2.2	Non-return valve	23
9.2.3	Test taps	23
9.3	Specific design requirements	23
9.3.1	Air port shields	23
9.3.2	Test taps	23
9.3.3	Critical level mark	23
9.4	Performance tests	24
9.4.1	Procedures	24
9.4.2	Non-return valve closing pressure	24
9.4.3	Ventilation valve opening pressure	24
9.4.4	Air port opening area	24
9.4.5	Water rise	24
9.4.6	Rated flow	24
9.4.7	Critical level	24
9.4.8	Endurance	25
9.4.9	Ability to resist adhesion between the ventilation valve sealing elements	25
9.5	Sampling and frequency plans	25
10	Double check valve (DCV)	25
10.1	General	25
10.2	Components	25
10.2.1	Non-return valve	25
10.2.2	Test taps	25
10.3	Specific design requirements	26
10.4	Performance tests	26
10.4.1	Procedures	26
10.4.2	Non-return valve closing pressure	26
10.4.3	Rated flow	26
10.4.4	Endurance	26
10.5	Sampling and frequency plans	26

11	Double check detector assembly (DCDA)	27
11.1	General	27
11.2	Components	27
11.2.1	Main double check valve	27
11.2.2	Bypass line	27
11.2.3	Water meter	27
11.2.4	Secondary double check valve	27
11.3	Performance test	28
11.3.1	Procedures	28
11.3.2	Pressure drop	28
11.3.3	Endurance	28
11.4	Sampling and frequency plans	28
12	Reduced pressure zone device (RPZD)	29
12.1	General	29
12.2	Components	29
12.2.1	Non-return valves	29
12.2.2	Relief valve	29
12.2.3	Test taps	29
12.3	Specific design requirements	30
12.3.1	Relief valve diaphragm or equivalent	30
12.3.2	Test taps	30
12.3.3	Relief valve opening	30
12.4	Performance tests	30
12.4.1	Procedures	30
12.4.2	Downstream non-return valve closing pressure	31
12.4.3	Intermediate chamber pressure	31
12.4.4	Supply pressure at which the intermediate chamber becomes atmospheric	31
12.4.5	Intermediate chamber pressure under backpressure conditions when the supply pressure is 14 kPa or greater	31
12.4.6	Intermediate chamber pressure under backpressure conditions, when the supply pressure is less than 14 kPa	31
12.4.7	Pressure differential at which relief valve commences to open	31
12.4.8	Supply pressure fluctuations and discharge from relief valve	31
12.4.9	Rated flow and pressure loss	31
12.4.10	Back-siphonage	32
12.4.11	Backpressure	32
12.4.12	Endurance	32
12.5	Sampling and frequency plans	32
13	Reduced pressure detector assembly (RPDA)	32
13.1	General	32
13.2	Components	33
13.2.1	Main reduced pressure zone valve	33
13.2.2	Bypass line	33
13.2.3	Water meter	33
13.2.4	Secondary reduced pressure zone device	33
13.3	Performance test	33
13.3.1	Procedures	33
13.3.2	Pressure drop	33
13.3.3	Endurance	34
13.4	Sampling and frequency plans	34
14	Spill-resistant pressure vacuum breaker (SPVB)	35
14.1	General	35
14.2	Components	35
14.2.1	Ventilation valve	35
14.2.2	Air port entry seal	35
14.2.3	Non-return valve	35
14.2.4	Test points	35

14.3	Specific design requirements.....	36
14.3.1	Air port shields.....	36
14.3.2	Test points.....	36
14.4	Performance tests.....	36
14.4.1	Procedures.....	36
14.4.2	Non-return valve closing pressure.....	36
14.4.3	Ventilation valve opening pressure.....	36
14.4.4	Air port entry seal.....	36
14.4.5	Air port opening area.....	36
14.4.6	Water rise.....	36
14.4.7	Rated flow and pressure loss.....	37
14.4.8	Critical level.....	37
14.4.9	Ability to resist adhesion between the ventilation valve sealing elements.....	37
14.4.10	Endurance.....	37
14.5	Sampling and frequency plans.....	37
15	Beverage dispenser dual check valve with atmospheric port (BDDC)	37
15.1	General.....	37
15.2	Components.....	38
15.2.1	Ventilation valve.....	38
15.2.2	Non-return valves.....	38
15.2.3	Air port.....	38
15.3	Specific design requirements.....	38
15.3.1	Air port.....	38
15.3.2	Air port shields.....	39
15.3.3	Air port opening area.....	39
15.3.4	Strainers.....	39
15.4	Performance tests.....	39
15.4.1	Procedures.....	39
15.4.2	Non-return valve closing pressure.....	39
15.4.3	Air port leakage.....	39
15.4.4	Backflow through upstream non-return valve.....	39
15.4.5	Ventilation valve opening pressure.....	39
15.4.6	Back-siphonage under backpressure.....	39
15.4.7	Rated flow and pressure loss.....	39
15.4.8	Ability to withstand continuous pressure.....	40
15.4.9	Endurance.....	40
15.5	Sampling and frequency plans.....	40
16	Pipe interrupter device (PID).....	40
16.1	General.....	40
16.2	Components — Air inlets.....	40
16.3	Specific design requirements.....	41
16.3.1	Air ports.....	41
16.4	Performance test.....	41
16.4.1	Procedures.....	41
16.4.2	Torque test for screwed end devices.....	41
16.4.3	Air inlets.....	41
16.5	Sampling and frequency plans.....	41
17	Single check valve (testable) (SCVT)	42
17.1	General.....	42
17.2	Components.....	42
17.2.1	Non-return valve.....	42
17.2.2	Test taps.....	42
17.3	Specific design requirements.....	42
17.4	Performance tests.....	42
17.4.1	Procedures.....	42
17.4.2	Non-return valve closing pressure.....	42
17.4.3	Rated flow and pressure loss.....	42

17.4.4	Endurance.....	43
17.5	Sampling and frequency plans.....	43
18	Single check detector assembly (testable) (SCDAT).....	43
18.1	General.....	43
18.2	Components.....	43
18.2.1	Main single check device.....	43
18.2.2	Bypass line.....	44
18.2.3	Water meter.....	44
18.2.4	Secondary check device.....	44
18.3	Performance tests.....	44
18.3.1	Procedures.....	44
18.3.2	Pressure drop.....	45
18.3.3	Endurance.....	45
18.4	Sampling and frequency plans.....	45
19	Marking and packaging.....	45
19.1	Marking.....	45
19.1.1	On the device.....	45
19.1.2	Nameplate or label.....	45
19.2	Packaging.....	46
20	Manufacturer's data.....	46
20.1	Installation instructions.....	46
20.2	Maintenance instructions.....	46
Appendix A (normative) Product conformity evaluation.....		47
Appendix B (normative) Testing apparatus, test sequence and instrumentation requirements.....		68
Appendix C (normative) Torque test on screwed-in end devices.....		74
Appendix D (normative) Test for ability to withstand continuous pressure — Devices intended for heated water applications.....		76
Appendix E (normative) Positive pressure test.....		78
Appendix F (normative) Reverse pressure test.....		79
Appendix G (normative) Air port opening area test — Atmospheric vacuum breaker (AVB), pressure type vacuum breaker (PVB), spill-resistant pressure vacuum breaker (SPVB) and pipe interrupter device (PID).....		81
Appendix H (normative) Water rise test — Atmospheric vacuum breaker (AVB), pressure type vacuum breaker (PVB) and spill-resistant pressure vacuum breaker (SPVB).....		83
Appendix I (normative) Endurance test — Atmospheric vacuum breaker (AVB).....		85
Appendix J (normative) Rated flow and pressure loss test.....		87
Appendix K (normative) Ventilation valve leakage test — Atmospheric vacuum breaker (AVB).....		89
Appendix L (normative) Determination of critical level — Atmospheric vacuum breaker (AVB), pressure-type Vacuum Breaker (PVB) and spill-resistant pressure vacuum breaker (SPVB).....		91
Appendix M (normative) Test for leakage from air ports — Hose connection vacuum breaker (HCVB) and dual check valve with intermediate vent (Du CV).....		93
Appendix N (normative) Test for resistance to bending — Hose connection vacuum breaker (HCVB).....		95
Appendix O (normative) Test for resistance and relief of backpressure — Hose connection vacuum breaker (HCVB).....		97

Appendix P (normative) Backpressure test — Hose connection vacuum breaker (HCVB)	99
Appendix Q (normative) Test for back-siphonage — Hose connection vacuum breaker (HCVB) and dual check valve with atmospheric port (DCAP)	101
Appendix R (normative) Test for rated water flow capacity and pressure loss — Hose connection vacuum breaker (HCVB)	103
Appendix S (normative) Endurance test — Hose connection vacuum breaker (HCVB)	105
Appendix T (normative) Non-return valve closing pressure test	107
Appendix U (normative) Test for leakage from air ports — Dual check valve with atmospheric port (DCAP) and beverage dispenser dual check valve with atmospheric port (BDDC)	109
Appendix V (normative) Test for backflow through upstream non-return valve—dual check valve with atmospheric port (DCAP) and beverage dispenser dual check valve with atmospheric port (BDDC)	110
Appendix W (normative) Ventilation valve opening pressure test — Dual check valve with atmospheric port (DCAP) and beverage dispenser dual check valve with atmospheric port (BDDC)	112
Appendix X (normative) Test for back-siphonage under backpressure — Dual check valve with atmospheric port (DCAP)	113
Appendix Y (normative) Testing installation for tests of Appendices D, E, I, K, L, R and Z	115
Appendix Z (normative) Test for flow rate at low supply pressure — Dual check valve with atmospheric port (DCAP)	116
Appendix AA (normative) Endurance test — Dual check valve with atmospheric port (DCAP)	117
Appendix BB (normative) Endurance test — Double check valve (DCA), dual check valve (Dual CV), dual check valve with intermediate vent (Du CV), double check detector assembly (DCDA), single check valve (testable) (SCVT) and single check detector assembly (testable) (SCDAT)	119
Appendix CC (normative) Back-siphonage test — Dual check valve with intermediate vent (Du CV)	121
Appendix DD (normative) Ventilation valve opening pressure test — Pressure type vacuum breaker (PVB) and spill-resistant pressure vacuum breaker (SPVB)	123
Appendix EE (normative) Endurance test — Pressure-type vacuum breaker (PVB) and spill-resistant pressure vacuum breaker (SPVB)	125
Appendix FF (normative) Intermediate chamber pressure test — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	127
Appendix GG (normative) Determination of supply pressure at which pressure in the intermediate chamber becomes atmospheric — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	129
Appendix HH (normative) Determination of intermediate chamber pressure under backpressure conditions when the supply pressure is 14 kPa or greater — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	131
Appendix II (normative) Determination of intermediate chamber pressure under backpressure conditions when the supply pressure is less than 14 kPa — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	133
Appendix JJ (normative) Determination of pressure differential at which relief valve commences to open — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	135

Appendix KK (normative) Test for effect of supply pressure fluctuation on discharge from relief valve — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	137
Appendix LL (normative) Back-siphonage test — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	138
Appendix MM (normative) Backpressure test — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPDA)	140
Appendix NN (normative) Endurance test — Reduced pressure zone device (RPZD) and reduced pressure detector assembly (RPZA)	142
Appendix OO (normative) Stiction test — Resilient seat material	143
Appendix PP (normative) Air port entry sealing test — Spill-resistant pressure vacuum breaker (SPVB)	145
Appendix QQ (normative) Back-siphonage test — Beverage dispenser dual check valve with atmospheric port (BDDC)	147
Appendix RR (normative) Endurance test — Beverage dispenser dual check valve with atmospheric port (BDDC)	149
Appendix SS (normative) Requirements specific to plastics materials for device bodies	150

Australian/New Zealand Standard

Water supply — Backflow prevention devices

Part 1: Materials, design and performance requirements

1 Scope and general

1.1 Scope, demonstration of conformance and application

1.1.1 Scope

This document specifies requirements for the materials, design, performance and testing of mechanical backflow prevention devices that are used for the protection of water supplies.

The backflow prevention devices covered in this document are of the following types:

- (a) Atmospheric vacuum breaker (AVB).
- (b) Hose connection vacuum breaker (HCVB).
- (c) Dual check valve with atmospheric port (DCAP).
- (d) Dual check valve (Dual CV).
- (e) Dual check valve with intermediate vent (Du CV).
- (f) Pressure-type vacuum breaker (PVB).
- (g) Double check valve (DCV).
- (h) Double check detector assembly (DCDA).
- (i) Reduced pressure zone device (RPZD).
- (j) Reduced pressure detector assembly (RPDA).
- (k) Spill-resistant pressure vacuum breaker (SPVB).
- (l) Beverage dispenser dual check valve with atmospheric port (BDDC).
- (m) Pipe interrupter device (PID).
- (n) Single check valve (testable) (SCVT).
- (o) Single check detector assembly testable (SCDAT).

NOTE Unless otherwise specified, the nominal size of a device is determined by the inlet connection.

1.1.2 Product conformity evaluation

Product conformity to this Standard shall be evaluated in accordance with [Appendix A](#).

If the evaluation of the product conformity is not completed, or the product does not fulfil the requirements stated in this Standard, claims shall not be made that products meet the requirements of this Standard.

1.1.3 Application

All backflow prevention devices shall conform to [Sections 1](#) to [3](#), and [19](#). Each backflow prevention device type shall conform the relevant Section as follows:

Section 4	Atmospheric vacuum breaker (AVB).
Section 5	Hose connection vacuum breaker (HCVB).
Section 6	Dual check valve with atmospheric port (DCAP).
Section 7	Dual check valve (Dual CV).
Section 8	Dual check valve with intermediate vent (Du CV).
Section 9	Pressure type vacuum breaker (PVB).
Section 10	Double check valve (DCV).
Section 11	Double check detector assembly (DCDA).
Section 12	Reduced pressure zone device (RPZD).
Section 13	Reduced pressure detector assembly (RPDA).
Section 14	Spill-resistant pressure vacuum breaker (SPVB).
Section 15	Beverage dispenser dual check device with atmospheric port (BDDC).
Section 16	Pipe interrupter device (PID).
Section 17	Single check valve (testable) (SCVT).
Section 18	Single check detector assembly (testable) (SCDAT).

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

AS 1349, *Bourdon tube pressure and vacuum gauges*

AS 1432, *Copper tubes for plumbing, gas fitting and drainage applications*

AS 1565, *Copper and copper alloys — Ingots and castings*

AS 1572, *Copper and copper alloys — Seamless tubes for engineering purposes*

AS 1646, *Elastomeric seals for waterworks purposes*

AS 1722.2, *Pipe threads of Whitworth form, Part 2: Fastening pipe threads*

AS 1769, *Welded stainless steel tubes for plumbing applications*

AS 1834.1, *Material for soldering, Part 1: Solder alloys*

AS 1874, *Aluminium and aluminium alloys — Ingots and castings*

AS 2074, *Cast steels*

AS 2129, *Flanges for pipes, valves and fittings*

AS 2345, *Dezincification resistance of copper alloys*

AS 2738, *Copper and copper alloys — Compositions and designations of refinery products, wrought products, ingots and castings*

AS 2845.3, Water Supply — Backflow prevention devices, Part 3: Field testing and maintenance of testable devices

AS 3565.1, Meters for cold and heated drinking and non-drinking water supplies, Part 1: Technical requirements

AS 3688, Water supply and gas systems — Metallic fittings and end connectors

AS 4087, Metallic flanges for waterworks purposes

AS ISO 7.1, Pipe threads where pressure-tight joints are made on the threads, Part 1: Dimensions, tolerances and designation

AS/NZS 1167.1, Welding and brazing — Filler metals, Part 1: Filler metal for brazing and braze welding

AS/NZS 1567, Copper and copper alloys — Wrought rods, bars and sections

AS/NZS 1568, Copper and copper alloys — Forging stock and forgings

AS/NZS 3500.0 Plumbing and drainage, Part 0: Glossary of terms

AS/NZS 3500.1 Plumbing and drainage, Part 1: Water services

AS/NZS 4020, Testing of products for use in contact with drinking water

AS/NZS 4129, Fittings for polyethylene (PE) pipes for pressure applications

AS/NZS 4158, Thermal-bonded polymeric coatings on devices and fittings for water industry purposes

AS/NZS 4331, Metallic flanges (series)

NZS 3501, Specification for copper tubes for water, gas and sanitation

ISO 1167 (series), Thermoplastics pipes, fittings and assemblies for the conveyance of fluids – Determination of the resistance to internal pressures

ISO 3459, Plastic piping systems — Mechanical joints between fittings and pressure pipes — Test method for leaktightness under negative pressure

ISO 3503, Plastics piping systems — Mechanical joints between fittings and pressure pipes — Test method for leaktightness under internal pressure of assemblies subjected to bending

ISO 4892-3, Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps

ISO 6957:1988, Copper alloys — Ammonia test for stress corrosion resistance

ISO 7686, Plastics pipes and fittings — Determination of opacity

ISO 9080, Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation

ISO 17885:2015, Plastics piping systems – Mechanical fittings for pressure piping systems - Specifications

ASTM A276, Standard Specification for Stainless Steel Bars and Shapes

ASTM A313/313M, Standard Specification for Stainless Steel Spring Wire

ASTM B127, Standard Specification for Nickel-Copper Alloy Plate, Sheet, and Strip

ASTM B163, Standard Specification for Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes

ASTM B164, Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire

ASTM B165, *Standard Specification for Nickel-Copper Alloy Seamless Pipe and Tube*

ANSI/ASME B1.20.1, *Pipe threads, General Purpose, Inch*

SAE J 512, *Automotive Tube Fittings*

SAE J 513, *Refrigeration Tube Fittings - General Specifications*

1.3 Terms and definitions

For the purpose of this Document, the definitions given in AS/NZS 3500.0 and those below apply.

1.3.1

air ports

openings or series of openings through the body of a device connecting the free atmosphere with the liquid passageway of the device

1.3.2

allowable operating pressure

AOP

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

1.3.3

allowable site test pressure

ASTP

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

1.3.4

atmospheric air

air of the surrounding atmosphere and at its existing pressure

1.3.5

backpressure

difference between the pressure within any water service and a higher pressure within any vessel or pipework to which it is connected

1.3.6

back-siphonage

reversal of flow of water caused by negative pressure in the distributing pipes of a water service or supply

1.3.7

component

part or sub-assembly of parts that contributes to the construction of a larger assembly or system

1.3.8

contaminant

solid, organisms, liquid or gases entering, or with the potential to enter and pollute, the drinking water supply

1.3.9

continuous pressure

system under constant hydrostatic pressure

1.3.10

critical level

CL

reference position on any vacuum breaker, at which point back-siphonage ceases, when a vacuum is present at the device inlet, and the device is fouled

1.3.11**downstream/outlet**

<1> opening or passage for water to exit

<2> portion of an assembly after the shut-off valve where water flows for its intended use

1.3.12**independently acting non-return valve**

any backflow prevention device that contains two or more check valves, a valve containing no common parts other than a body housing, has no contact between any of the moving parts of a non-return valve and any of the moving parts of any other non-return valve through the normal operation, and so constructed that the total failure of any non-return valve does not affect the operation of the other non-return valve in the device

1.3.13**Maximum allowable operating pressure****MAOP**

allowable internal pressure, including surge, that a component can safely withstand in service

1.3.14**maximum operating temperature****MOT**

maximum temperature at which a device can be safely operated

1.3.15**may**

indicates the existence of an option

1.3.16**plastics-bodied valves**

device where the major structural components are non-metallic

1.3.17**port****vent**

any opening(s) incorporated into a backflow preventer which allows air to enter the device under conditions of back-siphonage, or allows water to drain from the device under conditions of backpressure backflow

1.3.18**pressure class****PN**

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

1.3.19**rated flow**

rate of flow of a fluid through a device, pipework, or similar, which has been established under specified test conditions. It may be expressed in litres per second or cubic metres per second

1.3.20**shall**

indicates that a statement is mandatory

1.3.21**should**

indicates a recommendation

1.3.22**upstream/inlet**

<1> opening or passage for water to enter

<2> portion of an assembly before the shut-off valve where water flows for its intended use

1.4 Testing apparatus, testing sequence and instrumentation

Testing apparatus, testing sequence and instrumentation requirements shall be in accordance with [Appendix B](#).

1.5 Designation of size

Device sizes shall be designated by nominal size: DN 6, DN 8, DN 10, DN 15, DN 20, DN 25, DN 32, DN 40, DN 50, DN 65, DN 80, DN 100, DN 125, DN 150, DN 200, DN 250, DN 300, DN 350, DN 400.

1.6 Classification

Devices shall be classified by a PN number, based on allowable operating pressure (AOP). Standard pressure classifications are PN 10, PN 12 and PN 16; however, other pressure classifications are allowable, but not limited to the following:

- (a) PN 10 — for an allowable operating pressure of 1 000 kPa.
- (b) PN 12 — for an allowable operating pressure of 1 200 kPa.
- (c) PN 16 — for an allowable operating pressure of 1 600 kPa.

1.7 Allowable pressures

The allowable pressures for devices shall be as given in [Table 1.7](#).

Table 1.7 — Classification and allowable operating conditions

PN	AOP (allowable operating pressure)	MAOP (maximum allowable operating pressure)	ASTP (allowable site test pressure)
	kPa	kPa	kPa
10	1 000	1 200	1 250
12	1 200	1 440	1 500
16	1 600	1 920	2 000

2 Materials

2.1 General

This Section specifies requirements for materials for backflow prevention devices and associated fittings.

Materials used in the construction of backflow prevention devices and associated fittings shall be suitable for the conditions of use (that is, temperature, pressure, flow velocity and compatibility with any adjacent components). Alternative materials to those specified in this Section may be used, provided they are equivalent in performance, particularly with respect to strength, corrosion-resistance, device operation and durability.

NOTE Other alternative materials may be specified by a manufacturer.

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

Backflow prevention device component materials in contact with water shall be corrosion resistant.

2.2 Stainless steel

Stainless steel (SS) utilized in the construction of the assembly and in contact with water shall have a PREN of 18 or greater.

NOTE 1 PREN (Pitting resistance equivalent number) is defined in AS/NZS 3500.0 and may be calculated as follows:

$$\text{PREN} = \% \text{Cr} + (3.3 \times \% \text{Mo}) + (16 \times \% \text{N})$$

NOTE 2 A PREN of 18 is approximately equivalent to Grade 304 and a PREN of 22 is approximately equal to Grade 316.

NOTE 3 For corrosive mediums and environments, a higher grade stainless steel may be considered.

2.3 Filler metals for brazing or soldering

Filler metals material shall be one of the following:

- (a) Silver brazing alloy conforming to AS/NZS 1167.1.
- (b) Copper phosphorus brazing alloy conforming to AS/NZS 1167.1 with a minimum of 1.8 % silver.

2.4 Nickel-copper-iron

Other than for springs and circlips, nickel-copper-iron alloys shall conform to one of the following:

- (a) ASTM B127.
- (b) ASTM B163.
- (c) ASTM B164.
- (d) ASTM B165.

2.5 Ferrous materials

2.5.1 General

Other than for stainless steel, all ferrous materials such as steel, ductile iron and cast iron shall be coated in accordance with AS/NZS 4158.

2.5.2 Coating design

The coating system shall be fully effective for all internally wetted surfaces. The coating of ferrous components at all dissimilar metal interfaces shall form a complete seal in order to prevent formation of galvanic couples. This includes tapping points and retaining screws, which shall be sealed via the coating or an effective thread sealant. All surfaces that cannot be effectively coated and tested shall be of corrosion-resistant material.

2.6 Copper

Copper shall conform to the following:

- (a) Wrought product — AS 2738.
- (b) Tubular components — Copper pipe conforming to AS 1432 or NZS 3501.

2.7 Copper alloy

Copper alloys shall conform to the following:

- (a) Springs and circlips — Copper nickel alloy to AS/NZS 2738 alloy C70610 or Alloy C71630.
- (b) Springs and circlips — Phosphor bronze to AS/NZS 2738 alloy C51000.
- (c) Castings — AS 1565.
- (d) Hot pressings — AS/NZS 1568.
- (e) Rod for machined parts — AS/NZS 1567.
- (f) Tubular components — Copper alloy pipe conforming to AS 1572 alloy designation C 26130. Where bent or stamped in the fabrication process, the pipe shall be stress-relieved so that it is capable of passing the stress corrosion test specified in ISO 6957:1988 Clause 8, using a test solution of pH 9.5 without prior pickling, after all fabrication processes are completed.

NOTE ISO 6957 requires that the entire component is tested before any coating or plating operation.

- (g) Copper alloys that are buried and/or in contact with water shall be dezincification resistant (DR) in accordance with AS 2345.

2.8 Aluminium alloys

Aluminium alloys shall conform to AS 1874, Grade CA401, AA601, AA603 and AA607.

NOTE Hydrant standpipes manufactured from aluminium should be marked as “Hydrant standpipe use only”.

2.9 Corrosion-resistant metallic materials

For the purpose of this document the following materials are deemed to be corrosion resistant:

- (a) Copper conforming to [Clause 2.6](#).
- (b) Copper alloys conforming to [Clause 2.7](#).
- (c) Materials for springs and circlips specified in [Clauses 2.2\(d\)](#) and [2.7\(b\)](#).
- (d) Stainless steels specified in [Clause 2.2](#).
- (e) Filler metals specified in [Clause 2.3](#).
- (f) Ferrous materials coated as specified in [Clause 2.5](#).
- (g) Aluminium alloys specified in [Clause 2.8](#).

2.10 Elastomeric materials

Elastomeric materials shall conform to AS 1646.

2.11 Plastics

2.11.1 General

Plastics materials used in device components shall be of a type recommended by the polymer manufacturer as suitable and appropriate for use in the manufacture of the device component or otherwise demonstrate suitability. Characteristics to be taken into account shall include long-term resistance to pressure and creep, ultraviolet resistance, compatibility and resistance to variations in water quality and elevated temperatures.

2.11.2 Plastics-bodied devices

Plastics materials for device bodies shall conform to [Appendix SS](#).

2.11.3 Acetal

Acetal plastics used for structural components that are in contact with the water supply shall be copolymer.

3 Common design and performance requirements

3.1 General

This Section specifies requirements for the design and manufacture of backflow prevention devices.

Isolation valves supplied with backflow prevention devices, either integral or separate, shall be in accordance with relevant specifications as indicated in Schedule of Products under WaterMark Certification Scheme.

3.2 Effect on water

Backflow prevention devices shall conform to AS/NZS 4020.

A scaling factor of 0.01 shall be applied for devices DN 100 and above and 0.05 for devices < DN 100, except for HCVB and BDDC devices which shall be tested as end-of-line fittings.

3.3 Pressure and temperature ranges

Backflow prevention devices shall be designed to withstand test pressures and temperatures as nominated in test procedures, as follows:

- (a) *Pressure* — Devices shall be tested at pressures, up to and including 1.5 times (AOP) (see [Table 1.7](#)).
- (b) *Temperature* — The following shall apply:
 - (i) Cold water devices suitable for operation up to 40 °C shall be tested at a temperature not exceeding 40 °C.
 - (ii) Devices designed for use in cold and heated water shall be tested up to and including their nominated maximum operating temperature (MOT).

3.4 Design

3.4.1 Serviceability

The internal parts of testable devices shall be accessible for inspection, repair or replacement.

Testable devices shall be compatible with the field testing and maintenance as specified in AS 2845.3 without removal of the device from the service pipeline.

3.4.2 Release of trapped air

Provision shall be made for bleeding trapped air from the device when it cannot be displaced by the normal flow of water.

3.4.3 Flexible valve seats and diaphragms

In addition to the requirements of [Clause 3.3\(b\)](#), diaphragms, devices, disc seat facings and other flexible non-metallic parts shall be designed for continuous exposure to water, including chlorinated water, at the maximum rated operating temperature of the device without change in physical characteristics (i.e. corrosion-resistance and anti-adhesive properties).

3.5 End connections

3.5.1 General

Flanges shall conform to AS 4087, AS 2129 or AS/NZS 4331 series.

NOTE 1 Flanged adaptors may be used.

All other end connections shall conform to AS 3688.

Fittings such as end connectors intended to join alternative pipe systems made from other materials (e.g. plastics) shall also conform to the relevant dimensional and performance requirements of the appropriate Australian, New Zealand or Joint Australian/New Zealand Standard for the alternative pipe system.

NOTE 2 Requirements for end connections in New Zealand may differ from above requirements.

3.5.2 Hose connections

Hose connections shall be threaded in accordance with AS 1722.2.

3.5.3 Test tap outlets

Test tap outlets shall have either an internal thread conforming to AS ISO 7.1 or AS 1722.2, or an external thread conforming to ANSI/ASME B1.20.1 or SAE J 512 and J 513 requirements. The minimum thread size of test tap outlets shall be as specified in [Table 3.5.3](#).

Table 3.5.3 — Minimum thread size of test tap outlet threads

Nominal size of device DN	Minimum thread size ^a
25 and smaller	1/8/6
32 to 150	1/4/8
200 and larger	3/4/20
^a AS 1722.2	

3.5.4 Water meter connection ends

The thread form of water meter connection ends shall be in accordance with AS 1722.2 or in accordance with the requirements of the network utility operator.

NOTE The water meter type and form of connection ends may require network utility operator approval.

3.6 Valve seating

The seat or the valve disc shall be of an elastomeric resilient material.

3.7 Structural tests

3.7.1 General

Structural tests shall be performed prior to other tests. The tests shall be performed in the sequence shown in [Clauses 3.7.2 to 3.7.7](#). All the tests shall be performed on the same sample of each type of device.

3.7.2 Torque

When tested in accordance with [Appendix C](#), devices, other than HCVB, shall be capable of withstanding the applied torque given in [Table C.1, Appendix C](#), as applicable, without permanent deformation, breakage or damage to threads.

3.7.3 Heated water

Devices intended for heated water installation shall be tested in accordance with [Appendix D](#).

3.7.4 Positive pressure

When tested in accordance with [Appendix E](#), the device shall be capable of withstanding the appropriate test pressures for the pressure rating of the device at the required temperatures without leakage or distortion.

3.7.5 Reverse pressure

When tested in accordance with [Appendix F](#), each non-return valve shall be capable of withstanding, without leakage or distortion, a backpressure of not less than the test pressure specified with atmospheric pressure on its upstream side.

This test does not apply to atmospheric vacuum breakers (AVB), pressure vacuum breakers (PVB), spill-resistant pressure vacuum breakers (SPVB) and hose connection vacuum breakers (HCVB).

3.7.6 Endurance

There shall be no replacement of parts during or following completion of the cycling of the endurance test. Cleaning of internal parts may be carried out following completion of test.

3.7.7 Non-testable devices (low hazard)

For retesting following endurance cycling, non-return valves shall not be fouled.

3.8 Sampling and frequency plans

Sampling for conformance testing and frequency plans for each device shall be as specified in [Appendix A](#).

4 Atmospheric vacuum breaker (AVB)

4.1 General

This Section specifies the requirements for atmospheric vacuum breakers. Vacuum breakers incorporate the components specified in [Clause 4.2](#) and are required to pass performance tests specified in [Clause 4.4](#).

NOTE See [Figure 4.1](#) for a schematic diagram of a typical atmospheric vacuum breaker.

An atmospheric vacuum breaker is a device designed to prevent backflow caused by back-siphonage. It is not for use in systems subject to continuous pressure.

4.2 Components

4.2.1 Ventilation valve

A ventilation valve shall be provided, which shall be capable of venting the system to the atmosphere whenever the water pressure drops to or below atmospheric pressure, thereby providing airflow upstream if there are back-siphonage conditions in the pipework.

4.2.2 Non-return valve

A non-return valve shall be provided upstream of the vent valve.

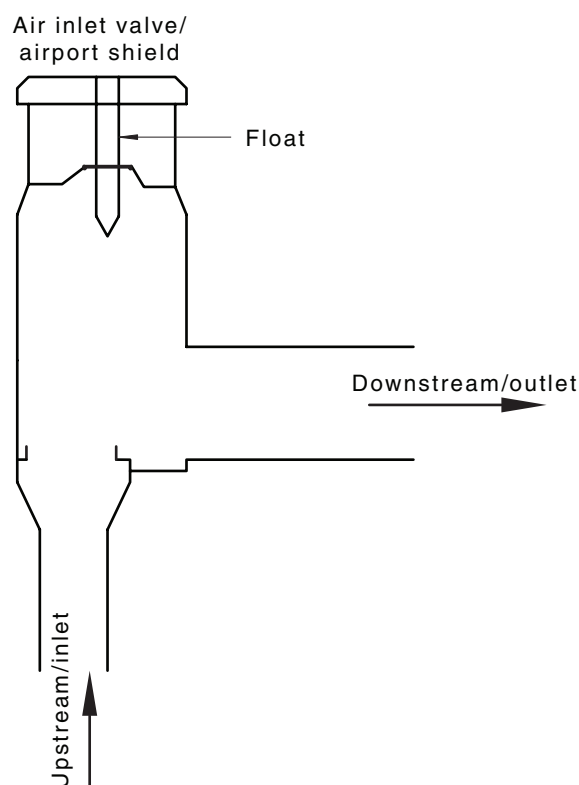


Figure 4.1 — Schematic diagram of a typical atmospheric vacuum breaker

4.3 Specific design requirements

4.3.1 Air port shields

Air port shields shall be designed to —

- (a) be arranged to extend down and around the body of the device to the lowest portion of the air port; and
- (b) provide an airflow passage of not less than 5 mm in width.

4.3.2 Critical level (CL) mark

Where the device is a separate unit and there is no mark, the lowest part of the body housing shall be deemed the CL mark. Where the device is incorporated in a downstream tube supplied by the manufacturer, a CL mark shall be inscribed on the outside surface of the tube.

4.4 Performance tests

4.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

4.4.2 Air port opening area

When tested in accordance with [Appendix G](#), the air ports shall admit a volume rate of airflow to the water outlet equal to or greater than the volume rate of airflow through the water inlet to the water outlet under equal vacuum.

4.4.3 Water rise

When tested in accordance with [Appendix H](#), the device shall not permit a water rise of more than 75 mm in the sight tube connected to the water outlet of the device, when the non-return valve is held open with fouling wire in accordance with [Appendix B](#) during varied vacuum applications ranging from 0 kPa to 85 kPa below atmospheric pressure, applied at the water inlet of the device.

4.4.4 Rated flow and pressure loss

When tested in accordance with [Appendix J](#), the maximum pressure loss across the vacuum breaker at the rated water flow shall be as given in [Table 4.4.4](#).

Table 4.4.4 — Rated flow and pressure loss

Nominal size of device DN	Rated flow L/s	Maximum pressure loss kPa
15	0.75	150
20	1.90	140
25	3.10	125
32	4.7	125
40	6.3	110
50	10.0	110
65	14.2	110
80	20.2	105

4.4.5 Ventilation valve leakage

When tested in accordance with [Appendix K](#), and taken from atmospheric pressure up to 1 400 kPa, there shall be no leakage of water from the air ports.

4.4.6 Critical level

When tested in accordance with [Appendix L](#) there shall be no evidence of water present in the transparent water trap after the vacuum surge loading test.

4.4.7 Endurance

After completion of endurance test in accordance with [Appendix I](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 4.4.3](#) and [4.4.8](#) (see [Table B.2](#), [Appendix B](#)).

For post-endurance test, non-return valves shall not be fouled.

4.4.8 Ability to resist adhesion between the ventilation valve sealing elements

When tested in accordance with [Appendix OO](#), there shall be no back-siphonage of water from the downstream piping into the supply piping when the non-return valve seat or disc is fouled in accordance with [Appendix B](#), under varied applications ranging from 0 kPa to 85 kPa below atmospheric pressure applied to the water upstream of the device.

4.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for atmospheric vacuum breakers shall be as specified in [Tables A.5.1\(A\)](#) and [A.5.1\(B\)](#), [Appendix A](#).

5 Hose connection vacuum breaker (HCVB)

5.1 General

This Section specifies the requirements for hose connection vacuum breakers. Hose connection vacuum breakers incorporate the components specified in [Clause 5.2](#) and are required to pass performance tests in accordance with [Clause 5.4](#).

NOTE See [Figure 5.1](#) for a schematic diagram of a typical hose connection vacuum breaker.

A hose connection vacuum breaker is a device designed for use in “low hazard” conditions to prevent backflow caused by back-siphonage or low head (30 kPa) backpressure. It is not for use in systems subject to continuous pressure conditions.

5.2 Components

5.2.1 Ventilation valve

A ventilation valve shall be provided to vent the hose to the atmosphere whenever the water pressure in the pipework drops below the pressure in the hose connected to the outlet.

5.2.2 Non-return valve

A non-return valve shall be provided, which shall be capable of being arranged to be force-loaded to the closed position.

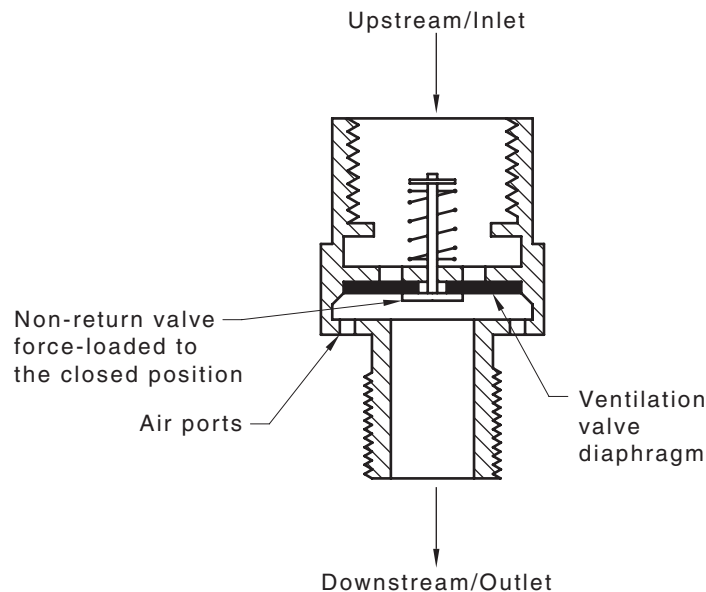


Figure 5.1 — Schematic diagram of a typical hose connection vacuum breaker

5.3 Specific design requirements

5.3.1 Air ports locations

Air ports shall be located so as to prevent the possibility of port fouling when installed in accordance with manufacturer's installation requirements.

5.3.2 Air ports opening area

The least total cross-sectional area of the airflow passage, including the seat area of the air vent device, shall be not less than the least total cross-sectional area of the water flow passage or passages upstream from the ventilation device. The minimum cross-sectional dimension of any port or air passage, other than the valve lift, shall be not less than 1.5 mm.

5.3.3 Security

Means shall be provided, in conjunction with the threaded inlet, to prevent the ready removal of the device from the tap to which it is connected.

NOTE This is not a mandatory requirement for DN 15.

5.4 Performance tests

5.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2 Appendix B](#).

5.4.2 Leakage from air ports

When determined in accordance with [Appendix M](#), the leakage rate from the air ports shall not exceed the following:

- | | |
|-------------------------------------|-------------|
| (a) Below 20 kPa upstream pressure; | 0.15 L/min. |
|-------------------------------------|-------------|

- (b) At or above 20 kPa upstream pressure; no leakage.

5.4.3 Resistance to bending

When tested in accordance with [Appendix N](#), devices shall withstand a bending moment of 35 Nm applied at the upstream end of the device without permanent distortion or damage that will affect their functioning capabilities. A device shall not leak during or at the conclusion of the test.

5.4.4 Ability to resist and relieve backpressure

When tested in accordance with [Appendix O](#), as the upstream pressure is suddenly released, the device shall relieve the downstream pressure through the air ports.

5.4.5 Backpressure

When tested in accordance with [Appendix P](#), there shall be no backflow of water through the non-return valve into the supply line when the air ports are sealed and a backpressure within a range of 150 mm to 3000 mm water head is applied downstream of the device.

NOTE For example, appearance of coloured water in the sight glass will be cause for rejection.

5.4.6 Back-siphonage

When tested in accordance with [Appendix Q](#), there shall be no back-siphonage of water from the downstream piping into the supply piping when the non-return valve seat or disc is fouled, in accordance with Clause B1.9, [Appendix B](#), under varied vacuum applications ranging from 0 kPa to 85 kPa below atmospheric pressure applied to the water upstream of the device. The crown of the meniscus in the sight tube shall not rise more than 3 mm.

Where the ventilation valve diaphragm (see [Figure 5.1](#)) of the device acts as a secondary non-return valve, fouling wires shall be positioned in accordance with [Figure B.1.9\(A\)](#), [Appendix B](#).

5.4.7 Rated flow and pressure loss

When tested in accordance with [Appendix R](#), the maximum pressure loss across the device at the rated water flow shall be as given in [Table 5.4.7](#).

Table 5.4.7 — Rated flow and pressure loss

Nominal size of device DN	Rated flow L/s	Maximum pressure loss kPa	Inlet/Outlet DN
15	0.2	175	15
15	0.4	175	20
20	0.6	175	25

5.4.8 Endurance

After completion of the endurance test in accordance with [Appendix S](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 5.4.6](#) and [5.4.7](#) (see [Table B.2](#), [Appendix B](#)). Non-return valves shall not be used during post-endurance tests.

5.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for hose connection vacuum breakers shall be as specified in [Tables A.5.2\(A\)](#) and [A.5.2\(B\)](#), [Appendix A](#).

6 Dual check valve with atmospheric port (DCAP)

6.1 General

This Section specifies the requirements for dual check valves with atmospheric port. Dual check valves with atmospheric port incorporate the components specified in [Clause 6.2](#) and are required to pass performance tests in accordance with [Clause 6.4](#).

NOTE See [Figure 6.1](#) for a schematic diagram of a typical dual check valve with atmospheric port is shown.

A dual check valve with atmospheric port is a device designed for use in “low hazard” conditions to prevent backflow caused by back-siphonage or backpressure. It is for use under continuous pressure conditions.

6.2 Components

6.2.1 Ventilation valve

A ventilation valve shall be provided, which shall be capable of being force-loaded to the open position when the supply pressure is both at atmospheric, and at 20 % less than the downstream pressure.

6.2.2 Non-return valves

Two independently acting non-return valves shall be arranged to be force-loaded to the closed position.

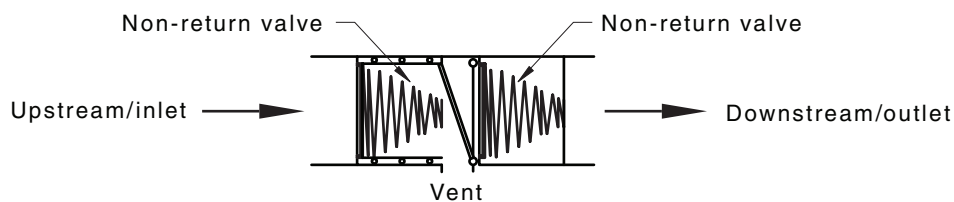


Figure 6.1 — Schematic diagram of a typical dual check valve with atmospheric port (DCAP)

6.3 Specific design requirements

6.3.1 Airflow passage, cross-sectional area

The least total cross-sectional area of the airflow passage, including the seat area of the ventilation valve, shall be not less than the least total cross-sectional area of the water flow passage or passages upstream from the ventilation valve. The minimum cross-sectional dimension of any air port or passage, not including the valve lift or ventilation valve lift, shall be not less than 2.4 mm.

6.3.2 Air port outlet

The air port outlet shall be —

- (a) located so as to prevent the possibility of port fouling when installed according to the manufacturer's installation requirements; and
- (b) of a size and shape that cannot be threaded or connected with tubing either internally or externally.

6.4 Performance tests

6.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

6.4.2 Non-return valve closing pressure

When tested in accordance with [Appendix T](#), each non-return valve shall not leak at pressures up to 7 kPa applied in the direction of normal water flow.

6.4.3 Leakage from air ports

When tested in accordance with [Appendix U](#), there shall be no leakage from the air ports for pressures up to the rated working pressure and at flow rates up to the rated flow.

6.4.4 Backflow through upstream non-return valve

When tested in accordance with [Appendix V](#), there shall be no backflow of water into the upstream of the device when backpressures of 1.5 kPa, 100 kPa, and the maximum rated working pressure are applied in succession to the outlet of the device.

6.4.5 Ventilation valve opening pressure

When tested in accordance with [Appendix W](#), the ventilation valve shall open to relieve backpressure due to backflow/backpressure before the supply pressure is 20 % less than the downstream pressure.

6.4.6 Back-siphonage

When tested in accordance with [Appendix Q](#), there shall be no back-siphonage of water from the downstream piping into the supply piping when the upstream non-return valve seat or disc is fouled in accordance with [Clause B.1.9](#), [Appendix B](#), and the downstream non-return valve is held open by mechanical means, under varied vacuum applications ranging from 0 kPa to 85 kPa below atmospheric pressure applied to the water upstream of the device. The crown of the meniscus in the sight glass shall not rise more than 3 mm.

6.4.7 Back-siphonage under backpressure

When tested in accordance with [Appendix X](#), there shall be no back-siphonage of water from the downstream piping into the supply piping when one non-return valve seat or disc is fouled in accordance with [Appendix B](#) under varied vacuum applications for separate backpressure conditions of 100 kPa and 350 kPa.

6.4.8 Rated flow and pressure loss

When tested in accordance with [Appendix J](#), with a maximum pressure loss across the device of 175 kPa, the rated flow shall be as given in [Table 7.3.3](#).

6.4.9 Flow with low supply pressure

When tested in accordance with [Appendix Z](#), the device shall be capable of a flow of not less than 20 % of its rated flow capacity when the supply pressure is 70 kPa.

6.4.10 Endurance

After completion of the endurance test in accordance with [Appendix AA](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 6.4.2](#), [6.4.4](#), [6.4.6](#) and [6.4.7](#) (see [Table B.2](#), [Appendix B](#)).

Non-return valves shall not be used for post-endurance tests.

6.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for dual check valve with atmospheric port shall be as given in [Tables A.5.3\(A\)](#) and [A.5.3\(B\)](#), [Appendix A](#).

7 Dual check valve (dual CV)

7.1 General

This Section specifies the requirements for dual check valves. Dual check valves incorporate the components specified in [Clause 7.2](#) and are required to pass the performance tests specified in [Clause 7.3](#).

NOTE See [Figure 7.1](#) for a schematic diagram of a typical dual check valve.

A dual check valve is a device designed for use in “low hazard” conditions to prevent backflow caused by back-siphonage or backpressure. It is for use under continuous pressure conditions.

7.2 Components

Two independently acting non-return valves shall be provided, and shall be arranged in series and force-loaded to the closed position.

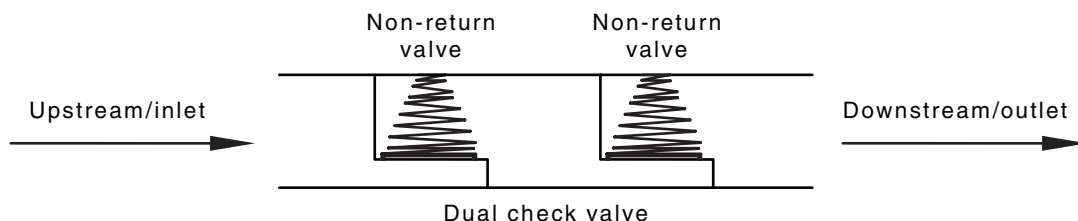


Figure 7.1 — Schematic diagram of a typical dual check valve (dual CV)

7.3 Performance tests

7.3.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

7.3.2 Non-return valve closing pressure

When tested in accordance with [Appendix T](#), each non-return valve shall not leak against pressure up to 7 kPa applied in the direction of normal water flow, with the pressure downstream at atmospheric pressure.

7.3.3 Rated flow and pressure loss

When tested in accordance with [Appendix J](#), with a maximum pressure loss of 50 kPa, the rated water flow of shall be as given in [Table 7.3.3](#).

Table 7.3.3 — Rated flow — Dual CV

Nominal size of device DN	Rated flow L/s
5	0.08
10	0.18
15	0.32
20	0.70
25	1.00
32	1.40
40	2.00
50	4.2
65	5.6
80	8.4
100	11
150	21
200	33
250	48.4
300	63.4

7.3.4 Endurance

After completion of the endurance test in accordance with [Appendix BB](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 7.3.2](#) and [7.3.3](#) (see [Table B.2](#), [Appendix B](#)).

7.4 Sampling and frequency plans

Sampling for conformance testing and frequency plans for dual check valves shall be as given in [Tables A.5.4\(A\)](#) and [A.5.4\(B\)](#), [Appendix A](#).

8 Dual check valve with intermediate vent (Du CV)

8.1 General

This Section specifies the requirements for dual check valves with intermediate vent. Dual check valves with intermediate vent incorporate the components specified in [Clause 8.3](#) and are required to pass performance tests specified in [Clause 8.5](#).

NOTE See [Figure 8.1](#) for a schematic diagram of a typical dual check valve with intermediate vent.

A dual check valve with intermediate vent is designed for use in “low hazard” conditions to prevent backflow caused by back-siphonage or backpressure. It is for use in systems subject to continuous pressure.

8.2 Components

8.2.1 Ventilation valve

A ventilation valve shall be provided, which shall open whenever the water pressure at the inlet drops to atmospheric pressure or below.

8.2.2 Non-return valves

Two independently acting non-return valves shall be provided, and shall be arranged to be force-loaded to the closed position.

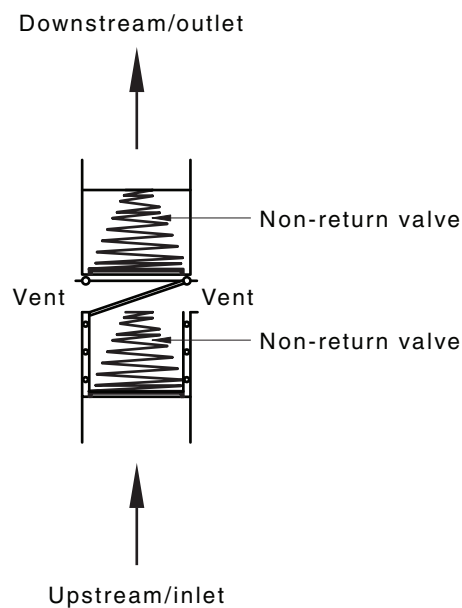


Figure 8.1 — Schematic diagram of a typical dual check valve with intermediate vent (Du CV)

8.3 Specific design requirements

8.3.1 Air port locations

The air ports of dual check valves with intermediate vent shall be located so as to minimize the probability of port fouling.

8.3.2 Air ports opening area

The least cross-sectional area of the airflow passage, including the seat area of the air vent valve, shall be not less than the least cross-sectional area of the water flow passage or passages upstream of the ventilation valve. The minimum cross-sectional dimension of any air port or air passage, other than the valve lift, shall be not less than 1.5 mm.

8.4 Performance tests

8.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

8.4.2 Non-return valve closing pressure

When tested in accordance with [Appendix T](#), each non-return valve shall not leak against a pressure of 7 kPa applied in the normal direction of water flow with the pressure downstream at atmosphere.

8.4.3 Minimum flow capacity and pressure loss

When tested in accordance with [Appendix J](#), the minimum flow capacity shall be 0.25 L/s and the maximum pressure loss 140 kPa.

8.4.4 Intermediate vent device leakage

When tested in accordance with [Appendix M](#), there shall be no leakage of water from the intermediate vent port, at any flow rate up to the rated flow capacity of the device.

8.4.5 Back-siphonage

When tested in accordance with [Appendix CC](#), there shall be no back-siphonage of water from the outlet of the device to the inlet, when both the upstream and downstream non-return valves are fouled in accordance with [Clause B.1.9](#), [Appendix B](#), and a vacuum of 60 kPa is created at the inlet when the pressure at the outlet is atmospheric.

8.4.6 Endurance

After completion of the endurance test in accordance with [Appendix BB](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 8.4.2](#) and [8.4.5](#) (see [Table B.2](#), [Appendix B](#)).

NOTE A hot water test may be required.

8.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for dual check valves with intermediate vent shall be as given in [Tables A.5.5\(A\)](#) and [A.5.5\(B\)](#), [Appendix A](#).

9 Pressure type vacuum breaker (PVB)

9.1 General

This Section specifies the requirements for pressure type vacuum breakers (PVBs). Pressure type vacuum breakers incorporate the components specified in [Clause 9.2](#) and are required to pass performance tests specified in [Clause 9.4](#).

NOTE See [Figure 9.1](#) for a schematic diagram of a typical pressure type vacuum breaker.

A pressure type vacuum breaker is a testable device designed for use in “high hazard” conditions to prevent backflow caused by back-siphonage. It is for use under continuous pressure conditions.

9.2 Components

9.2.1 Ventilation valve

A ventilation valve shall be provided. The valve shall be capable of being force-loaded to the open position, venting the pipework to atmosphere whenever the pressure in the device falls to 7 kPa.

9.2.2 Non-return valve

A non-return shall be provided upstream of the vent valve and shall be force-loaded to the closed position.

9.2.3 Test taps

Downstream and upstream test taps shall be provided to enable regular checking of the function of the non-return and ventilation valves.

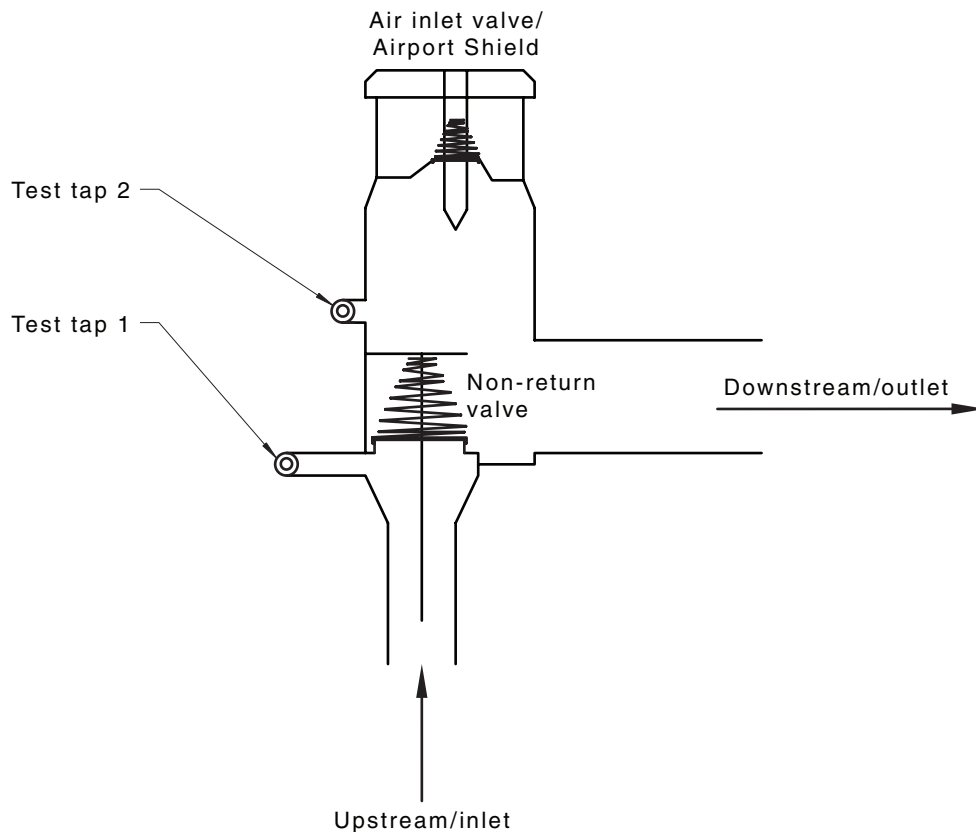


Figure 9.1 — Schematic diagram of a typical pressure type vacuum breaker (PVB)

9.3 Specific design requirements

9.3.1 Air port shields

Air port shields shall —

- (a) extend down and around the body of the device to the lowest portion of the air port; and
- (b) provide an airflow passage of not less than 5 mm in width.

9.3.2 Test taps

Test taps shall be provided in the device upstream and downstream of the non-return valve. The nominal size of tappings for test taps shall be in accordance with [Clause 3.5.3](#).

9.3.3 Critical level mark

Critical level (CL) mark is a mark corresponding to the critical level on any vacuum breaker. Where the device is a separate unit and there is no CL mark, the lowest part of the body housing shall be deemed

the CL mark. Where the device is incorporated in a downstream tube supplied by the manufacturer, a CL mark shall be inscribed on the outside surface of the tube.

9.4 Performance tests

9.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

9.4.2 Non-return valve closing pressure

When tested in accordance with [Appendix T](#), the non-return valve shall not leak against pressures up to 7 kPa applied in the direction of normal water flow, with the pressure downstream at atmospheric pressure.

9.4.3 Ventilation valve opening pressure

When tested in accordance with [Appendix DD](#), the ventilation valve shall start to open before the pressure falls to 7 kPa and shall be fully open when the downstream chamber is drained.

9.4.4 Air port opening area

When tested in accordance with [Appendix G](#), the air port shall admit a volume flow rate of air through the ventilation valve, into the valve outlet chamber, such that the procedure of [Clause G.4](#) is satisfied.

9.4.5 Water rise

When tested in accordance with [Appendix H](#), the device shall not permit a water rise of more than 3 mm in a sight tube connected to the water outlet of the device, when the non-return valve is held open with fouling wire in accordance with Clause B1.9, [Appendix B](#), during varied vacuum applications ranging from 0 kPa to 85 kPa below atmospheric pressure at the water inlet of the device.

9.4.6 Rated flow

When tested in accordance with [Appendix J](#) with a maximum pressure loss of 70 kPa, the rated water flow shall be as given in [Table 9.4.6](#).

Table 9.4.6 — Rated flow — PVB

Nominal size of device DN	Rated flow L/s
15	1.25
20	1.9
25	3.2
32	4.75
40	6.3
50	10

9.4.7 Critical level

When tested in accordance with [Appendix L](#), there shall be no evidence of water present in the transparent water trap after the vacuum surge loading test.

9.4.8 Endurance

After completion of the endurance test in accordance with [Appendix EE](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 9.4.2, 9.4.3, 9.4.4](#) and [9.4.9](#) (see [Table B.2, Appendix B](#)).

9.4.9 Ability to resist adhesion between the ventilation valve sealing elements

When tested in accordance with [Appendix OO](#), there shall be no back-siphonage of water from the downstream piping into the supply piping when the non-return valve seat or disc is fouled in accordance with [Clause B.1.9, Appendix B](#), under varied applications ranging from 0 Pa to 85 kPa below atmospheric pressure applied to the water upstream of the device.

9.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for pressure type vacuum breakers shall be as given in [Tables A.5.6\(A\)](#) and [A.5.6\(B\)](#), [Appendix A](#).

10 Double check valve (DCV)

10.1 General

This Section specifies the requirements for double check valves (DCVs). Double check valves incorporate the components specified in [Clause 10.2](#) and are required to pass performance tests specified in [Clause 10.4](#).

NOTE See [Figure 10.1](#) for a schematic diagram of a typical double check valve.

A double check valve is a testable device designed for use in “medium hazard” conditions to prevent backflow caused by back-siphonage or backpressure. It is for use under continuous pressure conditions.

10.2 Components

10.2.1 Non-return valve

Two independently acting non-return valves shall be provided and shall be arranged in series and force-loaded to the closed position.

10.2.2 Test taps

Test taps shall be provided to enable regular checking of the performance of the non-return valves.

NOTE This excludes hydrant standpipe devices.

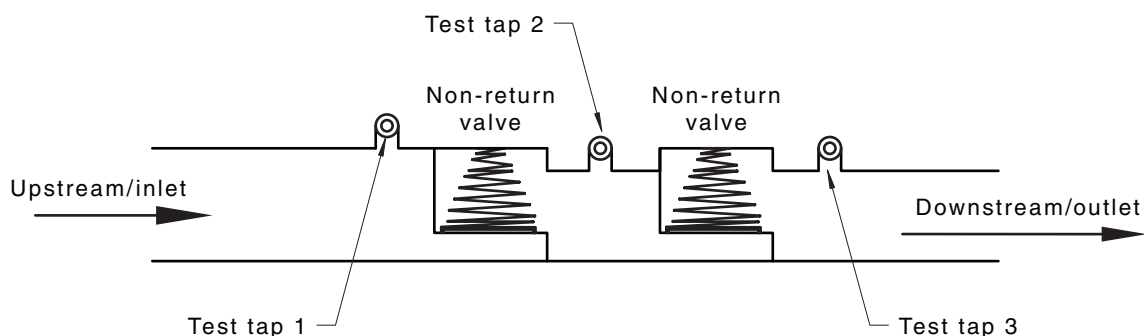


Figure 10.1 — Schematic diagram of a typical double check valve (DCV)

10.3 Specific design requirements

Test taps shall be provided in the device upstream of the upstream non-return valve, downstream of the downstream non-return valve, and in the intermediate chamber. Nominal pipe size of the tapings for test taps shall be as specified in [Clause 3.5.3](#).

10.4 Performance tests

10.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2, Appendix B](#).

10.4.2 Non-return valve closing pressure

When tested in accordance with [Appendix T](#), each non-return valve shall not leak against pressures up to 7 kPa applied in the direction of normal water flow, with the pressure downstream at atmospheric pressure.

10.4.3 Rated flow

When tested in accordance with [Appendix J](#), with a maximum pressure loss of 70 kPa, the rated water flow shall be as given in [Table 10.4.3](#).

Table 10.4.3 — Rated flow — DCV

Nominal size of device DN	Rated flow L/s
15	1.25
20	1.9
25	3.2
32	4.75
40	6.3
50	10
65	14
80	20
100	32
150	63
200	100
250	145
300	190
350	230
400	275

10.4.4 Endurance

After completion of the endurance test in accordance with [Appendix BB](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clause 10.4.2](#) (see [Table B.2, Appendix B](#)).

NOTE For devices above DN 100, the endurance test is waived, as such devices are usually special devices and tested in-house.

10.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for double check valves shall be as given in [Tables A.5.7\(A\)](#) and [A.5.7\(B\)](#), [Appendix A](#).

11 Double check detector assembly (DCDA)

11.1 General

This Section specifies the requirements for double check detector assemblies (DCDAs). Double check detector assemblies incorporate the components specified in [Clause 11.3](#) and are required to pass the following performance tests:

- (a) Test specified in [Section 10](#), other than the test of [Clause 10.4.3](#)
- (b) Special performance test specified in [Clause 11.3](#).

NOTE See [Figure 11.1](#) for a schematic plan view of a typical double check detector assembly.

A double check detector assembly is a testable device designed for use in “medium hazard” conditions to prevent backflow caused by backpressure or back-siphonage. It is for use in fire service lines under continuous pressure and allows monitoring of small draw-offs of water.

11.2 Components

11.2.1 Main double check valve

Two independently acting non-return valves shall be provided and shall be arranged in series and be capable of being force-loaded to the closed position (see [Clauses 10.2.1](#) and [11.3](#)).

11.2.2 Bypass line

The main double check valve shall have a bypass line of a minimum DN 20 size, and shall be installed bridging from upstream of the upstream non-return valve to downstream of the downstream non-return valve and incorporate two lockable isolating valves, conforming to WMTS 012. The inlet and outlet connections of the main device body bypass shall be of the same nominal size or larger than the selected nominal size of the bypass assembly.

11.2.3 Water meter

A water meter, conforming to AS 3565.1 and of the same nominal size as the bypass line, shall be installed in the bypass line.

NOTE 1 The pressure loss of a water meter conforming to AS 3565.1 will need to be considered in the design of the DCDA.

NOTE 2 For devices with meters DN 50 and larger on the bypass line, the required upstream and downstream straight lengths of bypass pipework need to be considered in the design of the device.

11.2.4 Secondary double check valve

A double check valve, conforming to [Section 10](#) and [Clause 11.3](#) and of the same nominal size as the bypass line, shall be installed in the bypass line downstream of the water meter.

11.3 Performance test

11.3.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

11.3.2 Pressure drop

When the assembly is tested in accordance with [Appendix T](#), the sum of the pressure drops across the upstream and downstream non-return valves of the main double check valve shall be not less than 10 kPa higher than the sum of pressure drops across the non-return valves of the secondary double check device.

11.3.3 Endurance

After completion of the endurance test in accordance with [Appendix BB](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clause 11.3.2](#) (see [Table B.2](#), [Appendix B](#)).

NOTE For devices above DN 100, the endurance test is waived, as such devices are usually special devices and tested in-house.

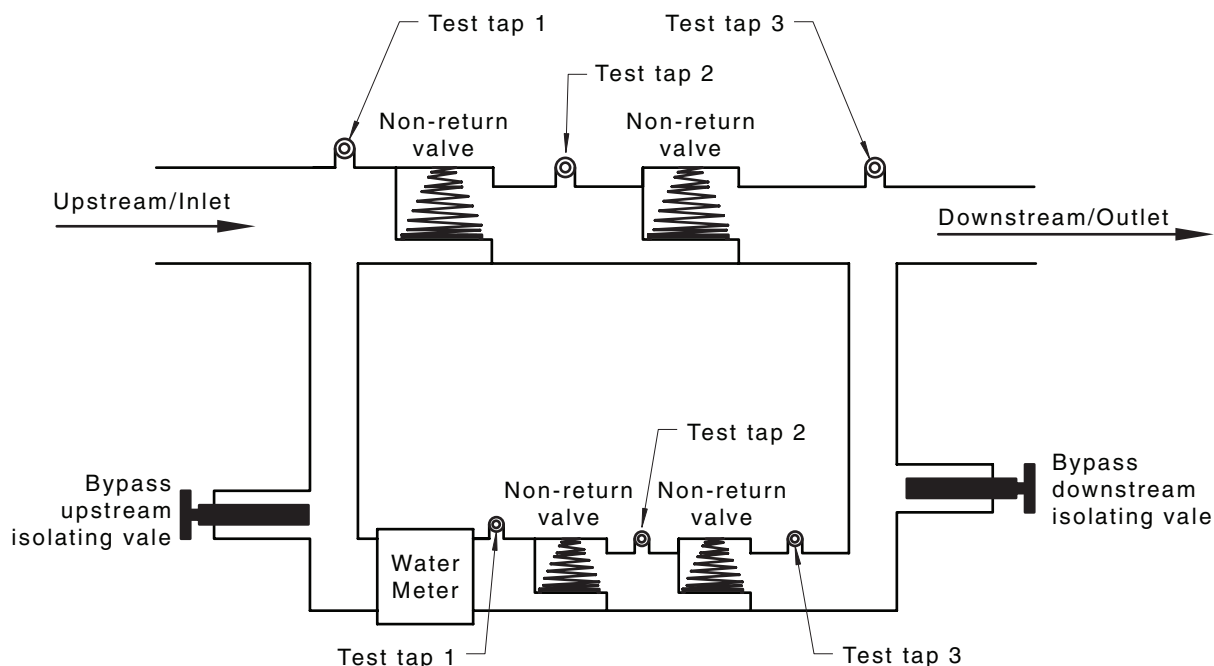


Figure 11.1 — Schematic plan view of a typical double check detector assembly (DCDA)

11.4 Sampling and frequency plans

Sampling for conformance testing and frequency plans for double check detector assemblies shall be as given in [Tables A.5.8\(A\)](#) and [A.5.8\(B\)](#), [Appendix A](#).

12 Reduced pressure zone device (RPZD)

12.1 General

This Section specifies the requirements for reduced pressure zone devices (RPZD). Reduced pressure zone devices incorporate the components specified in [Clause 12.2](#) and are required to pass performance tests specified in [Clause 12.4](#).

NOTE See [Figure 12.1](#) for schematic diagram of a typical reduced pressure zone device.

A reduced pressure zone device is a testable device designed for use in “high hazard” conditions to prevent backflow caused by back-siphonage or backpressure. It is for use under continuous pressure conditions.

12.2 Components

12.2.1 Non-return valves

Two independently acting non-return valves shall be provided and shall be arranged in series and force-loaded to the closed position.

12.2.2 Relief valve

A relief valve, positioned between the non-return valves, shall be provided and shall be arranged to be force-loaded to the open position to atmosphere, whenever the pressure differential across the upstream non-return valve reduces to 14 kPa.

12.2.3 Test taps

Test taps shall be provided to enable regular checking of the performance of the non-return valves and the relief devices.

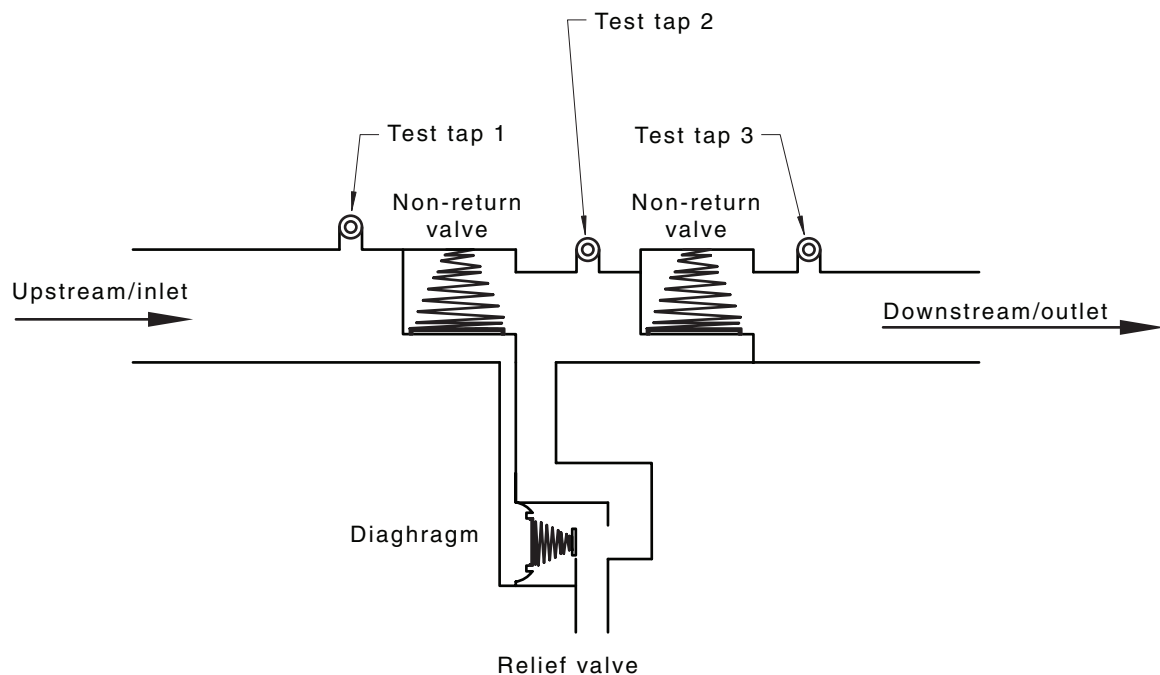


Figure 12.1 — Schematic diagram of a typical reduced pressure zone device (RPZD)

12.3 Specific design requirements

12.3.1 Relief valve diaphragm or equivalent

Diaphragms (or equivalent) shall be installed in a manner which, in case of failure, shall produce visible evidence of failure.

12.3.2 Test taps

Test taps shall be provided upstream of the upstream non-return valve, downstream of the downstream non-return valve, and in the intermediate chamber. Nominal pipe size of the tappings for test taps shall be as specified in [Clause 3.5.3](#).

12.3.3 Relief valve opening

The relief device shall conform to the following:

- (a) The relief valve discharge outlet shall be protected against collection of debris, which could reduce the flow area and adversely affect the performance of the device.
- (b) The relief valve outlet shall be of a size and shape that cannot be threaded or connected with tubing, either internally or externally.
- (c) The minimum total cross-sectional area of relief valve passageways shall be as given in [Table 12.3.3](#). The minimum dimension of all passageways and openings shall be not less than 5 mm.

Table 12.3.3 — Minimum water flow rates and minimum cross-sectional area of relief valve passageways for reduced pressure zone device (RPZD)

Nominal size of device DN	Rated flow through relief device L/s	Minimum total cross-sectional area of relief device passageways mm ²
6	0.06	70
10	0.19	70
15	0.19	70
20 and 25	0.32	120
32 and 40	0.63	280
50 and 65	1.25	490
80	1.9	790
100 and 150	2.5	1 130
200 and 250	3.75	1 960
300	4.75	3 120
350	5.7	4 420
400	6.3	4 420

12.4 Performance tests

12.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

12.4.2 Downstream non-return valve closing pressure

When tested in accordance with [Appendix T](#), the downstream non-return valve shall not leak against a pressure up to 7 kPa applied in the direction of normal water flow, with the downstream pressure at atmospheric.

12.4.3 Intermediate chamber pressure

When tested in accordance with [Appendix FF](#), the pressure difference during static conditions shall be not less than 14 kPa.

12.4.4 Supply pressure at which the intermediate chamber becomes atmospheric

When tested in accordance with [Appendix GG](#), when the pressure in the intermediate chamber (see [Figure 12.1](#)) is reduced to atmospheric pressure, the pressure in the upstream chamber shall be not less than 14 kPa.

12.4.5 Intermediate chamber pressure under backpressure conditions when the supply pressure is 14 kPa or greater

When tested in accordance with [Appendix HH](#), where there is a backflow and the supply pressure is greater than 14 kPa, the relief valve shall discharge water from the intermediate chamber to atmosphere at a rate not less than given in [Table 12.3.3](#), and the pressure in the intermediate chamber shall be at least 3.5 kPa below the upstream pressure.

12.4.6 Intermediate chamber pressure under backpressure conditions, when the supply pressure is less than 14 kPa

When tested in accordance with [Appendix II](#), where there is a backflow and the supply pressure is less than 14 kPa, the relief valve shall discharge water at a rate not less than that given in [Table 12.3.3](#), and the pressure in the intermediate chamber shall not exceed 1050 mm of water pressure, as shown on the sight glass.

12.4.7 Pressure differential at which relief valve commences to open

When tested in accordance with [Appendix JJ](#), the relief valve shall start to open when the pressure in the intermediate chamber is not less than 14 kPa below the pressure at the inlet of the device, and the relief valve shall close drip-tight when the inlet pressure is restored.

12.4.8 Supply pressure fluctuations and discharge from relief valve

When tested in accordance with [Appendix KK](#), the relief valve shall not discharge water under a supply pressure fluctuation having a maximum variation of ± 10 kPa.

12.4.9 Rated flow and pressure loss

When tested in accordance with [Appendix J](#) the maximum pressure loss across the device at rated water flow shall be as given in [Table 12.4.9](#).

Table 12.4.9 — Rated flow — RPZD

Nominal size of device DN	Rated flow L/s	Maximum pressure loss kPa
6	0.06	165
10	0.19	150
15	0.75	150

Table 12.4.9 (continued)

Nominal size of device DN	Rated flow L/s	Maximum pressure loss kPa
20	1.9	140
25	3.2	125
32	4.75	125
40	6.3	110
50	10	110
65	14	110
80	20	100
100	32	95
150	63	95
200	100	95
250	146	95
300	190	90
350	235	90
400	275	90

12.4.10 Back-siphonage

When tested in accordance with [Appendix LL](#) with both non-return valves fouled as required in [Clause B.1.9](#), [Appendix B](#), the meniscus of the water in the sight tube shall not exceed the level of the water in the reservoir by more than 3 mm.

12.4.11 Backpressure

When tested in accordance with [Appendix MM](#), with either check valve fouled as required in [Clause B.1.9](#), [Appendix B](#), there shall be no backflow of water from the downstream pipework to the supply line when the downstream pressure exceeds the supply pressure.

12.4.12 Endurance

After completion of the endurance test in accordance with [Appendix NN](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 3.7.5](#), [12.4.2](#), [12.4.3](#) and [12.4.7](#) (see [Table B.2](#), [Appendix B](#)).

NOTE For devices above DN 100, the endurance test is waived as such devices are usually special devices and tested in house.

12.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for reduced pressure zone devices shall be as given in [Tables A.5.9\(A\)](#) and [A.5.9\(B\)](#), [Appendix A](#).

13 Reduced pressure detector assembly (RPDA)**13.1 General**

This Section specifies the requirements for reduced pressure detector assemblies (RPDAs). Reduced pressure detector assemblies incorporate the components specified in [Clause 13.2](#) and are required to pass the following tests:

- (a) Tests specified in [Section 12](#), other than the test of [Clause 12.4.9](#).

- (b) The special performance test specified in [Clause 12.4](#).

NOTE A plan view of a typical reduced pressure detector assembly is shown in [Figure 13.1](#).

A reduced pressure detector assembly is a testable device designed for use in “high hazard” conditions to prevent backflow caused by backpressure or back-siphonage. It is for use in fire service lines under continuous pressure and allows monitoring of small draw-offs of water.

13.2 Components

13.2.1 Main reduced pressure zone valve

The main reduced pressure zone valve comprises two independently acting non-return valves. These valves shall be arranged in series to be force-loaded to the closed position and shall conform to [Section 12](#) and [Clause 12.4](#).

13.2.2 Bypass line

A bypass line, of a minimum DN 20 size, shall be installed bridging from upstream of the upstream non-return valve to downstream of the downstream non-return valve of the main reduced pressure zone device, and incorporate two lockable isolating valves conforming to WMTS 012. Inlet and outlet connections of the main device body bypass shall be the same nominal size or larger than the nominated bypass assembly nominal size.

13.2.3 Water meter

A water meter, conforming to AS 3565.1 and of the same nominal size as the bypass line, shall be installed in the bypass line.

NOTE 1 The pressure loss of a water meter conforming to AS 3565.1 will need to be considered in the design of the RPDA.

NOTE 2 For devices with meters DN 50 and larger on the bypass line, the required upstream and downstream straight lengths of bypass pipework need to be considered in the design of the device.

13.2.4 Secondary reduced pressure zone device

A secondary reduced pressure zone device, conforming to [Section 12](#) and [Clause 13.3](#), shall be installed in the bypass line downstream of the water meter and shall be of the same nominal size as the bypass line.

13.3 Performance test

13.3.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

13.3.2 Pressure drop

When the assembly is tested in accordance with [Appendices T, JJ](#) and [KK](#), the sum of the pressure drops across the upstream and downstream non-return valves of the main reduced pressure zone device shall be not less than 10 kPa higher than the sum of pressure drops across the non-return valves of the secondary reduced pressure zone device.

13.3.3 Endurance

After completion of the endurance test in accordance with [Appendix NN](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 3.7.5](#), [12.4.2](#), [12.4.3](#) and [12.4.7](#) (see [Table B.2](#), [Appendix B](#)).

NOTE For devices above DN 100, the endurance test is waived, as such devices are usually special devices and tested in-house.

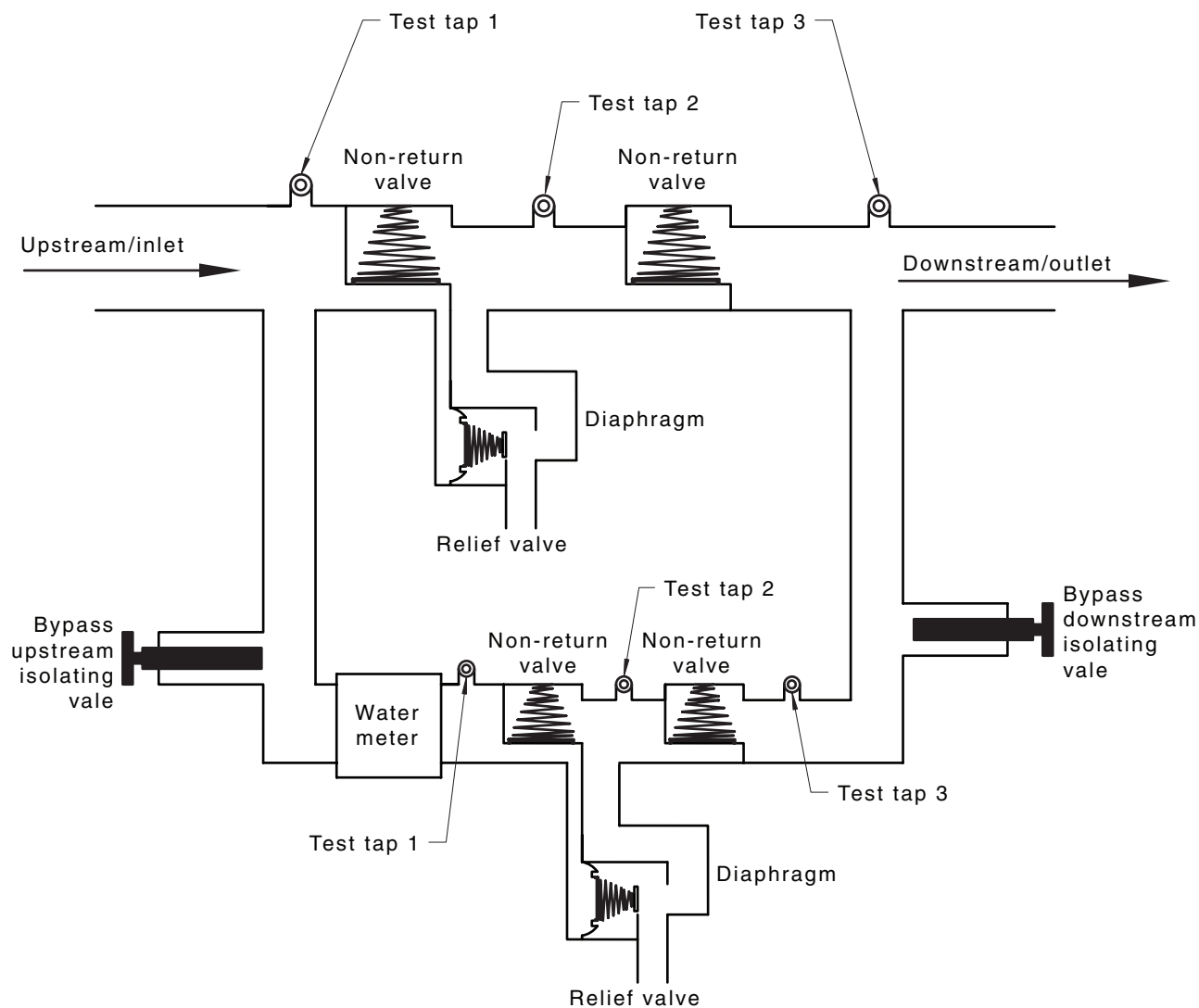


Figure 13.1 — Plan view of a typical reduced pressure detector assembly (RPDA)

13.4 Sampling and frequency plans

Sampling for conformance testing and frequency plans for reduced pressure zone assembly shall be as given in [Tables A.5.10\(A\)](#) and [A.5.10\(B\)](#), [Appendix A](#).

14 Spill-resistant pressure vacuum breaker (SPVB)

14.1 General

This Section (see [Figure 14.1](#)). Spill-resistant pressure vacuum breakers incorporate the components specified in [Clause 14.2](#) and are required to pass the performance tests specified in [Clause 14.5](#).

NOTE 1 Spill-resistant pressure vacuum breakers are also referred to as anti-spill vacuum breakers in other jurisdictions.

NOTE 2 A schematic diagram of a typical spill-resistant pressure vacuum breaker is shown in [Figure 14.1](#).

A spill-resistant pressure vacuum breaker is a testable device designed for use in “high hazard” conditions to prevent backflow caused by back-siphonage. It is for use under continuous pressure conditions.

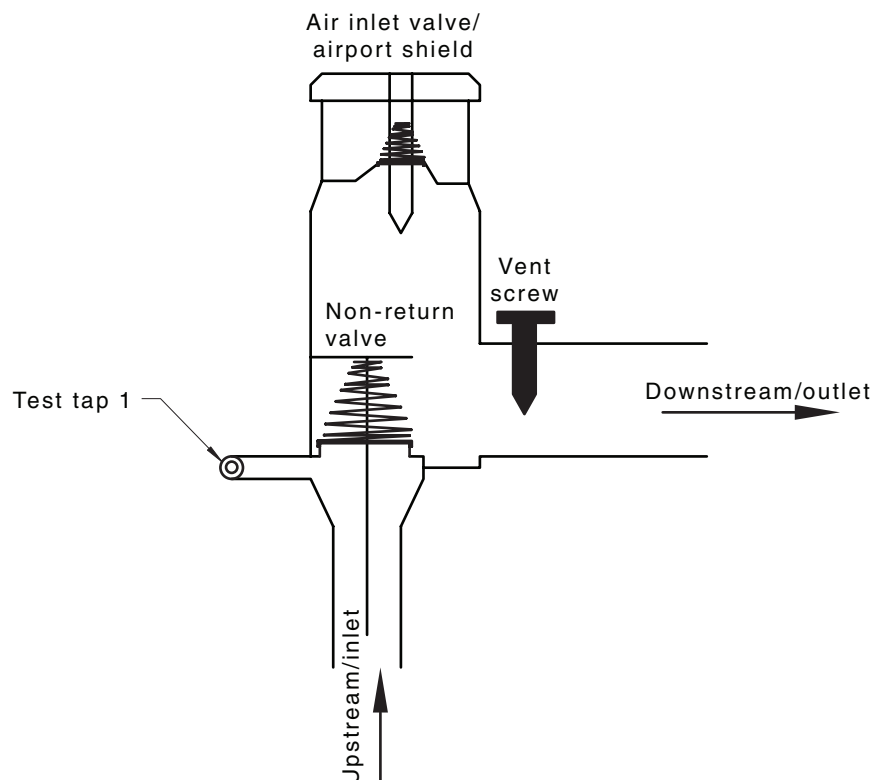


Figure 14.1 — Schematic diagram of a typical spill-resistant pressure vacuum breaker (SPVB)

14.2 Components

14.2.1 Ventilation valve

A ventilation valve shall be provided, which shall be capable of being force-loaded to the open position and venting the pipework to atmosphere whenever the pressure in the device falls to 7 kPa.

14.2.2 Air port entry seal

Means shall be provided to seal the air port entry before flow commences from the outlet of the device.

14.2.3 Non-return valve

A non-return valve arranged to be force-loaded to the closed position shall be provided.

14.2.4 Test points

Either a downstream and upstream test tap or an upstream tap and a downstream air bleed valve shall be provided, to enable regular checking of the function of the non-return and the ventilation valves.

14.3 Specific design requirements

14.3.1 Air port shields

Air port shields shall —

- (a) extend down and around the body of the device to the lowest portion of the air port; and
- (b) provide an airflow passage of not less than 5 mm in width.

14.3.2 Test points

For test points —

- (a) test taps shall be provided upstream and downstream of the non-return valve; or
- (b) a test tap shall provide upstream of the non-return valve and an air bleed shall be provided downstream of the non-return valve.

14.4 Performance tests

14.4.1 Procedures

Performance tests shall be conducted in the sequence shown in [Table B.2](#), [Appendix B](#).

14.4.2 Non-return valve closing pressure

When tested in accordance with [Appendix T](#), the non-return valve shall not leak against pressures up to 7 kPa applied in the direction of normal water flow, with the pressure downstream at atmosphere pressure.

14.4.3 Ventilation valve opening pressure

When tested in accordance with [Appendix DD](#), the ventilation valve shall start to open before the pressure falls to 7 kPa and shall be fully open when the upstream chamber is drained.

14.4.4 Air port entry seal

When tested in accordance with [Appendix PP](#), the air port entry shall close and remain closed whenever there is a water flow through the device.

14.4.5 Air port opening area

When the device is tested in accordance with [Appendix G](#), the air ports shall admit a volume rate of airflow to the water outlet equal to or greater than the volume rate of airflow through the water inlet to the water outlet with the non-return valves held open under conditions of equal vacuum application.

14.4.6 Water rise

When tested in accordance with [Appendix H](#), the device shall not permit a water rise of more than 3 mm in a sight tube connected to the water outlet of the device, when the non-return valve (or valves) is held open with fouling wire in accordance with [Clause B.1.9](#), [Appendix B](#), during varied vacuum applications ranging from 0 kPa to 85 kPa below atmospheric pressure at the water inlet of the device.

14.4.7 Rated flow and pressure loss

When tested in accordance with [Appendix J](#) with a flow rate given in [Table 14.4.7](#), a maximum pressure loss across the device shall not exceed 70 kPa.

Table 14.4.7 — Rated flow — SPVB

Nominal size of device DN	Rated flow L/s
6	0.19
10	0.38
15	0.76
20	1.9
25	3.2
32	4.75
40	6.31
50	10.00

14.4.8 Critical level

When tested in accordance with [Appendix L](#), there shall be no evidence of water present in the transparent water trap after the vacuum surge loading test.

14.4.9 Ability to resist adhesion between the ventilation valve sealing elements

When tested in accordance with [Appendix OO](#), there shall be no back-siphonage of water from the downstream piping into the supply piping when the non-return valve seat or disc is fouled in accordance with [Clause B.1.9](#), [Appendix B](#), under varied applications ranging from 0 kPa to 85 kPa below atmospheric pressure applied to the water upstream of the device.

14.4.10 Endurance

After completion of the endurance test in accordance with [Appendix EE](#), and subject to the requirements of [Clause 3.7.6](#), the device shall conform to the requirements of [Clauses 14.4.2](#), [14.4.3](#), [14.4.4](#) and [14.4.6](#) (see [Table B.2](#), [Appendix B](#)).

14.5 Sampling and frequency plans

Sampling for conformance testing and frequency plans for spill-resistant pressure vacuum breakers shall be as given in [Tables A.5.11\(A\)](#) and [A.5.11\(B\)](#), [Appendix A](#).

15 Beverage dispenser dual check valve with atmospheric port (BDDC)

15.1 General

This Section specifies the requirements for beverage dispensing dual check valves (BDDCs) with an atmospheric port). Dual check valves incorporate the components specified in [Clause 15.2](#) and are required to pass the performance tests in [Clause 15.4](#).

NOTE A schematic diagram of a typical beverage dispenser dual check valve with atmospheric port is shown in [Figure 15.1](#).

A beverage dispenser dual check valve with atmospheric port is a device designed for use in “low hazard” conditions to prevent backflow caused by backpressure in carbonated beverage dispensing equipment. It is for use under continuous pressure conditions.

15.2 Components

15.2.1 Ventilation valve

A ventilation valve, located between the non-return valves, shall be provided, and shall be arranged to be force-loaded to the open position to admit air whenever the water pressure at the inlet to the device reduces to a nominated value below the downstream pressure.

15.2.2 Non-return valves

Two independently acting non-return valves shall be provided and shall be arranged to be force-loaded to the closed position.

15.2.3 Air port

An air port, in direct communication with the ventilation valve (between the non-return valves) that admits air to the inner chamber shall be provided to prevent back-siphonage or to enable a discharge from the chamber between the non-return valves under a condition of backpressure should the downstream non-return valve become fouled.

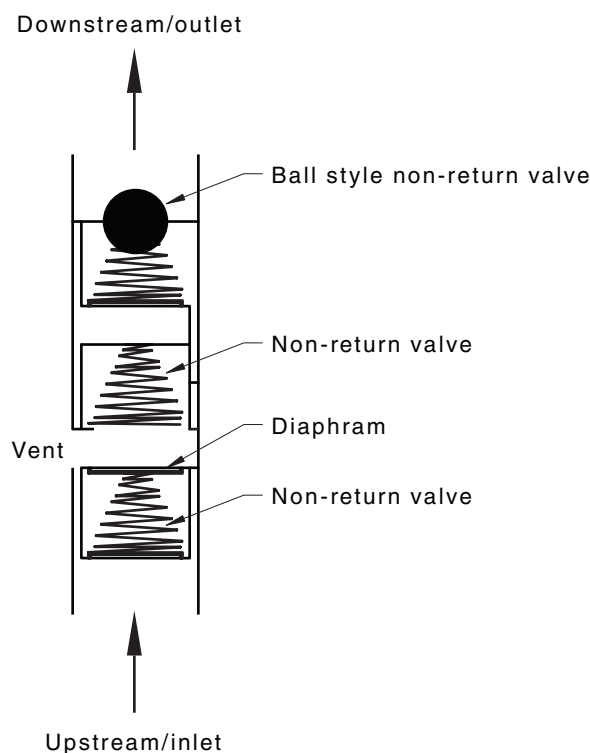


Figure 15.1 — Schematic diagram of a typical beverage dispenser dual check valve with atmospheric port (BDDC)

15.3 Specific design requirements

15.3.1 Air port

The air port shall be so located that when the device is installed according to the manufacturer's instructions no part of the air port shall be obstructed.