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WATER SUPPLY— MECHANICAL BACKFLOW PREVENTION DEVICES



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Australian Design and Technology Association
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Department of Housing and Construction (Commonwealth)
Department of Local Government Queensland
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Hobart City Council
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AUSTRALIAN STANDARD

**WATER SUPPLY—
MECHANICAL BACKFLOW
PREVENTION DEVICES**

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PREFACE

This standard was prepared by the Association's Committee on Backflow Prevention Devices for Water Supply at the request of the Australian Water Authorities Standing Committee Plumbing and Drainage.

In the preparation of this standard, reference was made to documents prepared by the American Water Works Association and the American Society of Sanitary Engineering Standards, and the assistance gained from these sources is acknowledged.

The Department of Housing and Construction, National Building Technology Centre, provided preliminary drafts and information and this assistance in the preparation of this standard is acknowledged.

This standard does not include all types of mechanical backflow prevention devices currently on the market. However it was decided to include only those which at the time of the preparation of the standard were considered to be most relevant to the protection of potable water supplies in Australia.

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FOREWORD

Purpose of backflow prevention devices. Backflow prevention devices are installed in water supply systems to prevent the reversal of direction of water flow and possible contamination of water within the water supply system.

Safety performance standard. Backflow prevention devices are intended to protect the health and safety of the public, which justifies the need for better performance standards than may be required for some water supply fittings for which health and safety are not jeopardized in the event of failure.

Structural strength of backflow prevention devices. The ability of a device to withstand the loads imposed on it is determined by the test methods described herein.

Minimum wall thicknesses are not considered to be applicable to this standard as the body shapes, dimensions, and conformation can vary greatly according to the design of the device.

Factors which promote potential reversal of water flow. In the use of backflow prevention devices, two categories of pressure drop are considered to promote reversal of flow. These categories are as follows:

- (a) Backsiphonage which can be caused by a failure at a lower level or other circumstances as the result of which the pressure at certain points in the system drops to below atmospheric pressure.
- (b) Backpressure which occurs when the pressure at the downstream end of a pipework system is increased above the supply pressure. In this situation, all water pressures are above atmospheric pressure.

Devices designed for protection against backsiphonage only. Certain devices are considered to prevent backflow only under circumstances of backsiphonage. These are atmospheric vacuum breakers, pressure type vacuum breakers and hose connection vacuum breakers (see Note). All incorporate a ventilation valve which vents the pipework to atmosphere under backsiphonage conditions, and generally include a non-return valve.

The installation requirements for these devices prevents any backpressure which may cause significant backflow through the device.

NOTE: Hose connection vacuum breakers may be required to withstand backpressure for a limited period while relieving the backpressure.

Non-return valves. Non-return valves are not expected to provide complete protection against backflow.

The double check valve device which relies entirely on non-return valves to prevent backflow is intended only for use where the potential contaminant hazard is considered low.

The use of non-return valves in other devices modifies the pressure and flow characteristics of the devices allowing the relief or air valves to prevent backflow. During many of the type tests a fouling wire is inserted on the non-return valve seat to cause leakage.

Devices designed for protection against both backsiphonage and backpressure. Double check valves, vented double check valves and reduced pressure zone devices are designed for protection against both backsiphonage and backpressure conditions. All incorporate two non-return valves. Reduced pressure zone devices include a differential pressure relief valve located between the two non-return valves. The differential pressure relief valve vents and drains the device under both backsiphonage and backpressure conditions and provides additional and more reliable protection against backflow.

Permitted use of backflow prevention devices. The permitted use of backflow prevention devices is dependant upon the degree of contaminant hazard involved and the particular policy of the Regulatory Authority/Certifying Body responsible for the installation.

AIRGAP PROTECTION IS NORMALLY MANDATORY WHERE SIGNIFICANT BACTERIAL AND TOXIC HAZARDS ARE INVOLVED.

Installation Approvals. MECHANICAL BACKFLOW PREVENTION DEVICES MAY ONLY BE USED AS AN ALTERNATIVE TO AN AIR GAP WHERE SPECIFICALLY APPROVED, INSTALLED, TESTED AND SERVICED AS REQUIRED BY THE LOCAL REGULATORY AUTHORITY/CERTIFYING BODY.

If required by the local Regulatory Authority/Certifying Body or for any other purpose, the manufacturer shall furnish a copy of a certificate of satisfactory

evaluation and type testing in accordance with this standard, issued by the Regulatory Authority/Certifying Body in the State of manufacture or State of importation for the relevant model, type, and size of the device.

Rated flows and pressure losses of backflow prevention devices. The selected rated flows and pressure losses for the devices are those determined by the American Water Works Association to be appropriate for the particular sizes of the devices. Devices are designed to minimize flow pressure losses.

Opening and closing springs on relief and non-return valves. The springs installed on relief and non-return valves serve the following purposes:

- (a) They positively open or close the valves before the conditions which might cause backflow to occur.
- (b) They force the valves to operate against any scale, or debris which might interfere with the mechanical function of the valves.

Endurance tests. Where the device is such that endurance tests using hydraulic means are impracticable, the use of mechanical or other means may be approved by the local Regulatory Authority/Certifying Body provided that the purpose of the test is not prejudiced.

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
WATER SUPPLY—MECHANICAL BACKFLOW PREVENTION DEVICES

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard specifies requirements for the manufacturing, performance and testing of mechanical backflow prevention devices used for the protection of potable water, of the following types:

- (a) Atmospheric vacuum breakers. (A.V.B)
- (b) Hose connection vacuum breakers. (H.C.V.B)
- (c) Pressure type vacuum breakers. (P.T.V.B)
- (d) Double check valves. (D.C.V)
- (e) Reduced pressure zone devices. (R.P.Z.D)
- (f) Vented double check valves. (V.D.C.V)

1.2 APPLICATION. Mechanical backflow prevention devices shall comply with the general requirements of this Section and with the requirements of Sections 2 and 3 as follows:

Section 2—Design, Materials and Workmanship

Section 3—Design and Performance Requirements.

1.3 REFERENCED DOCUMENTS. The following documents are referred to in this standard:

AS 1192	Electroplated Coatings—Nickel and Chromium
AS 1432	Copper Tubes for Water, Gas and Sanitation
AS 1444	Wrought Alloy Steels—AISI-SAE Standard, Hardenability (H) and Stainless Series
AS 1565	Copper Alloy Ingots and Copper and Copper Alloy Castings
AS 1566	Copper and Copper Alloy Plate, Rolled Bar, Sheet, Strip and Foil for General Engineering Purposes
AS 1567	Wrought Copper and Copper Alloy Rods, Bars and Sections for General Engineering Purposes
AS 1568	Copper and Copper Alloy Forging Stock and Forgings for General Engineering Purposes
AS 1590	Copper Alloy Threaded Pipe Fittings for Use with Tubes Threaded with Pipe Threads of Whitworth Form
AS 1645	Copper and Copper Alloy Compression Fittings for Use in Water Supply and Hot Water Services
AS 1646	Rubber Joint Rings for Water Supply, Sewerage and Drainage Purposes
AS 1650	Galvanized Coatings
AS 1718	Copper Alloy Draw-off Taps, Stop Taps, and Ferrule or Main Taps for Use in Water Supply and Hot Water Services

AS 1722	Pipe Threads of Whitworth Form Part 2—Fastening Pipe Threads
AS 1769	Welded Stainless Steel Tubes for Plumbing Applications
AS 1830	Grey Iron Castings
AS 1831	Spheroidal or Nodular Graphite Iron Castings
AS 2129	Flanges for Pipes, Valves and Fittings
AS 2345	An Accelerated Laboratory Test Method for Assessment of the Susceptibility of Brass to Dezincification
ASTM A 53	Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated Welded and Seamless
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
ASTM A 153	Specification for Zinc Coating (Hot-dip) on Iron and Steel Hardware
ASTM A 276	Specification for Stainless and Heat-resisting Steel Bars and Shapes
ASTM A 313	Specification for Chromium-nickel Stainless and Heat-resisting Steel Spring Wire
ASTM B 21	Specification for Naval Brass Rod, Bar and Shapes
ASTM B 23	Specification for White Metal Bearing Alloys (Known Commercially as 'Babbitt Metal')
ASTM B 61	Specification for Steam or Valve Bronze Castings
ASTM B 96	Specification for Copper-silicon Alloy Plate, Sheet, Strip and Rolled Bar for General Purposes and Pressure
ASTM B 159	Specification for Phosphor Bronze Wire
ASTM B 302	Specification for Threadless Copper Pipe
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications
HH-P-151e	U.S. Federal Specification for Packing; Rubber-sheet, Cloth-insert

1.4 DEFINITIONS. For the purpose of this standard, the following definitions apply:

1.4.1 Air gap—unobstructed vertical distance through the free atmosphere between the lowest outlet of a pipe or fitting discharging potable water to a tank, fixture or other device and the spill level of the receptacle.