
NEW ZEALAND STANDARD

**CONTROL VALVES FOR
HOT WATER SYSTEMS**

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COMMITTEE REPRESENTATION

This Standard was prepared under the supervision of the Building and Civil Engineering Divisional Committee (30/-) for the Standards Council established under the Standards Act 1988.

The Valve Vented Water Heaters Committee (46/4) was responsible for the preparation of the Standard and comprised representatives of the following organizations:

Electrical Development Association
Local Government Association
New Zealand Manufacturing Engineers Federation
New Zealand Society of Master Plumbers
Works Consultancy Services Corporation

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RELATED DOCUMENTS

Reference is made in this Standard to the following:

NEW ZEALAND STANDARDS

- NZS/BS 21:1985 Pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)
- NZS/BS 2779:1986 Specification for pipe threads for tubes and fittings where pressure-tight joints are not made on the threads
- NZS 3501:1976 Copper tubes for water, gas, and sanitation
- NZS 4602:1988 Low pressure copper thermal storage electric water heaters
- NZS 4603:1985 Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems)
- NZS 4606:1989 Storage water heaters
- NZS 4607:1989 Installation of thermal storage electric water heaters: valve vented systems
- NZS 9002:1990 Quality systems for production and installation
- NZS 9003:1990 Quality systems for final inspection and test

AUSTRALIAN STANDARDS

- AS 1271:1990 Safety valves, other valves, liquid level gauges, and other fittings for boilers and unfired pressure vessels
- AS 1349:1986 Bourdon tube pressure and vacuum gauges
- AS 1572:1985 Copper and copper alloys – Seamless tubes for engineering purposes
- AS 2345:1980 An accelerated laboratory test method for assessment of the susceptibility of brass to dezincification

INTERNATIONAL STANDARD

- ISO 2859:- - - - Sampling procedures for inspection by attributes
- Part 1:1989 Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection

NEW ZEALAND LEGISLATION

Boilers, Lifts and Cranes Act 1950

OTHER PUBLICATIONS

Board of Health Drinking-water standards for New Zealand

The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards are the latest revisions or include the latest amendments. Such amendments are listed in the annual Standards New Zealand *Catalogue* which is supplemented by lists contained in the monthly magazine *Standards* issued free of charge to committee and subscribing members of Standards New Zealand.

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FOREWORD

This Standard has been prepared to cover the requirements for control valves used primarily in the installation of thermal storage electric water heaters and should therefore be read in conjunction with NZS 4603:1985 *Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems)* and also NZS 4607 *Installation of thermal storage electric water heaters : Valve vented systems*.

REVIEW OF STANDARDS

Suggestions for improvement of this Standard will be welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag, Wellington.

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NEW ZEALAND STANDARD

CONTROL VALVES FOR HOT WATER SYSTEMS

1 SCOPE AND GENERAL

101 SCOPE

101.1

This Standard specifies the requirements for control valves used in conjunction with hot water supply systems suitable for static supply pressures up to 2000 kPa (204 mH₂O) and working pressures up to 600 kPa (61 mH₂O) with temperatures not normally exceeding 85 °C. The methods of test detailed herein determine the ability of the valves to perform within specified limits of water pressure and temperature.

NOTE –

- (1) For valves used with water heaters which are intended to operate at temperatures above 99 °C e.g. hot water boilers, see AS 1271.
- (2) Refer to NZS 4603 and NZS 4607 for the application or installation of these valves in hot water systems.

102 UNITS OF PRESSURE

102.1

Units of pressure are shown in both metres head of water (mH₂O) and kilopascals (kPa) on the following basis:

- (a) For pressures less than 15 mH₂O/147 kPa the principal unit will be 'mH₂O' with the approximate equivalent value in kPa as a secondary unit shown in brackets, e.g. 7.6 mH₂O (75 kPa).
- (b) For pressures greater than 15 mH₂O/147 kPa the principal unit will be 'kPa' with the approximate equivalent value in mH₂O as a secondary unit shown in brackets, e.g. 850 kPa (88 mH₂O).
- (c) For the test appendices, and those clauses making specific reference to test requirements, only kPa will be used.

103 DEFINITIONS

103.1

For the purposes of this Standard, unless inconsistent with the context, the following definitions apply.

EXPANSION CONTROL VALVE. A pressure actuated valve which opens automatically at a specified set pressure to discharge fluid through the valve from the inlet connection of a water heater, and which self re-seats.

MAXIMUM WORKING TEMPERATURE. The maximum water temperature at which the valve is designed to be used.

NON-RETURN VALVE. A device which allows flow of a fluid in one direction only.

PRESSURE CONTROL VALVE. A valve which either limits or reduces the pressure of water at its outlet to a predetermined set pressure.

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PRESSURE RELIEF VALVE. A pressure actuated valve which opens automatically at a specified set pressure to discharge fluid from the top of the water heater and which self re-seats.

SET PRESSURE. The pressure at which a valve is designated to operate.

SET TEMPERATURE. The temperature at which a valve is set to open in service.

TEMPERATURE RELIEF VALVE. A temperature actuated valve which automatically discharges fluid at a specified set temperature and which self re-seats.

UNIT. A valve in which two or more functions are combined.

VACUUM RELIEF VALVE. A pressure actuated valve which automatically opens to relieve vacuum conditions and which self re-seats.

103.2

The word “shall” refers to requirements which are mandatory for compliance with this Standard. The word “should” refers to requirements which are recommended or advised.

2 GENERAL REQUIREMENTS

201 MATERIALS

201.1

Materials used for components that are normally in contact with water shall be corrosion resistant.

201.2

None of the materials, including residual lubricants, solvents and fluxes, used in the fabrication of the valves/units should impart to the water traces of compounds in excess of those recommended by the Board of Health Drinking-water standards for New Zealand.

201.3

Valve seats, and components that have valve seats integral within them, which are made from copper alloy shall, when tested in accordance with AS 2345, have an average depth of dezincification not exceeding:

| | After forming or machining | After subsequent reheating (see note) |
|-----------------------------|---------------------------------------|--|
| Extruded bar: | | |
| Longitudinally | 300 µm | 400 µm |
| Transversely | 100 µm | 200 µm |
| Forgings and castings | 100 µm | 200 µm |

The maximum depth of dezincification at any one point shall not exceed 400 µm but isolated beta (β) phase stringers may exceed this limit on other than sealing faces. Dezincification shall be assessed on the fitting after all manufacturing processes have been completed.

NOTE – This includes any in-factory manufacturing processes subsequent to forming or machining which necessitate reheating e.g. brazing.

201.4

The outer sheath of the temperature sensing element of temperature relief valves shall not be inferior, under the conditions of use, to alloy 122 of AS 1572.

202 CONSTRUCTION AND DESIGN

202.1 General

When a valve/unit is subjected to a hydraulic, performance or vacuum test in accordance with Appendix A, B or C (as appropriate) there shall, during a test, be no sticking, jamming, or distortion of components or any other malfunctioning of the valve/unit and, at the end of the test, there shall be no sign of weeping or other non-normal operation leakage, and no sign of cracking, deformation or other defects that impair the operation of any component.

202.2 Connections

202.2.1

End connections shall be designed so that when a pipe or fitting is coupled to the connection it does not reduce the area of flow passage through the valve body or otherwise affect the operation of the valve.

202.2.2

All connection threads shall comply with NZS/BS 21 except that male threads which are able to accept copper pipes to NZS 3501 shall comply with NZS/BS 2779.

202.2.3

Connecting threads shall be capable of forming leak-proof joints when the connections are subject to a torque of not more than 8 Nm in the case of plastics components, and 16 Nm for other materials. The threads shall be capable of withstanding without any sign of stripping, a torque of 2.5 times the above values.

202.2.4

Soldered, brazed or welded joints shall be free from porosity, slag, spatter and undercuts visible to the naked eye.

202.3 Filters

Filters shall be of an intrinsically corrosion-resistant material, with an aperture size not exceeding 700 μm and the open area of the filter element at least twice the cross-sectional area of the inlet pipe bore. The filter element shall be easily removable without disconnection of the pipework.

202.4 Valve seats and jumper valve washers

Jumper valve washers (other than in temperature relief valves) or their assemblies shall be replaceable without damage to the components. Valve seats and jumper valve washers shall be such that when a valve/unit is tested in accordance with Appendix B the valve/unit shall still pass the hydraulic test in Appendix A.

202.5 Finish

- (a) Components that are cast, moulded or hot-pressed shall have a surface finish free from blowholes, sand, burrs, and other defects visible to the naked eye;
- (b) Components formed from a plastics material or a sheet metal, shall be free from burrs, cracks, warps, dents, buckles and other defects visible to the naked eye.

202.6 Flow rates

When tested in accordance with B4 the flow rate of a valve shall be not less than the appropriate minimum given below:

| Valve type | Flow rate L/min |
|--------------------|--------------------|
| Pressure control | 25 |
| Pressure relief | } 32 |
| Temperature relief | |
| Expansion control | |

3 SPECIFIC REQUIREMENTS

301 PRESSURE CONTROL VALVES

301.1 Inlet pressure

Pressure control valves/units shall be designed for operation on an inlet pressure of up to 2000 kPa (204 mH₂O).

301.2 Set pressures

The following are the preferred values of set pressure:

- (a) For valves for use with water heaters complying with NZS 4602 and with NZS 4606 where appropriate:

3.6 mH₂O (35 kPa), 5.6 mH₂O (55 kPa), 7.6 mH₂O (74 kPa), 10.2 mH₂O (100 kPa),

- (b) For valves for use with water heaters complying with NZS 4606:

350 kPa (36 mH₂O), 500 kPa (51 mH₂O) and 600 kPa (61 mH₂O).

301.3 Diaphragms

A diaphragm shall be of such quality, thickness and design that, when the valve is subjected to a hydraulic or performance test in accordance with Appendix A or B, it does not tear, burst or become permanently deformed.

301.4 Adjustment

Only valves with set pressures of 150 kPa (15.3 mH₂O) or less shall be capable of field adjustment. Valves that are adjustable shall have the adjuster secured by an appropriate means (e.g. locknut) to stop involuntary adjustment in service.

302 EXPANSION CONTROL VALVES

302.1 Set pressures

The following are the preferred values of set pressure:

- (a) For valves for use with water heaters complying with NZS 4602 and with NZS 4606 where appropriate:

4.7 mH₂O (46 kPa), 6.6 mH₂O (65 kPa), and 11.2 mH₂O (110 kPa)

- (b) For valves for use with water heaters complying with NZS 4606:

500 kPa (51 mH₂O), 700 kPa (71 mH₂O), 850 kPa (87 mH₂O), 1000 kPa (102 mH₂O), and 1200 kPa (122 mH₂O).

The maximum value of set pressure shall be 1400 kPa (143 mH₂O).

302.2 Adjustment

Means shall not be provided for the field adjustment of the set pressure.

302.3 Diaphragms

A diaphragm shall be of such quality, thickness and design that, when the valve is subjected to a hydraulic or performance test in accordance with Appendix A or B, it does not tear, burst or become permanently deformed.

302.4 Heat rating

Each valve shall have a heat rating of not less than 7.0 kW and when tested in accordance with

Appendix D, the maximum pressure developed shall not exceed the set pressure plus 15 kPa or 10 %, whichever is the greater.

303 PRESSURE RELIEF VALVES

303.1 Set pressures

The following are the preferred values of set pressure:

- (a) For valves for use with water heaters complying with NZS 4602 and with NZS 4606 where appropriate:

5.7 mH₂O (56 kPa), 7.5 mH₂O (74 kPa), and 12.2 mH₂O (120 kPa)

- (b) For valves for use with water heaters complying with NZS 4606:

500 kPa (51 mH₂O), 700 kPa (71 mH₂O), 850 kPa (87 mH₂O), 1000 kPa (102 mH₂O), 1200 kPa (122 mH₂O) and 1400 kPa (143 mH₂O).

The maximum value of set pressure shall be 1400 kPa (143 mH₂O).

303.2 Adjustment

Means shall not be provided for field adjustment of the set pressure.

303.3 Heat rating

Each valve shall have a heat rating of not less than 7.0 kW and when tested in accordance with Appendix D, the maximum pressure developed shall not exceed the opening pressure plus 15 kPa or 10 %, whichever is the greater.

303.4 Easing gear

303.4.1

Any pressure relief valve of the poppet valve type shall have manually operated easing gear provided.

303.4.2

The easing gear shall lift the valve off the seat, by an amount that achieves a flow rate complying with 202.6.

303.4.3

The effort required to operate the easing gear while the valve is not under pressure shall not exceed a force of 50 N or a torque of 1.5 N.m. whichever is the greater.

303.4.4

The easing gear shall be designed so that the valve cannot remain in the open position when the manual effort is removed.

304 VACUUM RELIEF VALVES

304.1 Opening

When tested in accordance with Appendix C vacuum relief valves shall open at a pressure not greater than 3.5 kPa below atmospheric pressure.

304.2 Flow rate

The design of a vacuum relief valve shall be such that when the valve is subjected to a vacuum test in accordance with Appendix C, with a flow of 100 L/min, the vacuum does not exceed 9.0 kPa below atmospheric pressure.

305 TEMPERATURE RELIEF VALVES

305.1

Temperature relief valves shall be designed for operation on an inlet pressure of 2000 kPa (204 mH₂O).

305.2 Set and reset temperatures

Each valve shall include a thermostatic sensor that, when the valve is subjected to a temperature response test in accordance with Appendix E, starts to open the valve at a temperature between 93 °C and 98 °C and allows the valve to fully close at a temperature not lower than 75 °C.

305.3 Heat rating

Each valve shall have a heat rating of not less than 7.0 kW and when tested in accordance with Appendix D, the maximum pressure developed shall not exceed the opening pressure plus 15 kPa or 10 %, whichever is the greater.

306 NON-RETURN VALVES

306.1 Inlet pressure

Non-return valves shall be designed for operation on an inlet pressure of 2000 kPa (204 mH₂O).

306.2 Flow area

306.2.1

The flow area of any cross section within the valve body between the inner end of the inlet connection and the valve orifice and between the valve orifice and the inner end of the outlet connection, shall be not less than the cross-sectional area of the nominal bore of the inlet end.

306.2.2

The flow area of a cross section of the valve assembly in the open position shall be not less than 70 % of the cross-sectional area of the nominal bore of the inlet end.

4 TYPE AND PRODUCTION TESTING

401 TYPE TESTS

401.1

Each type of valve/unit shall be capable of satisfying the test criteria for every function that the valve/unit is designed to perform. These tests shall be carried out to prove the design of each type and size of valve; they shall be repeated if there is any change in design, material or manufacturing process.

401.2

The tests shall be carried out on three valves of each type and size.

401.3

Where a valve of the same type has different maximum pressures or different set pressures, at least one valve of each pressure setting shall be tested.

401.4

Details of the type tests required for the different functions are given in table 1.

401.5 Inspection

Each sample valve shall be visually examined and measured for compliance with all the applicable requirements of the Standard, compliance with which is not assessed by the tests specified in table 1.

Table 1 – Type test requirements

| Valve type | Hydraulic pressure test | Performance tests | | Vacuum and flow test | Heat rating test | Temperature response test |
|--------------------|-------------------------|-------------------|--------------------|----------------------|------------------|---------------------------|
| | | Flow rate | Operating pressure | | | |
| Pressure control | ★ | ★ | ★ | | | |
| Expansion control | ★ | ★ | ★ | | ★ | |
| Pressure relief | ★ | ★ | ★ | | ★ | |
| Vacuum relief | ★ | | | ★ | | |
| Temperature relief | ★ | ★ | | | ★ | ★ |
| Non-return | ★ | | | | | |
| Appendix | A | B | B | C | D | E |

402 PRODUCTION TESTS

402.1 Pressure control valves

Every valve/unit shall be tested with an inlet pressure of at least 500 kPa greater than the outlet set pressure and the outlet pressure shall be within the following limits of the valve's nominal outlet set pressure.

For valves with nominal set pressures of:

15 mH₂O (147 kPa) or less: the smaller of ±5 % or ±2.5 kPa
 greater than 15 mH₂O (147 kPa): ±10 %.

402.2 Pressure relief and expansion control valves

402.2.1 Opening pressure test

Every valve/unit shall be tested and shall open within the following limits of the valve's nominal outlet set pressure.

For valves with nominal set pressures of:

15 mH₂O (147 kPa) or less: the smaller of ±5 % or ±2.5 kPa
 greater than 15 mH₂O (147 kPa): ±10 %.

402.2.2 Leakage test

Every valve/unit shall be tested with an inlet pressure of 80 +5–10 % of the set pressure applied for at least 30 seconds with the outlet open to atmosphere and there shall be no visible leakage.

402.3 Vacuum relief valves

When tested in accordance with Appendix C vacuum relief valves shall open with a pressure not greater than 3.5 kPa below atmosphere applied to their outlet. Assessment of compliance shall be in accordance with 402.5.

402.4 Temperature relief valves

When tested in accordance with Appendix E, the valve shall commence to open at a temperature not less than 93 °C or more than 98 °C. The first drop of water discharged from the valve shall

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be considered to be evidence of opening. Assessment of compliance shall be in accordance with 402.5.

402.5 Assessment of vacuum relief and temperature relief valves

Each batch or lot shall be inspected in accordance with the requirements of ISO 2859-1 using a single sampling plan, inspection level II and an acceptable quality level (AQL) of 1.5 or a similar quality control inspection system and level. Valves/units from any rejected batch may be accepted by a process of total sorting by testing each valve individually.

NOTE –

- (1) The designation of an AQL does not imply that the manufacturer has the right to knowingly supply any defective items or units of production.
- (2) To operate the above inspection plan the manufacturer should be certified to NZS 9003 for assembly or to NZS 9002 for component manufacture or to an alternative recognized quality management system.

5 PACKAGING AND MARKING

501 PACKAGING

Each valve/unit whether supplied individually or as part of a matched set, shall be so packed that it is protected from damage during normal handling, transportation and storage. All openings in the body of the valve/unit shall be protected to prevent the entry of foreign material.

502 MARKING

502.1

Each valve/unit shall have the following information stamped or embossed on the valve/unit or given on a durable label, closely and securely attached to it.

- (a) The manufacturer's name, trade name or trademark;
- (b) For valves/units with a pressure relief, temperature relief or expansion control function, the heat rating in kW;
- (c) For valves/units with a pressure control, pressure relief or expansion control function, the set pressure range i.e., the set pressure plus tolerances as per 402.1 or 402.2.1 as appropriate;
- (d) For temperature relief valves/units the set temperature;
- (e) The model number (where applicable);
- (f) The number of this New Zealand Standard i.e. NZS 4608.

502.2

Any other information required for the correct, safe and satisfactory installation, operation and when relevant, adjustment and maintenance of the valve/unit shall be given in a leaflet or booklet that is attached to, or packed with the valve/unit.

APPENDIX A HYDRAULIC PRESSURE TEST

A1 Apparatus

The following apparatus is required:

- (a) Hydrostatic test rig;
- (b) Test pressure gauges certified to AS 1349, reading to 100 kPa, 1000 kPa, and 3000 kPa with an air bleed attachment.

A2 Procedure

The procedure shall be as follows:

- (a) Bleed air from the test equipment;
- (b) Secure the valve/unit in its normal operating position and subject it to the following test conditions with the other port plugged.

Pressure control valves:

Inlet: 2000 – 2020 kPa for 30 ±1 mins
Outlet: 1.9 – 2.1 x set pressure for 30 ±1 mins

Pressure relief and expansion control valves:

Inlet: 1.9 – 2.1 x set pressure for 30 ±1 mins

Temperature relief as separate valve:

Inlet: 2000 – 2020 kPa for 30 ±1 mins

Vacuum relief as separate valve:

Inlet: 2000 – 2020 kPa

Vacuum relief integral with other valves

Inlet: 1.9 – 2.1 x set pressure

Non-return valves:

Inlet and outlet: 2000 – 2020 kPa

A3

While under pressure and also at the conclusion of each test, inspect the valve/unit for compliance with the requirements of 202.1. For valves incorporating a diaphragm, check for compliance with 301.3 or 302.3.

APPENDIX B FLOW AND OPERATING PRESSURE TEST

B1 Apparatus

The following apparatus is required:

- (a) *Water supply.* A water supply having a static pressure of 2000 – 2020 kPa.
- (b) *Cycling device.* A device that fully opens and then shuts off the water supply at a rate of 6 ± 1 cycles per minute and registers the number of completed cycles, each cycle consisting of one opening and one closing action;
- (c) Two test pressure gauges of suitable range certified to AS 1349;
- (d) *Flow rate measurement.* The flow from the valve/unit to be tested shall be measured by a graduated tank of known capacity which is fitted with a diverter that can discharge the water to waste or to be recycled. The graduated tank shall be calibrated to within ± 2 % of true value.

A timing device capable of reading to 0.1 s shall be used to measure the time interval from which the flow rate is calculated.

B2 Conditioning of test samples

Subject all expansion control, pressure relief and temperature relief valves to a temperature of 120 ± 5 °C in an autoclave for 60 mins and allow to cool to ambient temperature.

B3 Installation

Fit a pressure gauge to each of the inlet and outlet sides of the valve/unit and attach the cycling device to the inlet port of all valves/units excepting for pressure control valves which shall have the device attached to the outlet port. Mount in the test rig as shown in figure B1. Connect the assembly to the water supply and check for any requirements prescribed (see 502.2).

B4 Procedure for flow test

B4.1

The procedure shall be performed in ambient air conditions as follows:

- (a) Set the diverter mechanism to run to waste;
- (b) Start water supply system and with the cycling device in the open position increase the inlet pressure until the valve/unit opens;
- (c) Close the flow control valve and note the pressure on the outlet pressure gauge;
- (d) Set timing device to zero;
- (e) Adjust the flow control device to give an additional 150 ± 2 kPa pressure loss across the valve;
- (f) Switch the flow to the graduated tank, operating the timing mechanism simultaneously;
- (g) After a minimum period of 30 s, switch diverter to waste and simultaneously stop the timing mechanism;
- (h) Measure the volume of water in the graduated tank;
- (j) Record volume of water that has passed through the tap over the elapsed time recorded on the timing device and determine flow rate in litres per minute.

B4.2

Check for compliance with the requirements of 202.6.

B5 Procedure for operating pressure test

B5.1

Operate the cycling device for 50 000 cycles when testing a pressure control valve or an expansion control valve and for 10 000 cycles when testing a pressure relief valve.

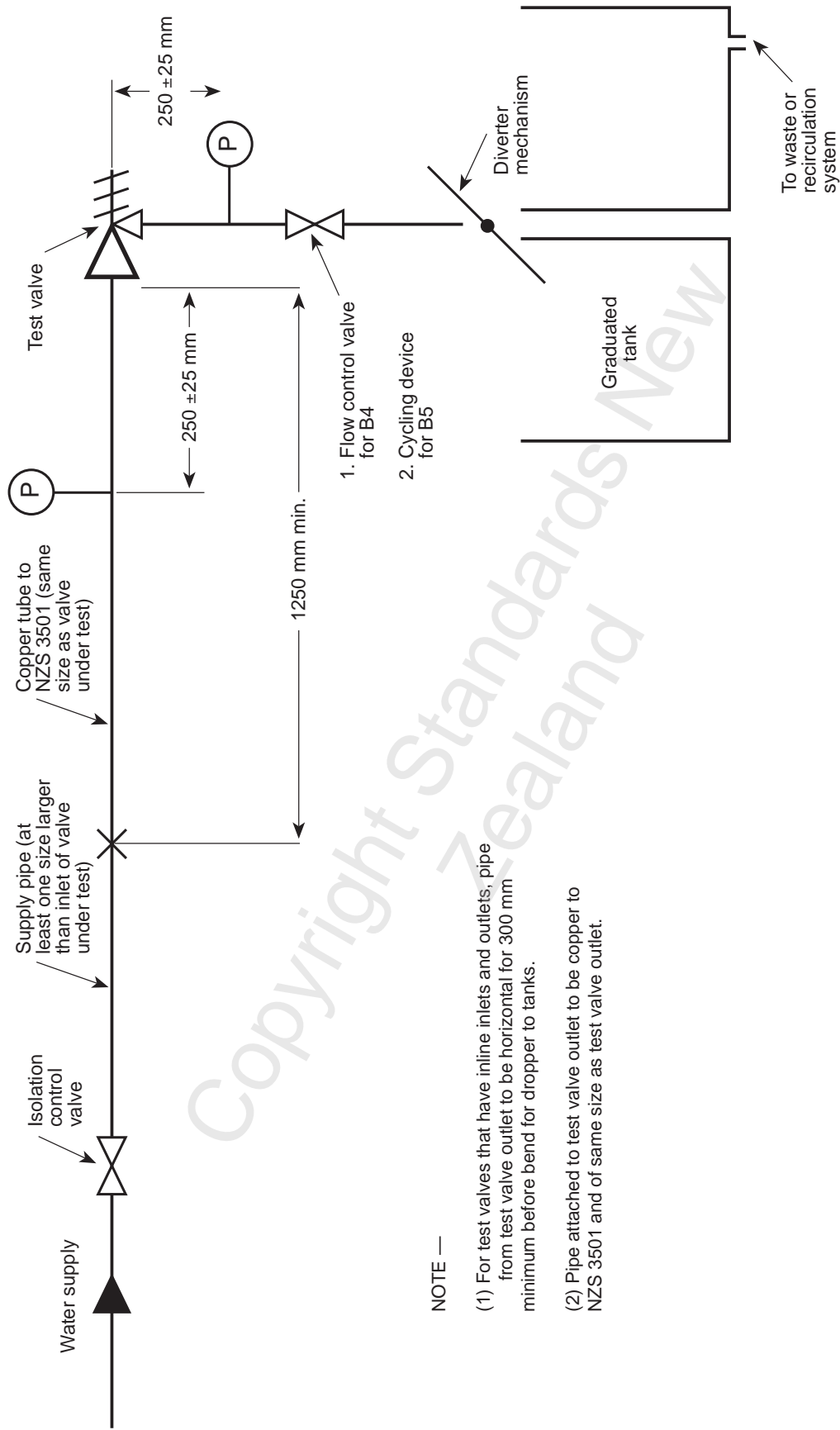
B5.2

During the test check the valve/unit for compliance with the requirements of 202.1.

At the end of the test check the valve/unit for compliance with the requirements of 202.1 and 202.4 and that the set pressure range specified by the manufacturer under 502.1(c) is still met.

In the case of valves, incorporating a diaphragm, at the end of the test check for compliance with the requirements of 301.3 or 302.3 as appropriate.

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NOTE —

- (1) For test valves that have inline inlets and outlets, pipe from test valve outlet to be horizontal for 300 mm minimum before bend for dropper to tanks.
- (2) Pipe attached to test valve outlet to be copper to NZS 3501 and of same size as test valve outlet.

Figure B1 – Typical test rig for determining flow and operating pressure

APPENDIX C VACUUM AND FLOW TEST

C1 Apparatus

The following apparatus is required:

- (a) Vacuum pump;
- (b) Air-flow meter accurate to ± 1 %;
- (c) Test vacuum gauge of suitable range certified to AS 1349;
- (d) *Cycling device*. A device that fully opens and shuts off the air flow at a rate of 6 ± 1 cycles per minute and registers the number of completed cycles, (each cycle consisting of 1 opening and 1 closing action).

C2 Conditioning of test samples

Subject the test samples to a temperature of 120 ± 5 °C in an autoclave for 60 mins and allow to cool to ambient temperature.

C3 Procedure

C3.1

Connect the cycling device, vacuum pump inlet, air flow meter and vacuum gauge to the vacuum relief valve outlet, operate the vacuum pump and by means of the cycling device operate the valve/unit for 10 000 cycles.

C3.2

While under test, inspect for compliance with relevant requirements of 202.1.

C3.3

Set the cycling device to the open position, adjust the flow rate to $100 \pm 2, -0$, L/min. and record the vacuum registered.

C3.4

Check for compliance with the requirements of 202.1 and 304.1, 304.2 or 402.3 as appropriate.

APPENDIX D HEAT RATING TEST

D1 Apparatus

The following apparatus is required:

- (a) A water heater of at least 90 L capacity and a working pressure of at least twice that of the valve under test, fitted with heating elements to 125 % of the heat rating claimed by the manufacturer for the valve under test (see 502.1);
- (b) A test pressure gauge of suitable range certified to AS 1349;
- (c) A pressure relief valve, with a set pressure which exceeds that of the valve under test by not less than 30 kPa or 20 % whichever is the smaller and with a heat rating 50 % in excess of the valve under test.

NOTE –

- (1) Attention is drawn to the need to comply with the relevant requirements of the Boilers, Lifts and Cranes Act.
- (2) The above requirement is intended to provide a 25 % safety factor on the valve rating.

D2 Procedure

D2.1

Fit the valve/unit under test to the water heater according to the manufacturers' instructions, fill the heater with water (ensuring that all air is expelled) and close the inlet.

D2.2

Short circuit the thermostat and thermal cutout and connect the heater to an electric power supply.

D2.3

Switch on the heating elements and when boiling occurs commence recording the electric power consumed and pressure developed in the water heater every 30 seconds for the next 4 minutes. If the water level drops to less than 50 mm above the highest point of the highest mounted element stop the test.

D2.4

Record the power consumed and the maximum pressure developed in the water heater.

D2.5

Check for compliance with 302.4, 303.3 or 305.2 as appropriate.

APPENDIX E TEMPERATURE RESPONSE TEST

E1 Apparatus

The following apparatus is required:

- (a) A water heater of at least 90 L capacity, fitted with a heating element, a pressure control valve, and a pressure relief valve having a set pressure of 7.6 mH₂O (75 kPa) for temperature relief valves or less than 50 % of the unit's set pressure for temperature/pressure relief units;
- (b) A temperature recording device accurate to ± 0.5 °C;
- (c) An energy input control device.

E2 Procedure

E2.1

Fit the valve/unit to the heater in the manner prescribed by the manufacturer (see 502.2). Mount the temperature recording device in such a position that it will register the temperature of the water in close proximity to the sensing element of the valve. Connect the heater to a water supply, fill the heater with water (ensuring that all air is expelled), connect the heating element to an electric power supply via the energy input control device and allow the temperature of the water in the proximity of the sensing element of the valve to rise at a rate of between 1.5 °C and 3.0 °C per minute.

E2.2

Record the temperature at which water first emerges from the valve/unit then switch off the power supply and allow to cool without the use of intercooler or draw-off of water. Record the temperature at which water stops flowing from the valve.

E2.3

Check for compliance with all the requirements of 305 or 402.4 as appropriate.

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OTHER NEW ZEALAND STANDARDS FOR WATER HEATING SYSTEMS

- NZS 4602:1988 Low pressure copper thermal storage electric water heaters
- NZS 4603:1985 Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems)
- NZS 4604:1990 Dairy-type thermal storage electric water heaters
- NZS 4605:1978 Code of practice for the installation of dairy-type thermal storage electric water heaters
- NZS 4606:1989 Storage water heaters
- NZS 4607:1989 Installation of thermal storage electric water heaters: valve vented systems
- NZS 4613:1986 Domestic solar water heaters
- NZS 4614:1986 Installation of domestic solar water heating systems
- NZS 4617:1989 Tempering (3-port mixing) valves
- NZS 6214:1988 Thermostats and thermal cutouts for domestic thermal storage electric water heaters (a.c. only)

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