NZS 4603:1985

Amendment No 1
Appended

INSTALLATION OF LOW PRESSURE THERMAL STORAGE ELECTRIC WATER HEATERS WITH COPPER CYLINDERS (OPEN VENTED SYSTEMS)

Superseding NZS 4603:1976

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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 1965. The Installation of Electric Water Heaters Committee (46/10) was responsible for the preparation of this Standard, and consisted of representatives of the following organizations:

Coal Research Association of New Zealand
Electrical Development Association
Institute of New Zealand Plumbing and Drainage Inspectors
Ministry of Energy — Electricity Division
Ministry of Works and Development
New Zealand Electrical Manufacturers' Federation
New Zealand Manufacturing Engineers' Federation
New Zealand Society of Master Plumbers

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AMENDMENTS

Date of Issue	*Description*

CONTENTS

RELATED DOCUMENTS

Reference is made in this Standard to the following:

NEW ZEALAND STANDARDS

NZS 1300:1965	General requirements for electrical appliances and accessories
NZS 1340:1970	Thermal insulating materials for buildings
NZS 2149:1967	Immersion type thermostat for thermal storage electric water heaters (a.c. only)
NZS 3501:1976	Copper tubes for water, gas, and sanitation
NZS 4602:1976	Low pressure thermal storage electric water heaters with copper cylinders
NZS 4608:0000*	

AUSTRALIAN STANDARDS

AS 1308:1973	Thermostats and over-temperature energy cut outs for automatic electric water heaters (metric units)
AS 1530:----	Methods for fire tests on building materials and structures
Part 3:1982	Test for early fire hazard properties of materials
AS 3161:1979	Thermostats and energy regulators

BRITISH STANDARDS

BS 874:1973	Methods for determining thermal insulating properties, with definitions of thermal insulating terms
BS 1394	Power driven circulators
Part 2:1971	Domestic glandless pumps
BS 1845:1977	Specification for filler metals for brazing

NEW ZEALAND LEGISLATION

Electrical Wiring Regulations 1976
Local Government Act 1974
Radio Interference Regulations 1958

* In preparation

FOREWORD

This Standard revises NZS 4603:1976 *Installation of low pressure thermal storage electric water heaters with copper cylinders (open vented systems).* Installation in accordance with this Standard will ensure safe and reliable hot water supply.

Changes from, and additions to the earlier Standard include:

Provision for pipe materials other than copper, in view of the increasing use of plastics materials.

Requirements for the securing of hot water storage tanks, cold water supply tanks and piping against seismic forces.

Changes in hot water pipe insulating materials from the traditional plumbers felt, in light of research carried out by the Building Research Association of New Zealand.

Addition of sections on natural and pumped circulation systems.

A recommendation is also given on suitable thermostat settings to minimize the danger of scalding. It should however be remembered that thermostat settings can be exceeded where a dual system is used. In such cases a reliable method of avoiding hot water scalds is to fit a valve by the outlet of the electric water heater, which mixes hot and cold water under thermostatic control, and delivers hot water at a pre-determined temperature, regardless of the higher temperature of the hot water in the water heater.

It should also be noted that lower than traditional thermostat setting may reduce the supply of household hot water.

ACKNOWLEDGEMENT

The assistance of the Ministry of Energy with the preparation of this Standard is gratefully acknowledged.

NEW ZEALAND STANDARD

INSTALLATION OF LOW PRESSURE THERMAL STORAGE ELECTRIC WATER HEATERS WITH COPPER CYLINDERS (OPEN VENTED SYSTEMS)

PART 1 GENERAL

101 SCOPE

101.1
This New Zealand Standard applies to the installation in the vertical position of thermal storage electric water heaters complying with NZS 4602 and designed to work on pressures not exceeding 120 kPa (12.0 m a head). It is restricted to systems with open vents. This Standard also applies to hot water reticulation systems, to dual systems, and to the use of wetbacks or similar water heaters which supply hot water to the cylinder, supplementing the heat derived from the electric element. Solar assisted systems are not covered in this Standard.

This Standard is divided into the following Parts:

Part 1 — General

Part 2 — Installation of water heaters

Part 3 — Installation of hot water reticulation systems

Part 4 — Installation of dual systems with natural circulation

Part 5 — Installation of dual systems with pumped circulation

102 DEFINITIONS

102.1
In this Standard, unless inconsistent with the context:

APPROVED means approved by the Engineer.

BACK CIRCULATION means circulation of the hot water from the water heater, causing a loss of the heat stored in the water heater when the wetback is not receiving heat from the combustion process.

BALL VALVE means a form of isolating valve having a spherical movable component which can be turned to move its port or ports, relative to the body seating ports.

CISTERN-WATER HEATER means a water heater with a self-contained cold water feed tank having a float-controlled valve.

DUAL SYSTEM means a water heater which is connected to an additional source of heat, such as a furnace or wetback, but not a solar water heater.

ENGINEER means the local authority's Engineer appointed under the Local Government Act.

FLOW LINE means that part of natural or pumped circulation system carrying the hot water from the top connection of the wetback to the water heater.

GATE VALVE means a valve which provides a straight-through passage for the flow of fluid. The body ends are in line, and a shaped gate is moved between the body seats by a stem whose axis is at right angles to the line between the body ends.

INDIRECT WATER HEATER means a water heater in which the draw-off is indirectly heated by heat exchange from electrically heated stored water.

KITCHEN SINK means a preparation or dishwashing facility including a dishwashing machine.

LOW PRESSURE WATER HEATER means a water heater designed to work under a pressure not exceeding 120 kPa (12.0 m head), and complying with NZS 4602.

NATURAL CIRCULATION (THERMOSIPHON) means the water flow induced in the circulation system by different temperature levels in the system.

OVER-AND-UNDER SYSTEM means a system in which the flow line is carried upwards, generally to above ceiling level, before it drops down to enter at the bottom of the water heater. The return line does not rise above the base of the water heater, but sometimes falls to a low point before rising to the wetback.

PLUG COCK means a device used to regulate or stop the flow of a fluid by the rotation, in its seating, of a drilled or slotted plug.

PUMPED CIRCULATION means the flow of water

caused by a pump in series with the flow line to the wetback heat exchanger.

PUMPED SYSTEM means a system which circulates hot water from the wetback to the water heater by means of a circulator which is commanded by a control which monitors the source of heat.

PUSH-THROUGH WATER HEATER means a water heater with a stop-tap on the cold water inlet so designed that the hot water is discharged through an open outlet.

RETURN LINE means that part of a natural or pumped circulation system carrying water from the water heater back to the bottom connection of the wetback.

STOP TAP means a screw-down pattern tap with horizontal inlet and outlet, having suitable means of connection for insertion in a pipeline.

THERMAL STORAGE ELECTRIC WATER HEATER means an electric water heater in which the heated water is stored or may remain in a container, and which is intended to be affixed in a building. It includes the vessel, insulation, and outer casing, but does not include the hot water reticulation, a separate cold water supply tank or pressure reducing valve, cold water supply piping, thermostat, or heating elements. WATER HEATER shall have the same connotation.

WETBACK means an approved heat-collecting device placed in the back of an open fire or in the combustion zone of a space heater, which receives heat from a combustion process.

ZERO PRESSURE WATER HEATER means a water heater in which the stored water has a free surface either open or accessible to atmosphere.

102.2
For the purposes of this Standard, 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.

103
WORKMANSHIP

103.1
The entire installation shall be carried out in accordance with this Standard, the requirements of the local authority, the requirements of the electric supply authority, and the manufacturers' instructions.

NOTE — Attention is drawn to the need for all electrical wiring work including the replacement of elements and thermostats to be carried out in accordance with the Electrical Wiring Regulations 1976.

PART 2 INSTALLATION OF WATER HEATERS

201 THERMOSTATS

201.1
A thermostat shall be fitted to every water heater. Provided that water heaters of the boiling type may alternatively be fitted with an audible alarm or other automatic device which will afford equivalent protection to that of a thermostat.

201.2
Each immersion type thermostat, where fitted, shall comply with NZS 2149.

201.3
Each contact type thermostat, where fitted, shall comply with AS 1308 and be approved to AS 3161.

NOTE — To reduce the danger of hot water scalds, particularly to children, thermostats should be set at 60-65°C or a thermostatically controlled mixing valve installed.

202 LOCATION AND INSTALLATION OF WATER HEATERS

202.1
To provide adequate hot water supply, to facilitate servicing, and to minimize heat losses from the water heater and the hot water supply piping, the following conditions shall apply:

(a) Every water heater shall be installed in the vertical position and be so located that the element, thermostat, and all other accessories, as well as all connections to pipeworks, are readily accessible and replaceable, and so that the details of marking specified in NZS 4602 can readily be seen

(b) The water heater should be located in a position free from draughts. This is usually best achieved, particularly with the larger size of water heaters, by locating the water heater in a cupboard

(c) Where the water heater is enclosed it shall be possible to remove and replace the complete water heater or any part without the necessity of dismantling the enclosure

(d) The hot water system shall be arranged with the water heater located so as to achieve the shortest convenient length of pipe run to the outlet most frequently used

(e) In a dwelling, a water heater serving the kitchen sink as well as other services shall be located as close to it as can be conveniently arranged, and the distance, measured along the pipe from the hot water outlet of the water heater to the sink tap, shall not exceed the following values:

Internal diameter of pipe (mm)	10	15	20
Maximum distance (m)	12	10	5

Where this condition cannot be met, the use of alternatives will be required, such as a small undersink heater serving the kitchen sink only, in addition to the water heater serving the remaining hot water requirements.

NOTE — In order to meet the requirements of (e), it may be found advisable to take the kitchen sink branch direct from the double sweep tee at the top of the water heater.

(f) Where the pipe supplying the sink is composed of sections of different diameters, the total permissible run shall be calculated by proportion.

(g) A safe tray shall be installed where required by the local authority, or where damage could arise from water leakage from the water heater, for example, in high rise flats or in a roof space.

It shall be fitted with an overflow pipe not less than 40 mm diameter discharging clear of the building.

203 SEISMIC REQUIREMENTS

203.1
Water heaters shall be secured against seismic forces.

203.2
Means of securing shall be sufficient to prevent movement of the water heater if subjected to a maximum horizontal seismic force of 1 g.

203.3
Suitable methods of securing to comply with this requirement are shown in figures 1A and 1B. The minimum size of fastenings is shown in table 1. Other means approved by the Engineer may be substituted.

203.4
Where fittings attached to the water heater pass through the supporting platform or floor the hole shall be made 50 mm oversize.

Table 1 MINIMUM SIZE OF FASTENINGS REQUIRED TO SECURE WATER HEATERS

Equipment weight kg	*Minimum fastener size*			
	Screw in 25 mm thick wood	*Screw in 50 mm thick wood*	*Bolt with washer through wood*	*Bolt through steel*
Below 50	10 g	10 g	M6	M6
50 to 100	24 g	24 g	M6	M6
100 to 150	Not recommended	24 g	M6	M6
150 to 200	Not recommended	24 g	M10	M6
100 to 250	Not recommended	12 mm dia.	M12	M6
150 to 350	Not recommended	12 mm dia.	M12	M10

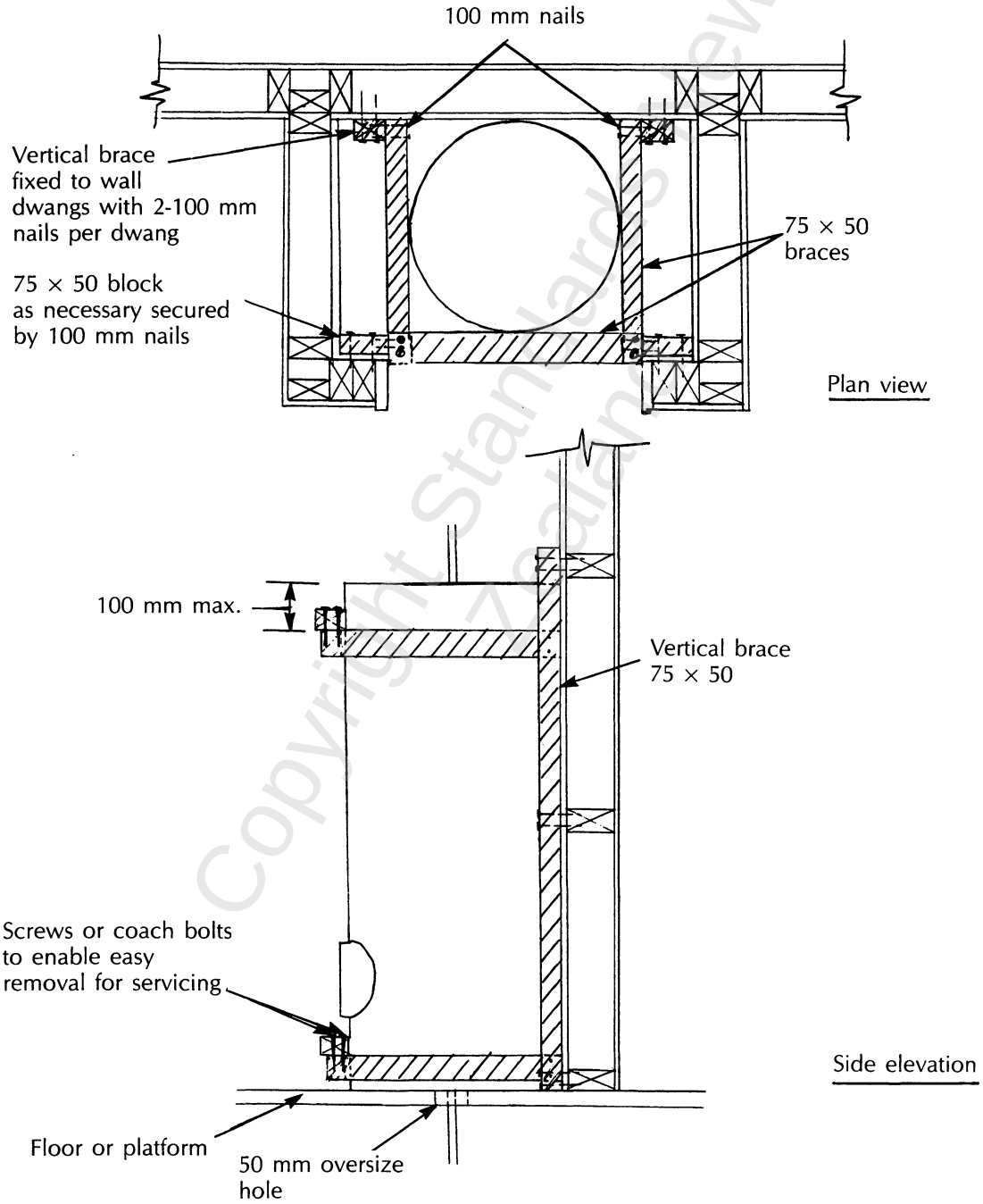


Fig. 1 METHOD FOR SECURING WATER HEATERS AGAINST SEISMIC FORCES
(a) Enclosed in a cupboard

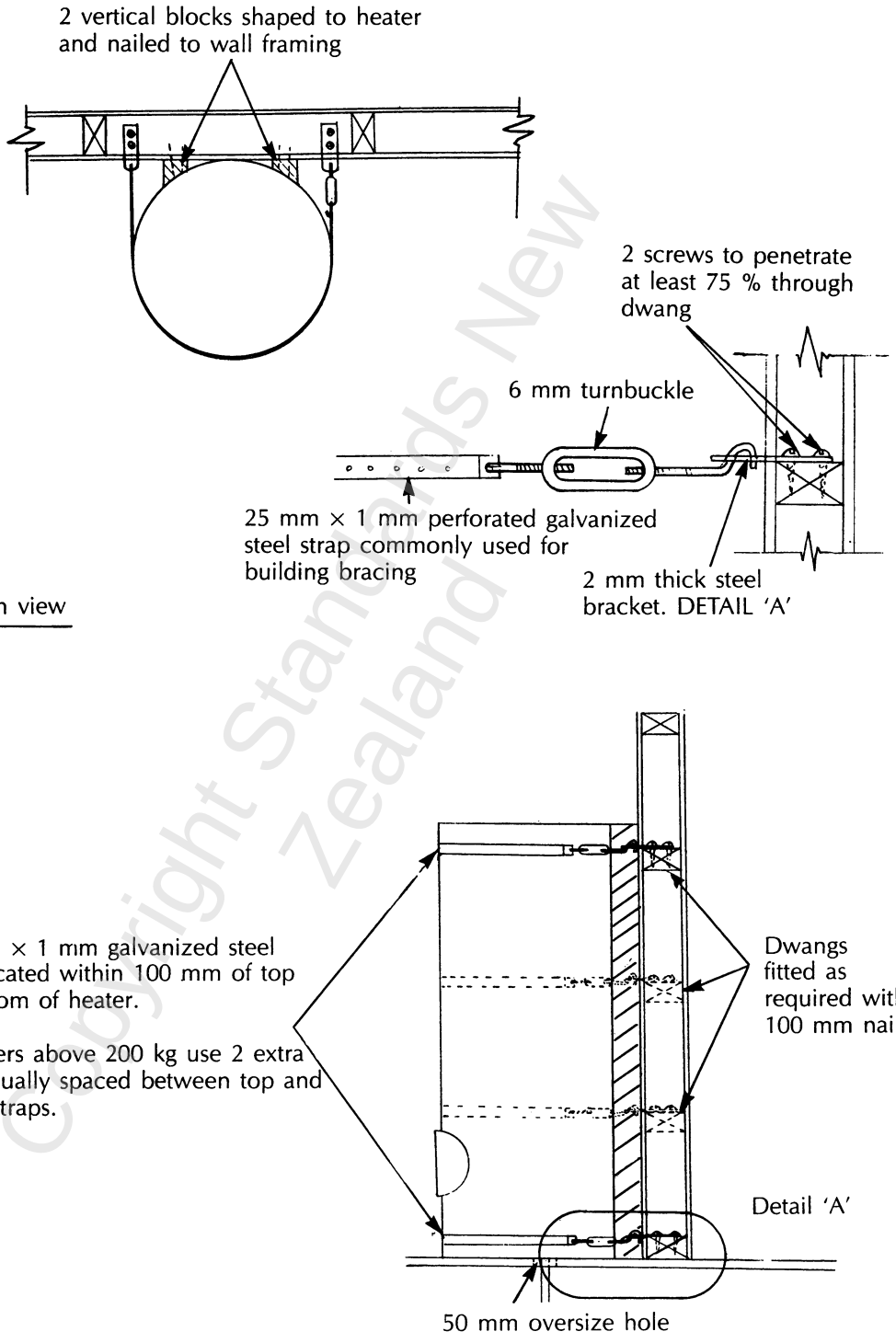


Fig. 1 METHOD FOR SECURING WATER HEATERS AGAINST SEISMIC FORCES
(b) Unenclosed against a wall

PART 3 INSTALLATION OF HOT WATER RETICULATION SYSTEMS

301
PIPES, FITTINGS, AND PIPE LAYOUTS

301.1
Copper pipes complying with NZS 3501 and copper or copper alloy fittings, or other materials of a quality acceptable to the Engineer, shall be used throughout for all hot water runs, for vent pipes, for cold feed from supply tank or pressure reducing valve, for drainpipes, and for any other pipe connection to the water heater. Adequate provision shall be made for thermal expansion, and precautions taken against damage due to seismic effects.

NOTE — Materials other than copper should have equivalent suitability and durability. Documentary evidence of suitability and durability in service should accompany any request to the Engineer for use of substitute materials.

301.2
All brazing materials used shall conform to the requirements of table 2 or table 3 of BS 1845.

301.3
The sizes of inlet and outlet pipes to and from the water heater shall be not less than the sizes of fittings on the water heater.

301.4
Draining

301.4.1
Provision shall be made for draining from the lowest point, every water heater of more than 30 litre capacity.

301.4.2
Where a drainpipe is required separate from the draw-off pipe, it shall be copper or other approved material, have an accessible valve in it, and terminate in a cap or plug in an accessible position. The drainpipe shall be not less than 15 mm diameter and should discharge at some convenient point external to the building.

301.4.3
In hard water areas the drainpipe shall be not less than 20 mm diameter.

301.5
Vents and hot water outlets

301.5.1
The combined hot water supply pipe and vent pipe from the hot water outlet at the top of the water heater shall be swept immediately above the water heater and run where practical for a minimum of 300 mm with an upward slope of approximately 50 mm (that is 10°) before being swept into a vertical run.

301.5.2
The hot water supply shall be teed off the common hot water supply and vent pipe at any appropriate point after the short run across the top of the water heater, the connection being made by means of a swept tee.

301.5.3
The vent pipe shall then be run with a steady rise to a point approximately 600 mm above the normal standing water level of the supply tank and shall finish with an open end led outside the building. Alternatively, where the supply tank is installed in an enclosed roof space, the vent may terminate over it provided that:

(a) the tank and float-controlled valve are made of metal, or other material which has been shown by test to be capable of withstanding continuously, without deformation, water at 100°C

(b) the vent is terminated and permanently fixed at least 25 mm above the invert of the tank overflow pipe (see fig. 2).

NOTE — Where vents are installed through metallic roofing, care should be taken to avoid the possibility of an intermittent contact occurring between a copper vent and such metallic roofing material, as this may become a source of radio interference. Because of this and the additional possibility of corrosion occurring between dissimilar metals it is recommended that the copper vent be kept from contact with metallic roofing by a wrapping of bituminous roofing fabric or equivalent material.

301.5.4
The diameter of the vent pipe shall be the same as the outlet fitting on the water heater.

301.5.5
Where a water heater is supplied from a pressure reducing valve, the vent pipe shall terminate outside the building at a height not less than 3 m above the highest draw-off point. The vent pipe shall be stayed if necessary.

301.5.6
In the case of indirect water heaters the vent and overflow shall have a slight but continuous fall for the whole distance from the water heater to the point of discharge outside the building. This pipe shall be not less than 20 mm diameter.

301.5.7
Subject to the provisions of clause 202.1(e), all hot water piping shall be of a diameter consistent with the supply required in relation to the pressure avail-

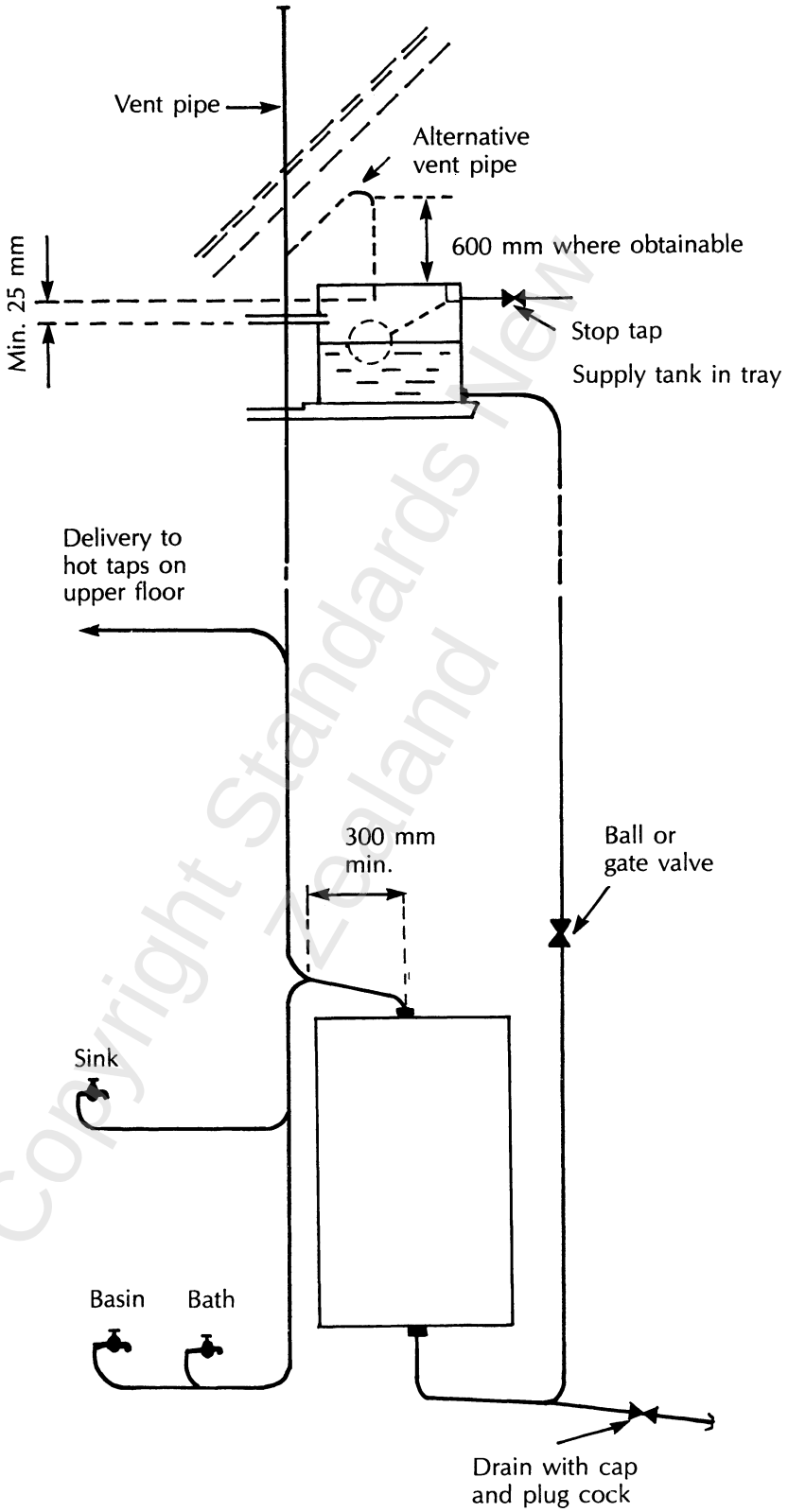


Fig. 2 TYPICAL PIPING LAYOUT USING COLD WATER SUPPLY TANK

able. (See Appendix A.) Pipe runs shall be set out by the shortest possible route with an even gradient, avoiding all places where an airlock is likely to occur. Easy bends shall be used throughout the installation. All tees should be swept in the direction of flow.

301.5.8
Where a shower is fitted, satisfactory mixing at varying flow will be assisted if the cold supply is taken at low pressure from the supply tank or from some other low pressure source (for example, pressure reducing valves or a separate supply tank).

301.5.9
The piping layout of a typical thermal storage electric water heater using a cold water supply tank is shown in fig. 2.

301.5.10
Pipe runs shall be adequately secured by such means as will not damage or deform the pipe. Materials used shall not corrode or cause corrosion or adversely affect the pipe.

301.5.11
Copper pipe shall be fixed in position with copper or brass traps secured by brass nails or screws or with suitable purpose designed clips of plastics or other material. Galvanized straps or steel nailing shall not be used in direct metallic contact with copper or copper alloy.

301.5.12
The distances between fixing points shall not exceed those required by the Statutory Authority or the manufacturer.

301.6
Where hot water pipes are buried in concrete the pipe should be provided with a suitable sheath to permit thermal expansion and contraction.

302
CONNECTIONS

302.1
All copper pipe connections to the water heater shall be made with copper alloy unions. No white or red lead or other hard setting material shall be used in making any joints in the installation.

302.2
Pipes of materials other than copper shall be connected to the water heater using unions or other readily detachable fittings of material recommended by the piping system manufacturer.

302.3
Heating elements and immersion thermostat pockets shall be fitted into the cylinder bosses with watertight joints using jointing material which will remain watertight for the life of the element and allow for easy removal.

303
PIPE INSULATION

303.1
Insulation material

303.1.1
Insulation shall be commercial preformed sections, having a heat loss not exceeding 17 watts per linear metre across 60 °C temperature differential, with a hot-face temperature of 80 °C when determined in accordance with BS 874. For connections onto high temperature secondary sources of heat where a fire risk exists such as fuel furnaces, the insulation may be replaced adjacent to the source of heat with the same thickness of high temperature insulation such as glass fibre, calcium silicate, or ceramic fibre.

303.1.2
Insulation shall be installed and secured in accordance with the manufacturer's instructions. Pipe runs outside buildings shall be fitted with a waterproof covering over the insulation.

303.1.3
Insulation shall have a low spread of flame index (preferably not more than 2) when tested in accordance with AS 1530: Part 3.

303.2
Vent pipes

303.2.1
Vent pipes of all materials shall be insulated without gaps along their length from the hot water cylinder to a height 300 mm above the normal standing water level, using material complying with 303.1.

303.3
Hot water pipes

303.3.1
Hot water pipes to kitchen sinks shall be insulated from water heater to sink using material complying with 303.1 but pipe may be left uninsulated for a maximum length of 500 mm immediately before the kitchen tap if the insulation is exposed and liable to damage.

303.3.2
All other hot water pipes should be continuously

insulated along their full length with helically wrapped, laminated aluminium foil complying with NZS 1340 or with self adhesive aluminium foil. Laminated foil, where fitted, shall be retained either with aluminium wire of not less than 0.7 mm diameter, tightly wrapped and at not more than 150 mm pitch, or in accordance with manufacturer's instructions. Other materials with an emissivity similar to aluminium may be used.

NOTE — Only polished metals have an emissivity similar to aluminium foil.

303.4
Flow and return pipes

303.4.1
Copper flow and return pipes larger than 10 mm diameter and approved plastics flow and return pipes shall be insulated over their whole length using material complying with 303.1.

303.5
Frost protection
All pipes liable to freezing should be insulated to reduce this risk, using material complying with 303.1. In extreme climates other precautions will be necessary to prevent freezing.

304
COLD WATER SUPPLY TANK

304.1
For water heaters, other than the cistern type, where a separate cold water supply tank is installed, the capacity of the tank shall be not less than half the capacity of the water heater and where a dual system is fitted not less than 136 litre.

304.2
The tank shall be of sufficient length and depth to allow a full size float-controlled valve to operate and shall be fitted with a tight fitting lid.

304.3
A gate valve or ball valve shall be fitted adjacent to the water heater in the cold feed from the supply tank.

304.4
Metal tanks, where used, shall be of copper not less than 0.45 mm in thickness for tanks up to 136 litre capacity, and not less than 0.6 mm in thickness for tanks over 136 litre capacity.

304.5
All joints in copper tanks shall be brazed using material conforming to the requirements of table 2 or table 3 of BS 1845.

304.6
Where tanks other than metal are used, they shall be installed to the manufacturer's instructions.

304.7
Where a supply tank is fitted within a roof space a tray shall be provided, and where metal is used it shall be not less than 0.45 mm in thickness.

304.8
A radial clearance of not less than 50 mm shall be provided between the cold water supply tank and the tray.

304.9
Both tank and tray shall be fitted with an over-flow pipe not less than 40 mm diameter, discharging clear of the building. To avoid corrosion, metal trays shall not be in direct contact with the tank or piping, but shall be separated by a bituminous roofing fabric or other equivalent waterproof material which is not an electrical conductor.

305
PRESSURE REDUCING VALVES

305.1
All pressure reducing valves shall conform to NZS 4608, and shall be installed to the requirements of the local authority and the manufacturer's instructions.

305.2
All pressure reducing valves shall incorporate a non-return feature. Alternatively, a separate non-return valve shall be fitted on the low pressure side of the pressure reducing valve as shown in fig. 3.

305.3
The cold water inlet pipe from valve to water heater shall be of the same diameter as that of the high pressure pipe, but shall be not less than 20 mm diameter except in the case of an undersink water heater with a 15 mm connection.

305.4
A filter and a stop tap shall be fitted on the high-pressure side (see fig. 3) adjacent to the pressure reducing valve.

305.5
A gate valve or ball valve shall be fitted between the pressure reducing valve and the inlet to the water heater.

NOTE — Attention is drawn to the fact that some water authorities in New Zealand do not permit the installation of pressure reducing valves in their areas of supply. Pressure reducing valves may not give adequate flow under conditions of low pressure supply.

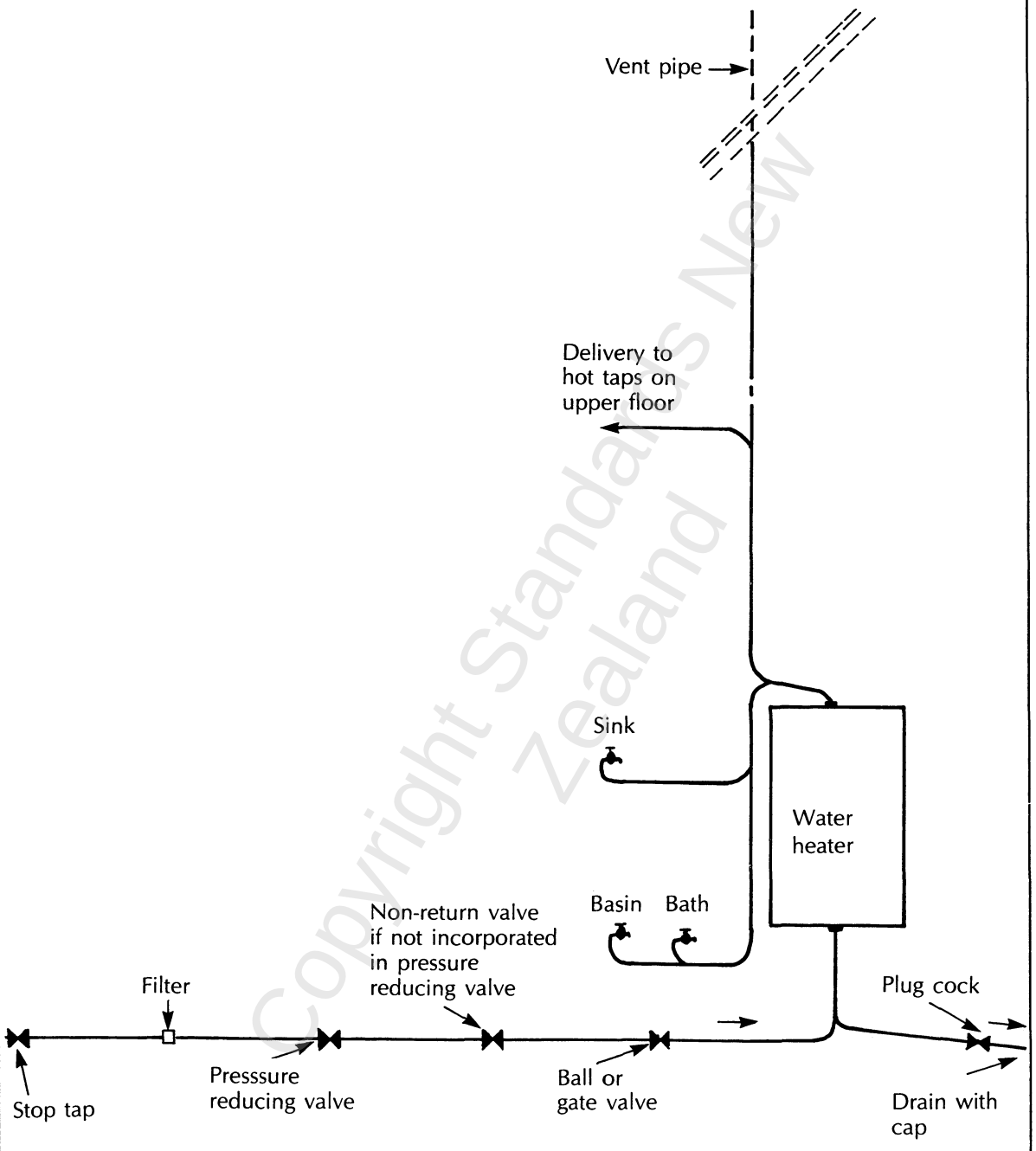


Fig. 3 TYPICAL PIPING LAYOUT USING PRESSURE-REDUCING VALVE

306
HOT WATER TAPS

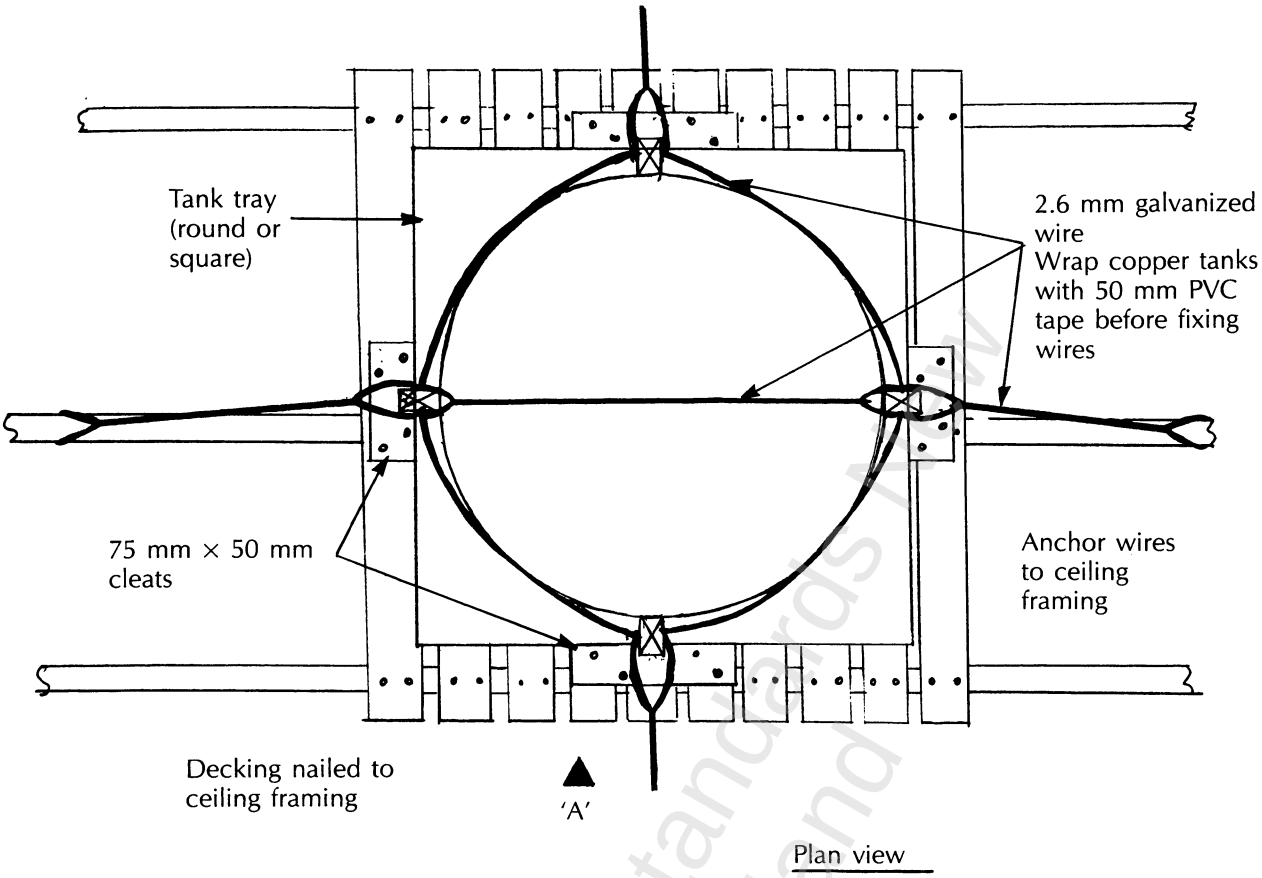
306.1
Hot water taps shall be of not less than 15 mm nominal bore. All wing-back elbows holding taps shall be secured to the supporting structure.

307
SEISMIC REQUIREMENTS

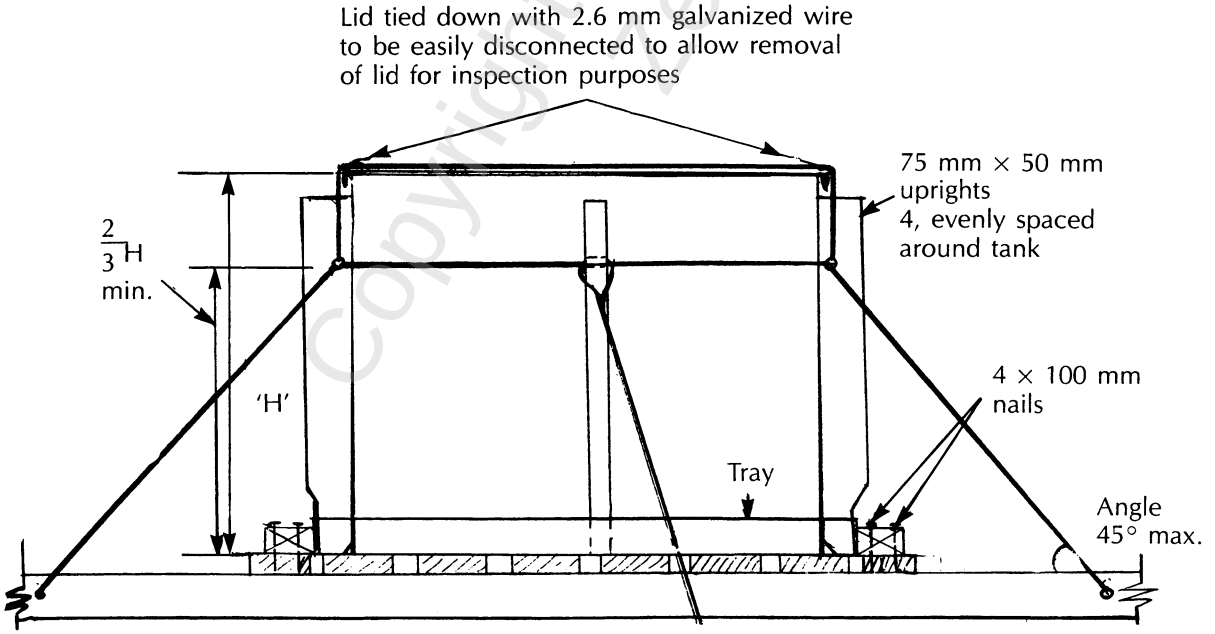
307.1
Cold water supply tanks shall be secured against seismic forces.

307.2
Means of securing shall be sufficient to restrict lateral movement and overturning of the tank and uplift of the tank lid if subjected to a maximum horizontal seismic force of 1 g.

307.3
Fig. 4 shows a suitable means of securing to comply with this requirement. Other means of securing approved by the Engineer may be substituted.



Plan view



View from 'A'

Fig. 4 METHOD FOR SECURING COLD WATER SUPPLY TANKS AGAINST SEISMIC FORCES

PART 4 INSTALLATION OF DUAL SYSTEMS WITH NATURAL CIRCULATION

401 GENERAL

401.1
Pipework between the wetback and the water heater permits the natural circulation of the hot water to the water heater where it is stored. Normally the heat flow from the wetback is of the order of 2 kW, but the principles of this Standard can also be applied to wetbacks larger than this.

401.2
The flow line shall be made into the top connection of the wetback, the return line into the bottom connection.

401.3
The wetback should be made in suitable material to resist corrosion.

401.4
Material other than copper shall not be used for the circulating pipework between wetback and water heater, unless approved by the Engineer.

NOTE — The material of the wetback and circulation pipes must be compatible.

401.5
Provision shall be made for expansion and contraction of the flow and return pipes.

401.6
Flow and return lines shall be insulated in accordance with 303.4, except where a short uninsulated loop may be used to ensure against back-circulation in an over-and-under system. See 404.3.

401.7
Where a wetback is used in a dual system with natural circulation, the pipe arrangement shall be such as to:

(a) Ensure that the heat received by the wetback is transferred at a steady rate to the water heater, with the necessary combination of a low resistance to water flow around the circuit, and sufficient difference in the level between wetback and water heater to promote circulation

(b) Ensure that hot water stored in the water heater does not back circulate when the wetback is not receiving heat from the combustion process.

401.8
No device, pipes, or couplings shall be connected into the water heater which would impinge on the integrity of the water heater design and performance.

402 RESISTANCE IN THE WATER CIRCUIT

In order to ensure that the flow of water around the circuit is not unduly restricted:

(a) The flow and return lines between the wetback and the water heater shall be of a sufficiently large diameter

(b) No valve (or non-return valve) shall be fitted in the circulation lines between the wetback and water heater

(c) Long-radius bends should be used to reduce friction losses in the circulating pipework and the number of bends kept to a minimum

(d) Where a tee is used in the circulating pipework the main flow of circulating water should be straight through the tee.

403 PROMOTION OF CIRCULATION

403.1
Circulation of hot water from wetback to water heater depends on the different temperature of the flow and return lines. The greater the difference in level of the water heater above the wetback, the greater will be the movement of water around the circuit.

403.2
With both flow and return lines made into the bottom of the water heater, in order to facilitate natural circulation, the flow line should be carried upwards internally in the water heater to about two-thirds the height of the water heater.

403.3
Under the conditions where:

(a) The output of the wetback is not greater than approximately 2 kW

(b) The pipework is simple and not unduly circuitous

(c) The length of the pipework circuit (flow and return lines) is not greater than 10 metres (this 10-metre total length shall be calculated as the actual length of the pipe plus the equivalent length for bends etc. as expressed in table 2),

Table 2 FLOW RESISTANCE OF FITTINGS EXPRESSED AS LENGTH OF PIPE (IN METRES) OF THE SAME NOMINAL BORE

Type of fitting	*Nominal bore – mm*			
	10	*15*	*20*	*25*
	m	m	m	m
Short bend	0.12	0.15	0.21	0.30
Easy bend	0.09	0.12	0.18	0.24
Straight tee	0.09	0.12	0.18	0.24
Straight reducing tee	0.12	0.15	0.21	0.30
Branch tee	0.39	0.51	0.69	0.93
Stop tap	3.66	4.88	6.10	8.54
Gate valve	0.06	0.09	0.12	0.18
Tank or boiler	0.39	0.51	0.69	0.93

the minimum inside diameter of the pipework (including any pipework in the wetback) shall be 25 mm and the base of the water heater above the level of the top of the wetback shall be not less than:

(i) 300 mm where the flow line is carried upward internally in the water heater to about two-thirds of the height of the water heater

(ii) 600 mm where there is no such internal riser pipe.

403.4
Where any of the conditions specified in 403.3(a), (b) and (c) are not met, then the inside diameter of the pipework, or the difference in levels between the wetback and the water heater (as specified in 403.3), or both, shall be increased and shall be of an approved design.

404
BACK CIRCULATION

404.1
To prevent back circulation, both flow and return line shall be made into the base of the water heater.

404.2
Where an elevated device which can promote circulation is fitted (such as a towel rail) it shall be connected into the system in such a way that heat cannot be lost from the water heater by water circulating in either direction when the wetback is not receiving heat from the fire.

404.3
An over-and-under system as shown in fig. 5D is acceptable, back circulation being prevented by:

(a) The introduction of flow and return lines into the base of the water heater

(b) High-quality thermal insulation (303) on the circulating lines, especially the flow line.

The greater length of pipework and the larger number of bends may necessitate some increase in pipe diameter, or in the difference in levels between the wetback and the water heater, or both, above those stated in 403.3.

If there is any doubt about the quality of the insulation on the flow line, a further step can be taken to ensure against back-circulation. An unlagged loop on the flow line into the water heater can be provided as illustrated in fig. 5D. Where this unlagged loop is within an enclosure such as a hot-water cupboard around the water heater, the inevitable loss of heat from the unlagged loop is not wasted. Where there is such an enclosure, the use of the unlagged loop as a further insurance against back-circulation in an over-and-under system, is recommended.

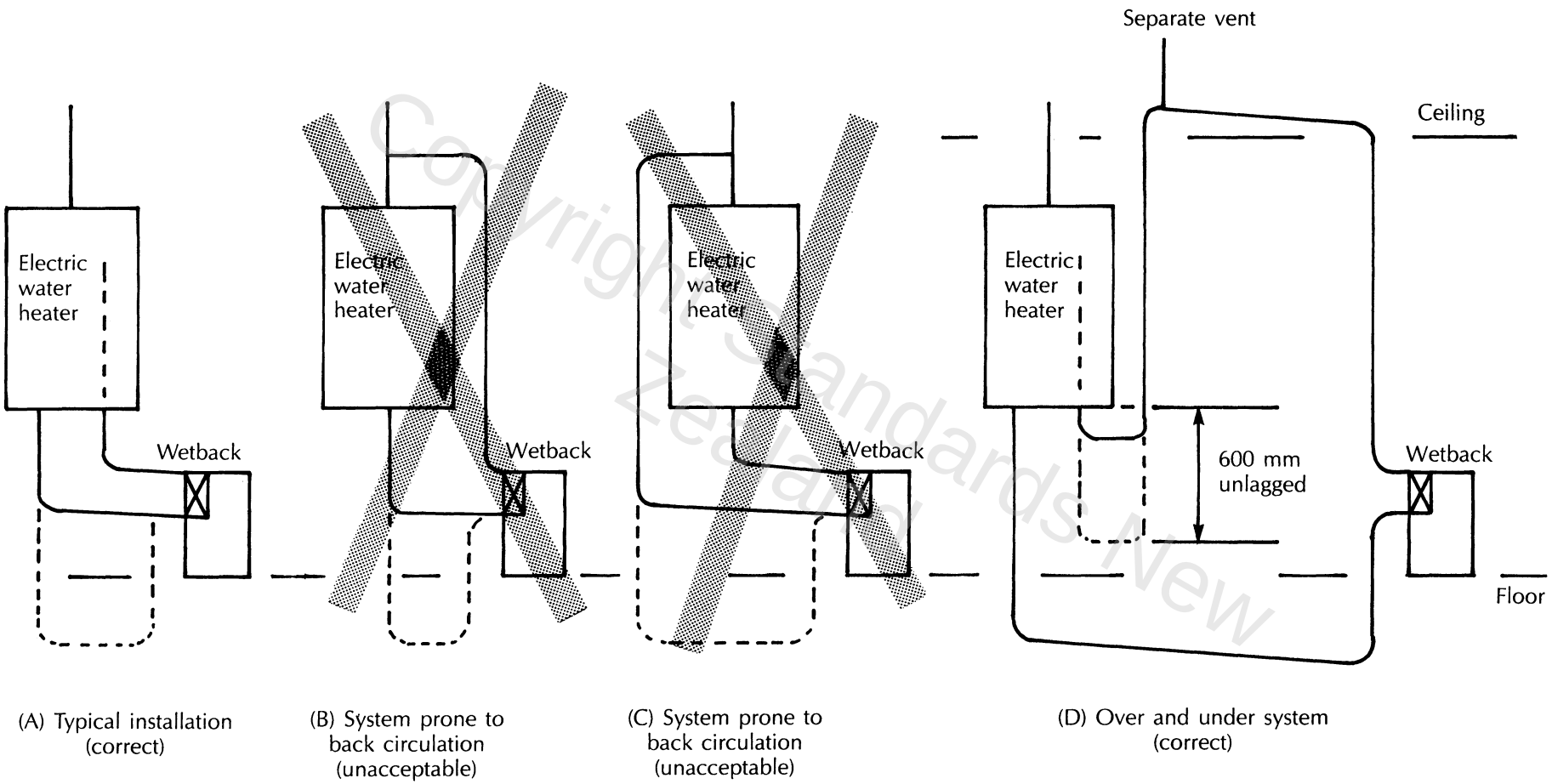
404.4
Fig. 5 illustrates typical wetback systems, correct and unacceptable.

405
VENTS

405.1
Vent pipes shall be provided at every high point in the circulating pipework. The vent pipes shall not be less than 20 mm internal diameter. Where more than one vent is required, each vent shall be independent of the others. Vent pipes shall not terminate within the enclosed roof space. (See also 301.5.)

406
COLD WATER SUPPLY

406.1
The cold water supply shall be made into the base of the water heater, or into the return line through a side tee.



(A) Typical installation (correct)

(B) System prone to back circulation (unacceptable)

(C) System prone to back circulation (unacceptable)

(D) Over and under system (correct)

Fig. 5 CORRECT AND UNACCEPTABLE WETBACK ARRANGEMENTS WITH NATURAL CIRCULATION

(All circulating lines to be insulated. The only exception is in the case where, in an over-and-under system, an unlagged loop in the flow line into the water heater (below the water heater and inside a hot-water cupboard) may be used as an insurance against back circulation.)

PART 5 INSTALLATION OF DUAL SYSTEMS WITH PUMPED CIRCULATION

The design and installation of wetbacks with pumped circulation should be approved by the Engineer. The following comments are intended primarily for general guidance.

501
GENERAL

501.1
The factors determining the resistance to water flow and the flow of water around the circuit, which control the design of natural circulation systems, are not important with pumped circulation. The slope of the pipework and the levels of it are not important. Larger wetbacks, smaller diameter pipe and longer pipe runs are acceptable.

502
PUMPS

502.1
The pump shall comply with BS 1394, Part 2, Grade 2. Any thermostatic controls which operate the pump should comply with NZS 1300 and the Radio Interference Regulations 1958. Provision should be made to ensure that in the event of the failure of a thermostatic device the pump is not left running continually when the wetback is not receiving heat.

503
VENT

503.1
The wetback shall be provided with a vent, minimum internal diameter 20 mm, discharging outside the building.

504
WATER IN WETBACKS

504.1
The presence of water in the wetback must be assured at all times.

505
BACK CIRCULATION

505.1
Back circulation can occur with pumped systems, but steps which are unacceptable in a natural circulation system, can be applied to prevent this.

506
CONNECTIONS INTO WATER HEATER

506.1
The connections of flow and return lines should be into the base of the water heater to prevent back circulation. These connections should be designed to prevent turbulence in the water heater and to ensure a minimum of direct cross flow between them.

506.2
The flow and return lines in some commercially available designs are sometimes incorporated in an inlet adapter attached to the bottom of the water cylinder.

506.3
No device, pipes, or couplings shall be connected into the water heater which impinge on the integrity of the water heater design and performance.

APPENDIX A
RECOMMENDED FLOW RATES

A1

It is recommended that the installation should be designed to provide the following hot water flow rates:

Type of outlet	*Flow rate (L/min)*
Kitchen sink	9
Bath	13
Wash hand basin	5
Shower	5
Laundry tub	9

A2

The diameter of pipe needed to meet these flow rates may be determined by use of table 3.

Table 3 FRICTION HEAD LOSS IN COPPER PIPES FOR DIFFERENT RATES OF HOT WATER FLOW

Loss of head in metres/ linear metre	*Nominal bore of pipe (in millimetres) flow in litres per minute (L/min)*				
	10 mm	*15 mm*	*20 mm*	*25 mm*	*32 mm*
	L/min	*L/min*	*L/min*	*L/min*	*L/min*
0.01	1.23	2.73	5.42	13.1	25.2
.02	2.00	4.20	9.15	19.4	39.2
.03	2.64	5.42	11.6	24.2	49.2
.04	3.14	6.41	13.7	27.9	56.5
.05	3.59	7.33	15.5	31.5	63.2
.06	4.00	8.10	17.1	34.7	69.2
.07	4.50	8.80	18.7	37.9	75.0
.08	4.73	9.55	20.0	40.5	81.0
.09	5.19	10.3	21.2	42.9	85.6
.10	5.42	10.9	22.4	45.5	91.0
.11	5.73	11.4	23.7	47.7	95.5
.12	6.00	11.9	24.7	50.0	99.0
.13	6.28	12.5	25.9	52.4	104.0
.14	6.60	12.9	26.9	54.2	108.0
.15	6.78	13.6	27.8	56.5	112.0
.16	7.10	14.0	28.8	58.8	115.0
.17	7.27	14.5	29.7	60.5	118.0
.18	7.60	15.0	30.6	62.9	122.0
.19	7.82	15.3	31.4	64.1	126.0
.20	8.00	15.8	32.4	65.0	129.0
.25	9.10	17.8	36.4	73.9	145.0

Other New Zealand Standards for water supply, use and disposal

NZS	4601		1971	*Performance of water fittings and appliances*
NZS	4602		1976	*Low pressure thermal storage electric water heaters with copper cylinders.* Amend: 1, 1976
NZS	4603		1985	*Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems)*
NZS	4604		1978	*Dairy-type thermal storage electric water heaters with copper cylinders*
NZS	4605		1978	*Code of practice for the installation of dairy-type thermal storage electric water heaters*
NZS	4610		1982	*Household septic tank systems*
NZS	4611			*Non-thermostatic shower mixing valves*
NZS	4611	Part 1	1982	*Specification for materials, design and construction.* Bound with NZS 4611: Pt 2
NZS	4611	Part 2	1982	*Code of practice for installation.* Bound with NZS 4611: Pt 1
NZMP	4613			*Solar water heating equipment*
NZMP	4613	Part 1	1979	*Specification for solar heating equipment* Bound with NZMP 4613: Pt 2
NZMP	4613	Part 2	1979	*Code of practice for installation of solar water heating equipment.* Bound with NZMP 4613: Pt 1
NZS	4616		1984	*Washbasins.* (± AS 1730:1975) Amend: 1; 2; 3; A

NOTES

NOTES

Pr AA

INSTALLATION OF LOW PRESSURE THERMAL STORAGE ELECTRIC WATER HEATERS WITH COPPER CYLINDERS (OPEN VENTED SYSTEMS)

AMENDMENT No. 1

July 1990

EXPLANATORY NOTE - Corrects a number of errors in the original text and introduces minor changes arising from changes to related documents.

To ensure receiving advice of the next amendment to NZS 4603:1985 please complete and return the amendment request form.

APPROVAL

Amendment No. 1 was approved on 22 June 1990 by the Standards Council to be an amendment to NZS 4603:1985 pursuant to the provisions of section 10 of the Standards Act 1988.

(Amendment No. 1, July 1990)

RELATED DOCUMENTS

Delete completely and **substitute:**

RELATED DOCUMENTS

Reference is made in this Standard to the following:

NEW ZEALAND STANDARDS

NZS 3501:1976	Copper tubes for water, gas, and sanitation
NZS 4222:1985	Materials for the thermal insulation of buildings
NZS 4602:1988	Low pressure copper thermal storage electric water heaters
NZS 4608:0000	Control valves for hot water systems (In preparation)
NZS 6200:1988	General requirements for electrical apparatus and material
NZS 6214:1988	Thermostats and thermal cutouts for domestic thermal storage electric water heaters (alternating current only)

AUSTRALIAN STANDARDS

AS 1530:- - - -	Methods for fire tests on building materials, components and structures
Part 3:1989	Simultaneous determination of ignitability, flame propagation, heat release and smoke release

BRITISH STANDARDS

BS 874:1973	Methods for determining thermal insulating properties, with definitions of thermal insulating terms

BS 1394:- - - -	Stationary circulation pumps for heating and hot water service systems
Part 2:1987	Specification for physical and performance requirements
BS 1845:1984	Specification for filler metals for brazing

NEW ZEALAND LEGISLATION

Electrical Wiring Regulations 1976
Local Government Act 1974
Radio Regulations 1987

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

(Amendment No. 1, July 1990)

101
SCOPE

101.1
In line 5 **amend** words in parenthesis to "12.0 m head"

(Amendment No. 1, July 1990)

201
THERMOSTATS
Delete 201.2 and 201.3 and **substitute:**

201.2
Each thermostat shall comply with the requirements of NZS 6214.

(Amendment No. 1, July 1990)

Table 1
In column 1 **delete** last 2 items and **substitute:**

200 to 250
250 to 350

(Amendment No. 1, July 1990)

301.5
Vents and hot water outlets

301.5.11
In line 2 **amend** "traps" to "straps"

(Amendment No. 1, July 1990)

303.3
Hot water pipes

303.3.2
Delete reference to NZS 1340 and **substitute** NZS 4222.

(Amendment No. 1, July 1990)

502
PUMPS

502.1
Delete and **substitute:**

502.1
The pump shall comply with BS 1394, Part 2. Any thermostatic controls which operate the pump should comply with NZS 6200 and the Radio Regulations. Provision should be made to ensure that in the event of the failure of a thermostatic device the pump is not left running continually when the wetback is not receiving heat.

(Amendment No. 1, July 1990)

(c) 1990 STANDARDS COUNCIL
STANDARDS ASSOCIATION OF NEW ZEALAND
WELLINGTON TRADE CENTRE, 181-187 VICTORIA STREET
WELLINGTON 1

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To confirm that the next amendment has been requested, enter details of despatch:

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Declared on 26 April 1985 by the Standards Council to be a standard specification pursuant to the provisions of section 23 of the Standards Act 1965.

First published August 1976
Revised June 1985
Note: Publication delayed for consideration of late comments

The following SANZ references relate to this Standard:

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