

Australian/New Zealand Standard™

National Plumbing and Drainage

**Part 4.2: Hot water supply systems—
Acceptable solutions**



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National Plumbing and Drainage

Part 4.2: Hot water supply systems— Acceptable solutions

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS/14, National Plumbing and Drainage Code, to supersede AS 3500.4—1994.

This Standard incorporates Amendment 1 (October 2002). The changes arising from the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure, or part thereof affected.

The object of this revision is to issue it as a Joint Australian/New Zealand Standard with minimum deemed-to-satisfy requirements and incorporate amendments and additions arising from industry requirements compatible with legislation of authorities who can enforce regulations and authorize products for connection to their systems.

Noise levels have not been included as progress on a unified method of analysis has not been agreed upon and require further research.

Attention is drawn to the publication of SAA Rul PL/1, *Rulings to the Joint Australia/New Zealand Plumbing and Drainage Code*. Where Rulings of public significance are issued, they will be available from Standards Australia through a subscription service. When rulings are included in an amendment, the specific ruling will be withdrawn at the time of publication of the amendment. Enquiries should be directed to Standards Australia.

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

CONTENTS

	<i>Page</i>
FOREWORD	6
 SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE AND APPLICATION	7
1.2 REFERENCED DOCUMENTS	7
1.3 DEFINITIONS	7
1.4 WATER QUALITY	7
1.5 EQUIVALENT PIPE SIZES	8
1.6 WATER TEMPERATURE	8
 SECTION 2 MATERIALS AND PRODUCTS	
2.1 SCOPE OF SECTION	9
2.2 AUTHORIZATION	9
2.3 LIMITS ON USE OF PIPES AND FITTINGS	9
2.4 CISTERN (COLD WATER STORAGE TANK) MATERIALS	11
2.5 SAFE TRAY AND SAFE WASTE MATERIALS	11
2.6 JOINTING	11
2.7 BEDDING AND BACKFILL	12
2.8 MISCELLANEOUS MATERIALS	12
 SECTION 3 INSTALLATION OF COLD AND HOT WATER PIPING AND CONTROLS	
3.1 SCOPE OF SECTION	13
3.2 SAFETY PRECAUTIONS	13
3.3 METHODS OF JOINTING	13
3.4 SUPPORT AND FIXING ABOVE GROUND	15
3.5 LOCATION OF PIPING	15
3.6 PIPES IN WATER-CHARGED OR FILLED GROUND	17
3.7 CROSS-CONNECTION CONTROL AND BACKFLOW PREVENTION ...	17
3.8 CONTAMINATED AREAS	17
3.9 CORROSIVE AREAS	17
3.10 DEPTH OF COVER IN PUBLIC AREAS	18
3.11 DEPTH OF COVER IN PRIVATE AREAS	18
3.12 PROTECTION AGAINST FREEZING	18
3.13 COLD WATER PIPING AND CISTERNS	20
3.14 INSTALLATION OF HOT WATER SUPPLY	23
3.15 TEMPERATURE CONTROL DEVICES	26
3.16 THERMOSTATIC MIXING VALVES	26
 SECTION 4 INSTALLATION OF WATER HEATERS—GENERAL REQUIREMENTS	
4.1 SCOPE OF SECTION	28
4.2 WATER HEATERS	28
4.3 LOCATION	28
4.4 PROTECTION AGAINST DAMAGE FROM LEAKING WATER	28
4.5 SUPPORT	30

4.6	CORROSION PREVENTION AND WEATHER PROTECTION	31
4.7	CONNECTIONS TO WATER HEATERS	31
4.8	PRESSURE RELIEF AND VENTING OF WATER HEATERS AND CONTAINERS	31
4.9	VALVES	32
4.10	MULTIPLE INSTALLATIONS OF PRESSURE-TYPE STORAGE WATER HEATERS	39
4.11	MULTIPLE INSTANTANEOUS WATER HEATERS	41
4.12	TEMPERATURE/PRESSURE/RELIEF AND EXPANSION CONTROL VALVE DRAIN LINES	41
4.13	VENT PIPES	42
 SECTION 5 INSTALLATION OF SOLAR WATER HEATERS		
5.1	SCOPE OF SECTION	53
5.2	GENERAL	53
5.3	INSTALLATION OF SOLAR WATER HEATER CONTAINER	53
5.4	INSTALLATION OF COLLECTORS	54
5.5	INSTALLATION OF CLOSE-COUPLED AND INTEGRAL SOLAR WATER HEATERS	57
5.6	THERMOSIPHON FLOW SOLAR WATER HEATERS WITH REMOTE CONTAINERS	57
5.7	SOLAR WATER HEATERS WITH FORCED PRIMARY CIRCULATION .	58
5.8	SOLAR WATER HEATERS USED AS PREHEATERS	59
5.9	MULTIPLE SOLAR WATER HEATERS INSTALLATIONS	60
5.10	SUPPLEMENTARY HEATING	60
 SECTION 6 ENERGY SOURCES AND HEAT RETENTION		
6.1	SCOPE OF SECTION	63
6.2	CONTROLLED ENERGY SOURCES	63
6.3	WATER HEATERS WITH UNCONTROLLED ENERGY SOURCE	63
6.4	HEAT RETENTION	64
 SECTION 6A ENERGY EFFICIENCY		
6A.1	SCOPE OF SECTION	65
6A.2	INSULATION	65
6A.3	HEAT TRAPS	66
 SECTION 7 HOT WATER SERVICES FOR THE DISABLED		
7.1	SCOPE OF SECTION	70
7.2	GENERAL	70
 SECTION 8 TESTING AND COMMISSIONING		
8.1	SCOPE OF SECTION	71
8.2	FLUSHING	71
8.3	TESTING	71
8.4	COMMISSIONING	71
8.5	OPERATING INSTRUCTIONS	71

Page

SECTION 9 OPERATION AND MAINTENANCE

9.1	SCOPE OF SECTION	72
9.2	GENERAL	72
9.3	MAINTENANCE OF HOT WATER SERVICES	72

APPENDICES

A	REFERENCED DOCUMENTS	73
B	WATER ANALYSIS	76
C	TYPICAL RATES OF FLOW	77
D	PREFERRED SIZES OF PIPE FOR NON-CIRCULATORY AVERAGE SINGLE-STOREY TYPE HOUSEHOLD INSTALLATIONS (Copper tube complying with AS 1432 or NZS 3501)	78
E	RECOMMENDATIONS FOR THE INSTALLATION OF UNRATED SOLAR HOT WATER SUPPLY SYSTEMS	79
F	RECOMMENDATIONS FOR THE INSTALLATION OF CLOSE-COUPLED AND INTEGRAL SOLAR HOT WATER SYSTEMS ON ROOFS	80
G	SOLAR HOT WATER SYSTEMS SUGGESTED COMPONENT SIZES (UNRATED SYSTEMS)	83
H	ESTIMATION OF SHADING OF COLLECTORS	88
I	EFFECT OF INCLINATION AND ORIENTATION ON SYSTEM PERFORMANCE	93
J	MAP OF REGIONAL BASIC DESIGN WIND SPEEDS	102
K	AUSTRALIAN CLIMATE REGIONS	103
L	NEW ZEALAND CLIMATE REGIONS	106

FOREWORD

STATUTORY REQUIREMENTS Attention is drawn to the relevant statutory requirements with respect to—

- (a) the qualifications of persons permitted by law to do hot water plumbing;
- (b) the administrative procedures to be followed by persons performing hot water installation; and
- (c) the authorization of materials, products, fixtures, fittings and other components for connection to water supply systems.

PROVISION FOR REVISION This Standard necessarily deals with existing conditions, but is not intended to discourage invention or to exclude materials, equipment and methods which may be developed in future. Revisions will be made from time to time in view of such developments and amendments to this edition will be made only when absolutely necessary.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard National Plumbing and Drainage

Part 4.2: Hot water supply systems—Acceptable solutions

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE AND APPLICATION This Standard sets out the requirements for the installation of domestic-type water heaters using potable water. It includes aspects of the installation from, and including, the valve(s) on the cold water inlet to any cistern or water heater and the downstream fixtures and fittings. This Standard applies to new installations as well as alterations, additions and repairs to existing installations.

This Standard applies to the installation of the following types of water heaters which comply with Clause 4.2.1 or Clause 5.3.1:

- (a) Electric storage water heaters with a rated delivery of up to 630 L per heater.
- (b) Other types of storage water heaters with a capacity of up to 700 L per heater.
- (c) Heat exchange water heaters in accordance with AS 1361.

NOTE: The reference to AS 1361 is made to positively identify the particular type of heat exchange water heater to which this Standard applies.

- (d) Instantaneous water heaters.
- (e) Other authorized water heaters.

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

Construction of hot water supply installations in accordance with this Standard is deemed to satisfy the requirements of AS 3500.4.1 and Clause G12, Water Supplies of the New Zealand Building Code.

1.2 REFERENCED DOCUMENTS The documents referred to in this Standard are listed in Appendix A.

1.3 DEFINITIONS For the purpose of this Standard the definitions given in AS/NZS 3500.0 and those below apply.

1.3.1 Acceptable solution—deemed to satisfy.

1.3.2 Deemed to satisfy—where a provision states that the use of a particular material, component, method of construction or design satisfies a performance requirement of this Standard. An equivalent material, component, method or design may be used if it meets the level of performance prescribed by the provisions concerned.

1.3.3 Container—the vessel, including fittings, in which the heated water is stored; sometimes referred to as a storage container, cylinder or tank.

1.4 WATER QUALITY Water quality can have a significant effect on the performance and life of water heaters. Information on water quality may usually be obtained from the local water supply utility. Where water heaters are deemed unsuitable for connection to a town water supply, advice shall be sought from the manufacturer who may request a water sample for analysis (See Appendix B.)

1.5 EQUIVALENT PIPE SIZES Where the nominal size of a pipe or fitting is specified in this Standard, an equivalent pipe size, appropriate to the material being used, shall be selected from Table 1.1.

1.6 WATER TEMPERATURE

1.6.1 Storage temperature Hot water shall be stored at a minimum of 60°C so as to inhibit the growth of legionella bacteria.

1.6.2 Sanitary fixtures delivery temperature All new hot water installations shall, at the outlet of all sanitary fixtures used primarily for personal hygiene purposes deliver hot water not exceeding—

- (a) 45°C for early childhood centres, primary and secondary schools and nursing homes or similar facilities for young, aged, sick or disabled persons; and
- (b) 50°C in all other buildings.

NOTE: Compliance with these temperature limits is optional for kitchen sinks and laundry tubs.

TABLE 1.1
EQUIVALENT PIPE SIZES GUIDE

Specified nominal size	Acceptable equivalent size						
	Copper		Stainless steel	PE-X Nominal	PB Nominal	PP-R Nominal	CPVC (for New Zealand only)
	AS 1432 DN	NZS 3501 NB					
DN			DN	D_e^*	D_e^*	D_e^*	D_e^*
10	10	10	10	12	15†	12	10
15	15	15	15	16	18	16	15
18	18	—	18	20	20	20	20
20	20	20	20	25	22	25	20
25	25	25	25	32	28	32	25
32	32	32	32	40	40	40	32
40	40	40	40	50	50	50	50
50	50	50	50	63	63	63	—

* Notation D_e —nominal size in plastic pipe Standards.

† No size smaller than 15 in AS/NZS 2642.2.

NOTE: Alternative sizes can be used providing they meet the performance requirements of this Standard.

SECTION 2 MATERIALS AND PRODUCTS

2.1 SCOPE OF SECTION This Section specifies material and product requirements. Alternative materials or methods may be used if proven to be equal to or better than those specifically referred to herein.

2.2 AUTHORIZATION Materials and products used in the installation shall comply with the relevant statutory requirements for authorization, if any, and with this Standard.

NOTE: In Australia refer to SAA MP52 whereas in New Zealand there is no mandatory system for authorization of products.

2.3 LIMITS ON USE OF PIPES AND FITTINGS

2.3.1 Copper pipes The following limitations shall apply to the use of copper pipes (see AS 1432 or NZS 3501):

- (a) AS 1432 Type D shall only be used in the as-drawn condition except that local annealing, incidental to the making of joints, is permitted.
- (b) AS 1432 Type D shall not be bent or used to form compression joints.
- (c) Bends shall be of uniform radii and free from wrinkling and flattening.
- (d) Where installed below ground in corrosive situations, pipes shall be protected in accordance with Clause 3.9.
- (e) In concealed locations, the provisions of Clause 3.5 shall be observed.

2.3.2 Copper alloy pipes The following limitations shall apply to the use of copper alloy pipes:

- (a) Pipes shall not be bent or used to form compression joints;
- (b) Pipes shall be protected in accordance with Clause 3.9 where installed below ground in corrosive situations; and
- (c) In concealed locations the provisions of Clause 3.5 shall be observed.

2.3.3 Copper alloy fittings All copper alloy fittings shall be dezincification-resistant (DR).

2.3.4 Galvanized steel Galvanized steel pipes and fittings shall not be used in hot water reticulation.

2.3.5 Polybutylene (PB) The following limitations shall apply to the use of polybutylene pipes and fittings:

- (a) Pipes and fittings shall not be less than Class 16.
- (b) Pipes and fittings shall not be used between the isolation valve and the inlet to a water heater or within 1 m of the outlet of a water heater.
- (c) In concealed locations, the provisions of Clause 3.5 shall be observed.
- (d) Pipes and fittings shall not be used where subject to direct sunlight.
- (e) Pipes and fittings shall not be used in areas subject to contamination by petroleum products.
- (f) Pipes and fittings shall not be used in continuously circulating hot water loops operating above 60°C or for branch lines within 1 m of such loops.
- (g) Pipes and fittings shall not be used for temperature pressure relief valve drain lines.
- (h) Pipes and fittings shall not be used downstream of an instantaneous water heater without a protective device to control maximum hot water temperature.

NOTE: Classes and temperature ratings for different working pressures are given in AS/NZS 2642.2.

2.3.6 Polyethylene (PE) Polyethylene pipes and fittings shall not be used in hot water reticulation or between the isolation valve and the inlet to a water heater.

2.3.7 Cross-linked polyethylene (PE-X) The following limitations shall apply to the use of cross-linked polyethylene pipes and fittings:

- (a) Pipes and fittings shall not be less than PN 16.
- (b) Pipes and fittings shall not be used between the isolation valve and the inlet to a water heater or within 1 m of the outlet of a water heater.
- (c) In concealed locations, the provisions of Clause 3.5 shall be observed.
- (d) Pipes and fittings shall not be used where subject to direct sunlight.
- (e) Pipes and fittings shall not be used in areas subject to contamination by petroleum products.

NOTE: PN and temperature ratings for different working pressures are given in AS 2492.

2.3.8 Polypropylene (PP-R) The following limitations shall apply to the use of polypropylene pipes and fittings:

- (a) Pipes and fittings shall not be less than PN 16.
- (b) Pipes and fittings shall not be used between the isolation valve and the inlet to a water heater or within 1 m of the outlet of a water heater.
- (c) In concealed locations, the provisions of Clause 3.5 shall be observed.
- (d) Pipes and fittings shall not be used where subject to direct sunlight.
- (e) Pipes and fittings shall not be used in areas subject to contamination by petroleum products.
- (f) Pipes and fittings shall not be used where water temperatures may exceed 70°C.

NOTE: PN and temperature ratings for different working pressures are given in DIN 8077 and DIN 8078.

2.3.9 Chlorinated polyvinyl chloride (CPVC) The following limitations shall apply to the use of chlorinated polyvinyl chloride:

- (a) Pipes and fittings shall not be less than PN 16 for pipes and PN 18 for moulded fittings.
- (b) Pipes and fittings shall not be used in areas subject to contamination by petroleum products.
- (c) Pipes and fittings shall not be used beyond the inlet stop valve and within 1 m of the outlet of the water heater.
- (d) In concealed locations the provisions of Clause 3.5 shall be observed.
- (e) Pipes and fittings shall not be used where subject to direct sunlight.

NOTE: For information on CPVC see ASTM 2846 (CPVC applies to New Zealand only).

2.3.10 Stainless steel The following limitations shall apply to the use of stainless steel pipe and fittings:

- (a) Fittings shall be either copper alloy compression type and be dezincification resistant (DR) or:
Stainless steel compression or capillary type manufactured from alloy 304 or 316 complying with AS 1449.
- (b) All bends shall be of uniform radii and free from wrinkling and flattening.
- (c) Bends in sizes up to and including DN 20 shall be made using bending machines or tools and have a minimum radii of five times the nominal size of the pipe.
- (d) Bends in sizes above DN 20 shall only be made with machines incorporating internal plug support.

- (e) In concealed locations, the provisions of Clause 3.5 shall be observed.
- (f) Where installed below ground in corrosive areas, the pipes shall be protected in accordance with Clauses 3.9.

2.4 CISTERN (COLD WATER STORAGE TANK) MATERIALS

2.4.1 Copper Copper sheet shall be alloy C12200 complying with AS 1566.

2.4.2 Galvanized steel Galvanized steel sheet shall comply with AS 1397, and have a minimum nominal coating mass of 550 g/m².

2.4.3 Stainless steel Stainless steel sheet shall be manufactured from alloy 316 complying with AS 1449.

2.4.4 Other materials Other materials authorized by the relevant statutory authority may be used.

2.5 SAFE TRAY AND SAFE WASTE MATERIALS

2.5.1 Safe tray Safe trays shall be fabricated from materials not inferior, under the conditions of use, to 0.60 mm thick galvanized steel sheet complying with AS 1397 and having a minimum nominal coating mass of 275 g/m².

2.5.2 Safe wastes Safe waste pipes from safe trays shall be fabricated from material complying with the following:

- (a) AS/NZS 1260 or NZS 7641, NZS 7642 and NZS 7649 for UPVC.
- (b) AS 1074 or NZS/BS 3601 for galvanized steel pipe.
- (c) AS 1432, NZS 3501 for seamless copper pipe (min. 0.9 mm thickness).
- (d) AS 1397 for sheet steel (min. 0.6 mm thickness).

2.6 JOINTING

2.6.1 Elastomeric rings Elastomeric rings shall be of dimensions, composition and hardness appropriate to the materials being joined and for the particular application.

2.6.2 Elastomeric gaskets Elastomeric gasket materials shall comply with AS 1646 or NZS/BS 2494 as appropriate.

Where a gasket is normally provided in the line or in a fitting, it shall not be replaced with mastic or sealant compounds.

2.6.3 Silver brazing alloy

2.6.3.1 Copper and copper alloys Silver brazing alloys for capillary jointing of copper and copper alloy pipes and fittings shall comply with AS 1167.1 and contain a minimum of 1.8% silver and a maximum of 0.05% cadmium.

2.6.3.2 Stainless steels Silver brazing alloys for capillary jointing of stainless steel pipes and fittings shall comply with Table 1 of AS 1167.1—1993 and contain a minimum of 38% silver and a maximum of 0.05% cadmium.

2.6.4 Soft solders The following limitations shall apply to the use of soft solder which shall—

- (a) not contain more than 0.1% lead by weight;
- (b) only be used for jointing copper or copper alloy pipes to capillary fittings of the long engagement type complying with AS 3688; and
- (c) not to be used with coiled annealed pipes.

NOTE: The chemical composition of water in some areas may preclude the use of soft solder joints.

2.6.5 Filler rods for stainless steel joints Joints in stainless steel pipework larger than DN 25 shall be made using filler rods of low carbon stainless steel not greater than 2 mm in diameter and complying with AS 1167.2.

2.7 BEDDING AND BACKFILL The water services shall be surrounded with not less than 75 mm of compacted sand, or fine-grained soil, with no hard-edged object permitted to come in contact with or rest against any pipe or fitting.

Any backfill within 300 mm of the top of the pipe shall be free from builder's waste, bricks, concrete pieces, rocks or similar material which would be retained on a 75 mm sieve.

Unless specified to the contrary, copper and stainless steel pipelines may be installed in soil excavated from the trench in which it is to be installed, providing the soil is compatible with copper and stainless steel and free from rock and rubble.

2.8 MISCELLANEOUS MATERIALS

2.8.1 Timber Timber exposed to the weather shall be of durability Class 2 complying with AS 2878, NZS 3631 or shall be adequately treated in accordance with AS 1604 or NZS 3640.

2.8.2 Thermal insulation Thermal insulation for the protection of pipework against freezing shall comply with BS 5422.

NOTE: In selecting insulating materials, consideration should be given to maintaining the fire-resistance level of any affected building components and to potential smoke and fume release.

2.8.3 External protective coatings External coatings used for the protection against corrosion of pipelines buried in corrosive areas shall—

- (a) be impervious to the passage of moisture;
- (b) be resistant to the external corrosive environment;
- (c) be resistant to abrasion by the surrounding fill; and
- (d) not contain any material which could cause corrosion to the underlying pipes or fittings.

NOTE: Polyethylene sleeving used to protect underground pipelines may require additional protection if installed in rock or stony ground.

SECTION 3 INSTALLATION OF COLD AND HOT WATER PIPING AND CONTROLS

3.1 SCOPE OF SECTION This Section sets out the requirements for the installation of pipes, fittings, cisterns and apparatus used to supply water to and from a water heater.

3.2 SAFETY PRECAUTIONS

3.2.1 Electrical earthing Before any existing metallic water service pipe, which forms part of an earth electrode for an electrical installation, is cut or uncoupled, the following precautions shall be taken to reduce the risk of electrical shock:

- (a) The main switch or switches on the premises shall be switched off and a tag reading 'DANGER DO NOT SWITCH ON' attached over the switch.
- (b) A bridging conductor, fitted with suitable clamps and having a current rating of not less than 70 A, shall be connected across the intended gap.
- (c) The pipe shall be cleaned to bare metal where the clamps are to be connected.
- (d) The electrical bridge shall not be broken or removed until all work on the water service is completed and continuity of the metallic service pipe is restored.
- (e) Where any existing metallic service pipe is to be replaced in part or in its entirety by plastic pipe or other non-metallic fittings or couplings, the work shall not commence until the earthing requirements have been checked by an electrical contractor and modified, if necessary.

3.2.2 Proximity to electrical cables and gaspipes Water services shall be installed so that—

- (a) no potential safety hazard is created when in close proximity to other services; and
- (b) access for maintenance and potential branch insertions is not impaired by the other services.

NOTE: The proximity to other services will vary, depending on the type and size of the services affected.

3.3 METHODS OF JOINTING

3.3.1 General Jointing of water services shall be in accordance with the following:

- (a) Burrs formed in cutting any pipe shall be removed.
- (b) Where heat is used in joining taps or valves to pipes, only valves specifically designed for capillary joints and of a size not larger than DN 50 shall be used. To prevent damage, the top assembly and jumper valve shall be removed from the body of taps and valves before silver-brazing.
- (c) Where straight sections of pipes of different diameter are to be joined, such increase or reduction in size shall be made by a fitting.
- (d) Sockets and tees shall be fabricated from AS 1432 Type A, B or C or NZS 3501 copper, copper alloy or stainless steel pipe using tools designed for such purposes; they shall then be silver-brazed.

3.3.2 Prohibited methods The following methods of jointing shall be prohibited:

- (a) Crimping to reduce a larger diameter pipe when joining to a smaller diameter pipe.
- (b) Use of a filler rod to fill the annular space when joining copper, copper alloy or stainless steel pipes of different sizes.

3.3.3 Threading Threads shall comply with the relevant Standard for the materials to be joined and be sealed with an appropriate jointing medium.

3.3.4 Compression-type fittings Compression-type fittings shall comply as follows:

- (a) Where Type 2 fittings are used, the pipe shall be flared or croxed to join copper or stainless steel.
- (b) Plastic nuts shall not be used to connect any pipe to a cistern that supplies water to a water heater.

3.3.5 Flanged joints Flanged joints shall be appropriate for the test pressure requirements described in Section 8 and shall comply with—

- (a) AS/NZS 1477 or NZS 7648 for UPVC;
- (b) AS/NZS 2280 and AS/NZS 4331 for ductile iron and grey cast iron; or
- (c) AS 2129 or AS/NZS 4331.

Flanges shall be attached to the pipe ends by means of—

- (i) threads for galvanized steel pipe and fittings;
- (ii) silver brazing in accordance with Clause 2.6.3 or bolting for flanges of copper alloy to copper or copper alloy pipes or fittings;
- (iii) solvent cement for UPVC pipes and fittings; or
- (iv) set screws for cast iron pipes and fittings.

Flange joints below ground shall be protected against corrosion as detailed in Clause 3.9.

3.3.6 Jointing of stainless steel pipe and fittings

3.3.6.1 Jointing of pipework, up to and including DN 25 Joints not larger than DN 25 shall be made by using mechanically jointed compression fittings Type 1 or 2 complying with AS 3688 or using silver brazed stainless steel capillary joints. Silver brazing alloys shall comply with Clause 2.6.3.2.

3.3.6.2 Jointing of pipework larger than DN 25 Joints in stainless steel piping larger than DN 25 shall be in accordance with one of the following:

- (a) To be butt welded using a tungsten inert gas (TIG) argon arc method and—
 - (i) have a gap not greater than 0.5 mm between the abutting pipe ends to be joined;
 - (ii) have inserted a back-up ring 6 mm long, made from the parent pipe, to straddle the joint of pipes with a wall thickness less than 1.2 mm;
 - (iii) use a low carbon stainless steel type filler rod not greater than 2 mm in diameter; and
 - (iv) be tack welded in not less than four spots around the circumference, prior to welding the entire joint.
- (b) Have flanged joints, fabricated by rolling or welding to the pipe, a stub flange of the same wall thickness as the pipe, having a diameter conforming to dimension 'F' in AS 2129 or AS/NZS 4331. A mild steel back-up flange complying with AS 2129 or AS/NZS 4331 shall be fitted and a gasket not less than 3 mm thick, shall be inserted.

NOTE: Jointing should be carried out by suitably trained persons.

3.3.7 Alternative jointing Alternative methods such as non-metallic friction lock, crimp, fusion welded joints or other methods suitable to the product may be used. Manufacturer's installation instructions shall be adhered to where applicable.

3.4 SUPPORT AND FIXING ABOVE GROUND

3.4.1 General Water services installed above ground shall be retained in position, by brackets, clips or hangers.

3.4.2 Brackets, clips and hangers Brackets, clips and hangers shall be—

- (a) formed from a suitable material;
- (b) securely attached to the building structure;
- (c) designed to withstand the applied loads;
- (d) protected against corrosion, where exposed to a corrosive environment;
- (e) of like material or lined with a non-abrasive, inert material for that section where contact with the piping may occur;
- (f) clamped securely to prevent movement, unless designed to allow for thermal movement;
- (g) restrained to prevent lateral movement; and
- (h) installed so that no movement can occur while a valve is being operated and that the weight of the valve is not transferred to the pipe.

3.4.3 Prohibited supports The following methods of support shall be prohibited:

- (a) Pipes shall not be supported by brazing or welding short sections of any material to the pipe surface, nor by clamping, brazing or welding to adjacent pipes.
- (b) Brackets, clips and hangers incorporating PVC shall not be used in contact with stainless steel pipes.

3.4.4 Spacing Water services shall be supported and fixed at intervals, in accordance with Table 3.1.

3.4.5 Securing of pipes and fittings Any pipe or fitting which may be subjected to strain or torsion shall be positively fastened against twisting or any other movement.

For hot water piping, the fixing shall be in such a manner as to permit movement due to thermal expansion and not to cause damage or corrosion to the pipe (see Clause 3.4.3(b)).

3.5 LOCATION OF PIPING

3.5.1 Walls Water services located in timber or metal-framed walls of brick or veneer construction shall be installed in accordance with the following:

- (a) The pipe material shall be copper complying with NZS 3501 or not less than AS 1432 Type C, copper alloy, stainless steel, polybutylene, polypropylene, chlorinated polyvinyl chloride or cross-linked polyethylene.
- (b) Holes drilled in studs or plates shall be accurately sized so as to firmly fix in position fully lagged pipes. Where unlagged pipes are used, a collar of lagging material or a neutral cure silicone sealant shall be used to fill the annular space.

NOTES:

- 1 The cavity wall gap should not be reduced with installation of piping runs.
- 2 Relevant building codes and regulations specify maximum diameters and frequency limits for any holes drilled in timber or steel framing members.

TABLE 3.1
SPACING OF BRACKETS AND CLIPS

Nominal pipe size DN	Maximum spacing of brackets and clips, m		
	Copper, copper alloy and stainless steel pipes	PE-X, PB, cPVC and PP-R pipes	
		Horizontal or graded pipes	Vertical pipes
10	1.50	0.50	1.00
15	1.50	0.60	1.20
16	—	0.60	1.20
18	1.50	0.60	1.20
20	1.50	0.70	1.40
22	—	0.70	1.40
25	2.00	0.75	1.50
32	2.50	0.85	1.70
40	2.50	0.90	1.80
50	3.00	1.05	2.10
63	—	1.10	2.20
65	3.00	1.20	2.40
75	—	1.30	2.60
80	4.00	1.35	2.70
90	4.00	1.40	2.80
100	4.00	1.50	3.00
110	—	1.50	3.00
125	4.00	1.70	3.40
140	—	1.70	3.40
150	4.00	2.00	4.00
160	—	2.00	4.00

NOTES:

- 1 Due to water pressure effects, additional brackets, clips or hangers (complying with Clause 3.4.2) may be required to prevent movement.
- 2 Where plastic pipes are supported by building structures, clips and brackets may be placed at larger intervals than above. Pipes in parallel pipe systems may be bundled together using non-metallic ties.

3.5.2 Chases, ducts or conduits Service pipes located in chases, ducts or conduits within walls or floors of masonry or concrete construction shall be installed in accordance with the following:

- (a) Material shall be copper complying with NZS 3501 or not less than AS 1432 Type C, copper alloy, stainless steel, polypropylene, polybutylene, chlorinated polyvinyl chloride or cross-linked polyethylene.
- (b) Pipes in chases shall be continuously wrapped with an impermeable, flexible material.

NOTE: Continuous wrapping may depend on type of material and its application.

- (c) Ducts shall be fitted with removable covers.
- (d) Conduits embedded in walls or floors shall comply with the requirements of the appropriate building authority.
- (e) Due allowance shall be made for expansion and contraction in accordance with Clause 3.14.3.
- (f) Service pipes shall not be embedded or cast into concrete structures.

3.5.3 Under concrete slabs Water service pipes located beneath concrete slabs on ground level shall comply with the following:

- (a) Material shall be copper complying with NZS 3501 or not less than AS 1432 Type B, copper alloy, stainless steel, polypropylene, polybutylene, chlorinated polyvinyl chloride or cross-linked polyethylene.
- A1 | (b) Pipes shall be insulated in accordance with Clause 6A.2. laid in a narrow trench on a bed of sand or fine-grained soil, placed and compacted in a manner which will not damage the piping. There shall be a minimum distance of 75 mm between the pipe and the underside of the slab.
- (c) The pipe ends shall be crimped or capped prior to pouring of the concrete and measures shall be taken to protect the exposed pipe from damage.
- (d) Any piping that penetrates the slab shall be at right angles to the surface of the slab and shall be lagged with an impermeable, flexible plastic material of not less than 6 mm thickness for the full depth of the slab penetration.
- (e) Soft-soldered joints shall not be permitted.
- (f) The number of joints shall be kept to a minimum.

3.5.4 Protection during building construction Care shall be taken to ensure that the pipes are not damaged during normal building activities. Concealed pipework shall be maintained under normal water pressure while subsequent building operations are being carried out which could cause damage to the pipes. The service shall be flushed with clean water at regular intervals until the building is occupied.

3.5.5 Floor or roof penetrations Any suspended floor or roof penetration shall be rendered waterproof in such a manner as to allow for expansion.

- A1 | **3.5.6 Protection of buried piping** Hot water piping buried in the ground shall be insulated by means of an inert waterproof material. Where insulation is cut for joining purposes, the joint shall be wrapped with a durable inert waterproof tape. All absorptive insulation material shall be effectively protected against moisture penetration by an outer cover of polyethylene sheeting or similar waterproof material spiral-wrapped to give a double thickness along the length of the insulated pipe.

- A1 | **3.5.7 Protection of encased piping** All hot water piping, including relief drain pipes, encased in plaster, mortar or similar material, shall be wrapped to permit movement due to expansion and contraction.

3.6 PIPES IN WATER-CHARGED OR FILLED GROUND Water services using pipes of DN 50 or larger shall not be laid in water charged or filled ground unless supports have been designed by a qualified engineer.

3.7 CROSS-CONNECTION CONTROL AND BACKFLOW PREVENTION Cross-connection controls and backflow prevention devices shall be installed in accordance with AS/NZS 3500.1.2.

3.8 CONTAMINATED AREAS

3.8.1 General Any area that may be contaminated by bacterial or chemical pollution shall be deemed to be a contaminated area. These areas shall include ashpits, tanks, ponds, manure bins, waste disposal depots, and wastewater treatment works.

3.8.2 Installation The installation of any water service in or through a contaminated area shall not be permitted unless the water service—

- (a) is laid through a watertight, corrosion resistant conduit of sufficient length and strength to afford adequate protection to the water service; or
- (b) is fixed not less than 600 mm above the surface of the ground likely to be contaminated.

3.9 CORROSIVE AREAS Where a metallic water service is installed in a corrosive area, it shall be externally protected by—

- (a) having an impermeable flexible plastic coating;
- (b) placing in a sealed polyethylene sleeve; or
- (c) continuously wrapping in a petrolatum taping material.

NOTE: Corrosive areas are those which contain substances such as any compound consisting of magnesium oxychloride (magnesite) or its equivalent, coal wash, sodium chloride (salt), ammonia or materials that may produce ammonia.

3.10 DEPTH OF COVER IN PUBLIC AREAS Where water services are installed below ground in public areas, the minimum cover shall comply with Table 3.2.

Where it is advised that the finished road level is to be lowered by the local authority responsible for roadways, the cover over any water service shall be as shown in Table 3.2 measured from the proposed finished road surface levels.

TABLE 3.2
MINIMUM COVER IN PUBLIC AREAS

Location	Minimum cover measure below ground surface level, mm
Unpaved	450
Paved or road surface	450
Solid rock	300

3.11 DEPTH OF COVER IN PRIVATE AREAS Where water services are installed below ground in private property, the minimum cover shall comply with Table 3.3.

TABLE 3.3
MINIMUM COVER IN PRIVATE PROPERTY

Location	Minimum cover measured below ground surface level, mm
Subject to vehicular traffic	300
Under houses or concrete slabs	75
All other locations	225

NOTE: Water services with flexible joints laid below ground in sandy conditions, may require a minimum cover of 600 mm.

3.12 PROTECTION AGAINST FREEZING

3.12.1 Requirement for protection In areas where the ambient temperature frequently falls below 0°C, care shall be taken to avoid the likelihood of the water service being damaged by water freezing within the pipes.

3.12.2 Piping located outside buildings All pipes and fittings shall be buried to a minimum depth of 300 mm. Where this cannot be achieved, the piping shall be covered with a waterproof insulation or provided with trace heating.

NOTE: Trace heating methods include thermostatically controlled electric resistance heating, self-limiting electric tape heating and hot water or steam heating.

3.12.3 Pipes located on metal roofs Pipes shall not be installed in direct contact with metal roofs. Where it is necessary to run piping across a metal roof, it shall be raised above the roof and surrounded with a waterproof insulation of minimum thickness given in Table 3.5.

3.12.4 Pipes located inside buildings

3.12.4.1 General Wherever possible, the pipes should be installed so as to avoid those areas of the building which are difficult to keep warm and where temperatures are likely to fall below freezing. These areas include—

- (a) unheated roof spaces;
- (b) unheated cellars;
- (c) locations near windows, ventilators or external doors where cold drafts are likely to occur; and
- (d) locations in contact with cold surfaces, such as metal roofs, metal framework, or external metal cladding materials.

3.12.4.2 Pipes in unheated roof spaces Pipes in unheated roof spaces shall be located not less than 100 mm from the roof covering and external walls. Where practicable, pipes shall be located under any insulating material laid for restricting heat losses through the ceilings.

3.12.4.3 Pipes adjacent to external walls Pipes in external walls shall be positioned not less than 20 mm away from the external surface and, where practicable, located on the heated side of any wall insulation present.

3.12.5 Insulation of piping Where it is necessary to install piping in areas where temperatures are likely to fall below freezing, see Clause 3.12.4.1, the pipes and fittings shall be surrounded by an appropriate thickness of insulation. Suggested minimum thicknesses for insulations of various thermal conductivity ranges are given in Tables 3.4 and 3.5.

NOTES:

- 1 If conditions are particularly severe over an extended time, additional thicknesses of insulation may be necessary to prevent water freezing.
- 2 In situations where the building, or part of the building, is not in use over the winter months, and no heating of the inside areas is maintained, it may be necessary to drain the pipes to prevent damage by freezing of the water. For effective drainage to occur, it is essential for air to freely enter the pipes, and for all draw-off taps and float valves to be left open when draining is being carried out.

TABLE 3.4
TYPICAL EXAMPLES OF INSULATING MATERIALS

Example of material	Thermal conductivity W/m.K
Rockwool or fibreglass section pipe insulation (prefabricated sections)	0.032
Rockwool or fibreglass loose fill or blanket material	0.032–0.045
Flexible polyethylene foam pipe	0.034–0.040
Foamed nitrile rubber	0.040
Loose vermiculite (exfoliated)	0.06–0.07
Preinsulated copper pipe	0.070–0.075

TABLE 3.5
MINIMUM THICKNESSES FOR THERMAL INSULATION
TO PREVENT FREEZING OF WATER IN PIPES

Pipe size DN	Minimum thickness required, mm				
	Thermal conductivity of insulating material, W/m.K				
	0.03	0.04	0.05	0.06	0.07
15	9	14	20	29	40
18	6	9	12	15	20
20	4	6	8	10	12
25	3	4	5	6	8
32	2	3	4	5	6

NOTE: The insulation thicknesses were calculated using the equations given in BS 5422 to just prevent freezing of water initially at 15°C if exposed to an ambient temperature of -5°C for a period of 8 h.

3.13 COLD WATER PIPING AND CISTERNS

3.13.1 General The following requirements apply to the cold water piping to water heaters and cisterns, and to cold water cistern piping:

- (a) *Cold water supply pipe* The cold water supply pipe shall be of the same nominal size as the inlet to the isolating valve.
- (b) *Cistern connections* Unions or similar couplings shall be used for the connections to the inlet and outlet of a separately mounted cistern.
- (c) *Cold water cistern piping* Any cold water feed piping between a cistern which is not an integral part of a water heater and the water heater shall—
 - (i) have a nominal size not less than DN 25 for a displacement water heater, and larger than the nominal size of the heater outlet;
 - (ii) be fitted with a gate valve or other full-way valve of the same nominal size as the piping, if the cistern has a capacity exceeding 50 L; and
 - (iii) be connected to the water heater inlet by unions or similar couplings to facilitate disconnection.

3.13.2 Cold water cisterns (See Figures 4.1 and 4.2)

3.13.2.1 General Cold water cisterns installed to supply water to a water heater shall meet the following requirements:

- (a) They shall be constructed of a material complying with Clause 2.4 and having equivalent strength and durability to copper sheet of 0.55 mm thickness.
- (b) For metal cisterns, they shall be—
 - (i) reinforced along the upper edges to prevent distortion of the tank;
 - (ii) welded, brazed or soft-soldered at all joints;
 - (iii) independent of the solder for mechanical strength of soldered joints; and
 - (iv) have joints of a type suitable for the water conditions for which the cistern is intended.

- (c) They shall have an outlet of brass or other suitable material threaded to series RP in accordance with AS 1722.1 or NZS/BS 21. The outlet shall be—
 - (i) placed as far as practicable from the float valve outlet;
 - (ii) fixed so as to provide a distance of not less than 25 mm between the floor of the tank and the invert of outlet; and
 - (iii) secured into the tank by a method appropriate to the materials to ensure a permanent watertight and mechanically strong connection but which shall not rely on soft solder alone for this purpose.
- (d) They shall be fitted with a float valve complying with AS 1910;
- (e) They shall incorporate an air gap in accordance with AS/NZS 3500.1.2;
- (f) They shall be clearly and indelibly marked with the static level at which the water is to be set.
- (g) They shall be fitted with a close-fitting cover which, in the case of external tanks, shall be adequately secured and of material having corrosion-resisting properties not inferior to 0.5 mm thick galvanized steel sheet complying with AS 1397.

3.13.2.2 Cistern capacity Where a displacement water heater or container is supplied from a remote cistern, the cistern shall have an effective capacity between the outlet and the marked water level not less than the following:

- (a) *Household installations*—
 - (i) 36 L for water heaters or containers up to and including 400 L capacity; and
 - (ii) 68 L for water heaters or containers greater than 400 L up to and including 700 L capacity.
- (b) *Commercial and industrial installations*—a capacity which shall ensure effective operation of the hot water system under the peak loading conditions that are likely to occur.

NOTES:

- 1 Where the hot water draw-offs are less than those in household premises, a cistern of the capacity specified in Item (a) should suffice.
- 2 Where large hot water draw-offs are made over a short period, a capacity substantially greater than that specified in Item (a) will be needed.
- 3 Allowance for extra capacity should be made where the cistern is required to supply water additional to the supply to the water heater.
- 4 In New Zealand allowance must be made for seismic restraint (see NZBC Clause G12 Water Supplies).

3.13.2.3 Flow capacity The capacity of the float valve and all pressure piping to the float valve and connecting pipes from the cold water tank to the water heater or container shall be capable of maintaining a water flow rate of not less than—

- (a) 0.21 L/s (12.5 L/min) for water heaters or containers with volumetric storage capacity up to 400 L; or
- (b) 0.27 L/s (16 L/min) for water heaters or containers with volumetric storage capacity greater than 400 L up to and including 700 L.

This flow rate shall be maintained during the drawing off of the capacity of the water heater or container without the water level of the cold water feed tank falling to a point which allows air to enter either the water heater or container or the hot water system supply piping.

3.13.2.4 Cistern overflow Every cold water cistern shall be fitted with an overflow complying with the following requirements:

- (a) The overflow from the cold water cistern shall be so placed that, with the water in the cistern at the marked level so that either—
 - (i) a further quantity of water, not less than 3% of the hot water capacity of the heater, can be added before overflow occurs; or
 - (ii) there shall be no discharge from the overflow during the initial heating of the water through a 70°C temperature rise.
- (b) The overflow from an internally mounted cistern shall discharge into—
 - (i) the safe-tray of the cold water cistern, terminating not less than 20 mm above the top edge of the safe tray; or
 - (ii) into the waste from the safe tray at a point not less than 75 mm below the floor of the safe tray.
- (c) The overflow shall be so constructed that with the float valve discharging at its maximum flow, with water pressure of 700 kPa and with all service outlets closed, no spillage shall occur from the cold water cistern.
 The vertical distance between the static overflow level and the lowest outlet of the float valve shall be in accordance with AS/NZS 3500.1.2.
- (d) The overflow from an externally mounted cistern shall—
 - (i) discharge so as to be readily discernible and not cause a nuisance over windows, open doors or incur damage to buildings or injury to persons; and
 - (ii) be installed in a manner to prevent blockage due to freezing.

3.13.2.5 Position of cistern Cisterns shall be placed in accordance with the following:

- (a) *Mounted on water heater* Where the water heater is supplied complete with an attached cold water cistern, which is connected to the container, the cistern shall not be removed from that position except with the permission of the water heater manufacturer.
- (b) *Separately mounted* Every separately mounted cold water cistern shall be placed so that the vertical distance from the marked water level of the cistern to the base of the water heater or container does not exceed a height equivalent to the maximum pressure rating marked on the water heater or specified by the manufacturer.

NOTE: See also Clause 3.14.5(c).

3.13.3 Safe tray for cold water cistern Every cold water cistern fixed in a roof space or other concealed space shall be placed on a safe tray complying with Clause 4.4, except that, where the cistern is mounted on the water heater, a water heater safe tray complying with Clause 4.4 may be accepted as the safe tray for the cold water cistern.

NOTE: In New Zealand safe trays are only required where leakage could result in damage to another occupancy in the same building.

3.13.4 Support for separately mounted cisterns

3.13.4.1 Platform Every separately mounted cold water cistern shall be supported on a platform complying with Clause 4.5.

3.13.4.2 Spacing between cold water cistern and safe tray The cold water cistern shall be placed in the safe tray on supports in accordance with Clause 4.4.5.

3.14 INSTALLATION OF HOT WATER SUPPLY

3.14.1 Layout and size The layouts and sizes of hot water pipes in a non-circulatory hot water system shall be sufficient to give the required flow at all outlets (including branches from non-circulatory systems), and shall reduce to a minimum the amount of dead (cold) water drawn off before hot water commences to flow at any tap. The following requirements shall apply:

- (a) The main flow hot water pipes and branches to the hot water outlets shall be by the shortest practicable route.
- (b) The diameter of the hot water pipes shall be the minimum necessary to supply the outlet draw-off requirements. Water velocity shall not exceed 3 m/s.

NOTES:

- 1 For guidance, typical rates of flow are given in Appendix C and preferred sizes of pipes in Appendix D, to achieve the above requirements.
- 2 Where the distance between hot water outlets causes an excessive amount of dead water, the use of two or more heaters, trace heating of pipes or a pumped circulation should be considered.
- 3 Reference should be made to Clause 3.14.4 regarding requirements for gradients.

3.14.2 Identification In other than domestic or residential buildings, where water services are installed in ducts, accessible ceilings and exposed in basements or plant rooms, they shall be identified in accordance with AS 1345 or NZS 5807.

3.14.3 Provision for expansion

3.14.3.1 General Hot water supply pipes shall be installed with appropriate allowance for expansion and contraction as given in Table 3.6 and shall—

- (a) have sufficient free length of piping around the bend or along the branch to prevent oversteering the pipe and allow for thermal expansion;
- (b) have a clear space to permit movement; and
- (c) have expansion loops, or offsets located at or near midpoint in straight lengths that exceed 18 m, or have expansion joints fitted.

TABLE 3.6
CHANGE IN LENGTH OF COPPER PIPES DUE TO TEMPERATURE CHANGES

Pipe length m	Change in length, mm					
	Temperature change, °C					
	40	50	60	70	80	90
≤3	3	3	4	4	5	5
>3 ≤5	4	5	6	7	8	8
>5 ≤9	7	8	10	12	13	15
>9 ≤12	9	11	13	15	17	20
>12 ≤15	11	14	16	19	22	24
>15 ≤20	15	18	22	25	29	32
>20 ≤25	18	23	27	31	36	40

NOTE: This Table is based on the equation for copper pipes:

Change in length (mm) = pipe length (m) × temperature change (°C) × 0.0177.

3.14.3.2 Expansion of fixed offsets Where an offset is proposed, provision for thermal expansion shall be made in accordance with Table 3.7.

TABLE 3.7
ALLOWANCES FOR EXPANSION

Run length m	Minimum free length of offset mm	Minimum clearance to obstruction (for 60°C temp. rise) mm
≤4.5	600	5
>4.5 ≤9	900	10
>9 ≤18	1 200	20

3.14.3.3 U-bends, coiled loops, offsets and lyre bends Allowance for thermal expansion shall be incorporated in the design of relatively long pipe runs and fixing points by the installation of expansion loops or bends, where significantly large temperature differences occur. The required radii for such loops or bends shall be determined by reference to Figure 3.1.

3.14.3.4 Placement of bends and offsets Expansion loops and offsets shall be placed horizontally to avoid forming air locks at the top of the loops and to ensure proper circulation of the water.

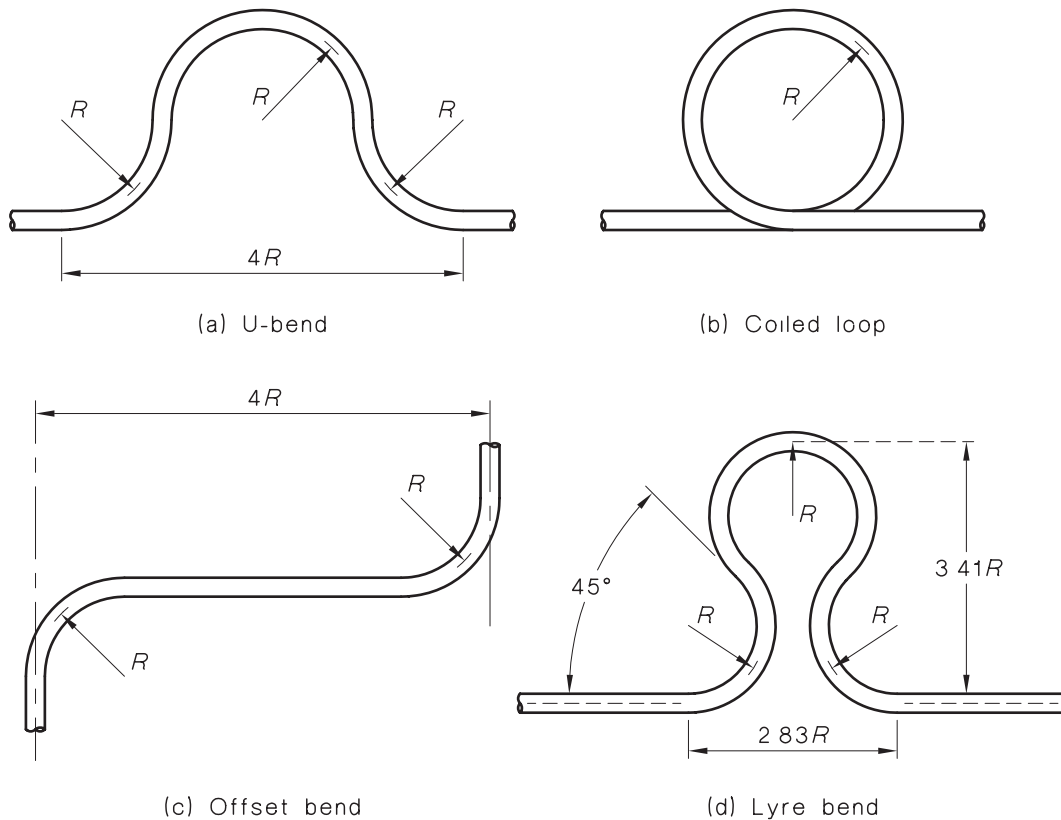
3.14.4 Gradient The grading of a hot water reticulation system shall comply with the following:

- (a) Mains pressure or pressure limiting, valve-controlled reticulation: rise or fall as required subject to the requirements of Clause 3.14.5.
- (b) Reducing valve-controlled reticulation: rise and fall as required subject to the provisions of Table 3.8.
- (c) Cistern-fed reticulation: rise or fall continuously in the direction of flow with a minimum grade of 1 in 200.

3.14.5 Maximum rise of hot water supply pipes The maximum rise of the hot water supply pipes shall be as follows:

- (a) *For mains pressure reticulation*—60% of the available mains pressure expressed in metres head above the level of the cold water inlet.
- (b) *For pressure limiting valve or pressure reducing valve controlled reticulation*—60% of the valve setting, expressed in metres head, above the level of the cold water inlet.
- (c) *For cistern-fed reticulation*—1 metre below the marked water level of the cistern.

NOTE: For the purpose of this Clause, the equation 10 kPa = 1 metre head should be used.



Expansion mm	Radii for expansion loops or bends (R), mm									
	DN 15	DN 20	DN 25	DN 40	DN 50	DN 65	DN 80	DN 90	DN 100	DN 125
10	180	210	250	320	350	400	430	470	510	560
15	220	270	290	370	410	440	500	540	600	650
20	250	300	380	430	510	560	620	670	710	790
25	300	350	400	500	550	630	680	730	810	910
30	320	370	430	530	610	660	740	780	840	950
40	340	430	490	620	720	770	870	920	1 000	1 130
50	400	480	550	680	780	880	1 000	1 050	1 150	1 300
60	450	530	630	760	880	960	1 060	1 160	1 260	1 350
70	460	560	660	790	910	1 020	1 130	1 220	1 320	1 450
80	510	610	710	860	990	1 120	1 220	1 320	1 410	1 530
90	610	640	740	920	1 020	1 150	1 250	1 350	1 430	1 550
100	680	760	840	990	1 120	1 190	1 340	1 420	1 470	1 570

NOTE: For pipe sizes DN 18 and DN 32, the next larger pipe size is used.

FIGURE 3.1 PROVISION FOR EXPANSION IN HOT WATER PIPING

TABLE 3.8
MAXIMUM RISE

Reducing valve setting kPa	Highest point of reticulation above reducing valve outlet m
25	1.5
30	1.75
35	2.0
40	2.5
45	2.75
50	3.0
70	4.5
100	6.5

3.14.6 Shower assemblies Where the hot water is at a lower pressure than the cold water, the hot and cold water mixing assembly shall be constructed so that the cold water flow does not seriously restrict the hot water flow.

3.14.7 Venting of secondary circuit Every low pressure fed secondary circuit shall be vented at the highest point of the rise on the secondary flow pipe by either—

- (a) a vertical vent pipe complying with Clause 4.13; or
- (b) an automatic air elimination device suitable for that purpose.

3.14.8 Terminal fittings A hot water tap, when installed in combination with a cold water tap, shall be the left hand or upper tap in new installations. (For New Zealand, other tap arrangements may be allowed.)

3.15 TEMPERATURE CONTROL DEVICES These devices shall be installed according to manufacturer's instructions and the relevant requirements of this Standard.

3.16 THERMOSTATIC MIXING VALVES Each thermostatic mixing valve shall be installed in accordance with the relevant requirements of this Standard and the following:

- (a) The manufacturer's installation instructions (see AS 4032).
- (b) Each thermostatic mixing valve shall have an isolating stop tap/valve, line strainer and cross-flow prevention device (non-return) valve fitted to the hot and cold water supply lines as shown in Figure 3.2.

These devices may be fitted separately from the thermostatic mixing valve or as an integral part of the valve.

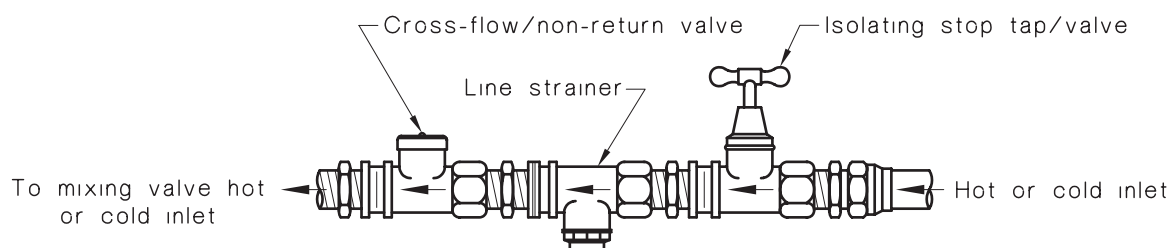


FIGURE 3.2 TYPICAL ISOLATING ASSEMBLY FOR WATER SUPPLIES TO THERMOSTATIC MIXING VALVE

- (c) Independent ancillary items, e.g. isolating assemblies, shall comply with the relevant Australian Standard. Integral stop tap/valves and cross flow valves shall comply with AS 4032.
- (d) There shall be no branch line off-take between a non-integral isolating valve and the inlet to the thermostatic mixing valve except in multiple installations (see Item (f)).
- (e) Thermostatic mixing valves are to be adequately supported independent of all piping.
- (f) Where multiple installations of thermostatic mixing valves are located in the same area, then a stop tap or valve, line strainer and non-return valve may control each of the hot and cold water supplies to more than one thermostatic mixing valve. However each of the individual thermostatic mixing valves shall be controlled by an isolating stop tap/valve and installed with a cross-flow non-return valve.
- (g) Each thermostatic mixing valve and each associated valve, pressure control or temperature control shall be readily accessible.
- (h) The nominal size of the connecting piping and associated valves shall be not less than the nominal size of the thermostatic mixing valve. For sizing of pipes, refer to AS/NZS 3500.1.2.
- (i) The flushing specified in Clause 8.2 shall be undertaken—
 - (i) prior to the installation of the thermostatic mixing valve(s); or
 - (ii) after the installation of the thermostatic mixing valve(s) provided each line-strainer integral and non-integral and each thermostatic element/sensor is removed and cleaned and replaced after the flushing operation is completed.

SECTION 4 INSTALLATION OF WATER HEATERS — GENERAL REQUIREMENTS

4.1 SCOPE OF SECTION This Section sets out the general requirements for the installation of water heaters, their location, support, cold water service valves, the vent or drain lines, and the first 2 m of hot water supply pipes.

A1 | For energy efficiency design and installation criteria, see Section 6A.

NOTE: For additional requirements for solar water heaters see Section 5.

4.2 WATER HEATERS

4.2.1 Water heaters Water heaters shall be installed in accordance with the manufacturer's instructions and comply with the requirements of AS 1056 or NZS 4602, NZS 4603, NZS 4606 and NZS 4607, AS 1361, AS 3142 or AS 3498, as appropriate. Oil-fired water heaters shall comply with AS 1690.

4.2.2 Selection of anode If required, reference shall be made to Appendix B for suitability. The manufacturer's advice shall be sought in all cases where the water quality or the fitted anode fails to conform to Appendix B.

4.2.3 Working pressure Water heaters shall be installed so that the maximum rated working pressure is not exceeded during normal operation. Reference shall be made to the heater label for the relevant information.

4.2.4 Auxiliary controls Auxiliary controls shall be mounted in accordance with the manufacturer's instructions and adjusted, as required.

4.3 LOCATION

4.3.1 Placement The water heater shall be placed as close as practicable to the most frequently used outlet point or points. Consideration shall be given to the route taken by vent pipes, drain lines or safe wastes.

4.3.2 Accessibility and clearances Water heaters shall be located and oriented in accordance with the following:

- (a) The rating plate and instruction notice shall be in a position where they are readily visible.
- (b) Unobstructed access shall be available to the burner, heating units, controls, cisterns and other apparatus requiring maintenance.
- (c) All valves and the easing gear on a relief valve shall be readily accessible.
- (d) There shall be 150 mm minimum clearance from the end of the easing gear of temperature/pressure relief valves to allow for valve removal.
- (e) The heater can be subsequently removed without major structural alteration to the building or major alteration to the piping.

NOTES:

- 1 Wherever possible, clearance should be allowed for removal and replacement of anodes, where fitted.
- 2 For cistern fed water heaters, see also Clause 3.14.5.

4.3.3 Ventilation and fluing Fuel-burning water heaters shall be located so that the correct ventilation and fluing can be provided in accordance with the manufacturer's instructions and relevant codes and Standards.

4.4 PROTECTION AGAINST DAMAGE FROM LEAKING WATER

4.4.1 Concealed water containers All water containers, cisterns, cistern-fed water heaters, storage water heaters and such that are installed in roof spaces, in cupboards or

otherwise concealed, shall be placed on safe trays complying with Clause 4.4.3, which are drained by safe wastes complying with Clause 4.4.4.

NOTES:

- 1 Where concealment is by hinged or sliding doors, the provisions of Clause 4.4.2 apply.
- 2 In New Zealand safe trays are only required where leakage could result in damage to another occupancy in the same building.

4.4.2 Unconcealed storage water containers Unconcealed water storage containers installed inside buildings on or above a floor surface which is impervious to water and where any leakage is readily visible do not require safe trays. All other unconcealed water storage containers installed inside buildings require safe trays in accordance with Clause 4.4.3 and 4.4.4.

NOTES:

- 1 Free outlet-type storage water heaters, not exceeding 7 L capacity, and instantaneous water heaters do not require safe trays.
- 2 In New Zealand, safe trays are only required where leakage could result in damage to another occupancy in the same building.

4.4.3 Safe tray construction Safe trays shall be fabricated from materials in accordance with Clause 2.5.1 and have sides turned up not less than 50 mm, and all joints made watertight.

4.4.4 Safe wastes

4.4.4.1 Sizes of safe wastes The minimum sizes of safe waste pipes shall be—

- (a) DN 25 for safe trays in under-sink situations; or
- (b) DN 50 (DN 40 New Zealand only) for all other situations.

4.4.4.2 Safe waste construction Safe wastes shall be fabricated with all joints in sheet metal pipe lapped in the direction of the flow and all circumferential joints made watertight.

4.4.4.3 Safe waste installation Each safe waste shall have—

- (a) a continuous fall to its discharge point;
- (b) all seams in sheet metal pipe uppermost;
- (c) support in the vicinity of the tray and at intervals not greater than 1 m horizontally and 2.4 m vertically; and
- (d) the discharge position complying with the following:
 - (i) *Where discharging outside the building*—to a point within the property boundaries which is readily visible from within the property, clear of doors, windows and other openings and is unlikely to cause injury to people or damage to property.
 - (ii) *Where discharging inside the building*—to a readily visible position which is unlikely to cause injury to people or damage to property.
 - (iii) *Where cisterns or cistern-fed water heaters are outside the building*—to a readily visible position.

4.4.5 Placement of water heater or cistern on a safe tray The water heater or cistern shall be placed on the safe tray as shown in Figure 4.1 and shall—

- (a) have no portion of any attached feed tank closer than 75 mm to a vertical line from the edge of the safe tray and no portion of the heater or cistern or any attached auxiliary part closer than 25 mm to the vertical line; and
- (b) have placed between the tank and the safe tray, supports not less than 12 mm thick and of an area not less than $0.5A$, nor more than $0.6A$, where A is the area of the

base of the tank. The support shall project beyond the sides and walls of the tank but not closer than 20 mm to the sides of the safe tray.

4.5 SUPPORT

4.5.1 Support of water containers installed in a roof Storage water heaters and cisterns installed in a roof space as shown in Figure 4.2 shall be placed on a safe tray supported by a platform of hardwood or other suitable and not less durable material as set out in Figure 4.3 and the following requirements:

- (a) The safe tray shall drain to its safe waste.
- (b) The safe tray shall be placed so that the load of the water heater or cistern is supported by one or more load-bearing walls which are vertically continuous to a solid foundation, a concrete slab or similar support of comparable strength provided that—
 - (i) where the platform is placed over one wall only, it shall be placed centrally over the wall, and any ceiling joist which is subjected to additional stress shall cross the wall at right angles. The capacity of the water heater or cistern, or both, supported by the platform, shall not in this case exceed 450 L;
 - (ii) where the load is carried by beams or bearers spanning two walls, no ceiling joists shall carry any of the load, except where immediately over a wall; and
 - (iii) where the load is carried on load-bearing walls supported on piers, the water heater or cistern shall be placed centrally above a solid pier which supports the wall immediately under the water heater or cistern, or the load shall be transmitted to a designed floor beam or bearer supported by two piers not more than 2 m apart.

NOTE: These requirements do not preclude the load or part of the load from being carried on a beam or bearer which spans an opening in a wall. As such, the wall immediately above the opening is not subjected to additional stress and the load is distributed over at least 0.6 m of vertical continuous wall on either side of the opening.

4.5.2 Support of water containers installed above a roof Storage heater and cisterns installed above a roof shall be supported on a platform being not less durable than timber complying with Clause 2.8.1, and—

- (a) with a clearance between the lowest part of the platform and the roof of not less than 75 mm;
- (b) so that the load is distributed over two walls continuous to a solid foundation without any stress being placed on the roof structure;
- (c) with structural members which penetrate the roof flashed or rendered watertight in a manner that will allow for expansion and be appropriate to the construction; and
- (d) in cyclone prone areas complying with the requirements of the regulating authority.

4.5.3 Support of water containers installed other than in a roof space or above a roof Storage water heaters and cisterns installed other than in a roof space or above a roof shall be floor-mounted or supported, as follows:

- (a) By brackets or hangers supplied by, or as specified by, the manufacturer, and installed in accordance with the manufacturer's instructions.
- (b) In a recess in a wall structure as specified by the manufacturer.
- (c) On an impervious base—
 - (i) of bonded brick or concrete cast *in situ*, having a thickness of not less than 75 mm; or

- (ii) of pre-cast concrete having a thickness of not less than 50 mm; and
 - (iii) having the top of the base not less than 50 mm above the surrounding surface.
- (d) On a platform of timber, as shown in Figure 4.3, or other suitable and not less durable material. Where such a platform is located at or near ground level, it shall be supported so that a clearance of not less than 100 mm is maintained from the surrounding ground.

4.5.4 Seismic restraints In New Zealand cisterns and hot water container assemblies are required to be restrained against movement (see Section 203 of NZS 4603—1985 or NZS 4607—1989 and Figure 4.4 of this Standard).

4.6 CORROSION PREVENTION AND WEATHER PROTECTION

4.6.1 Water heater base—corrosion avoidance Water heaters, supported on a surface that may become wet, shall be installed to allow a free air circulation between the surface and the base of the water heater unless stated otherwise in the manufacturer's written installation instructions.

4.6.2 Weather protection of externally installed water heaters Water heaters installed externally shall—

- (a) be of a type recommended by the manufacturer for external installation; or
- (b) be protected by a weatherproof enclosure.

NOTE: A water heater or enclosure complying with the above requirements may not necessarily be suitable for extreme conditions, such as sustained freezing temperature or for salt-laden or corrosive atmospheres. For installations, under such conditions, reference should be made to the water heater manufacturer.

4.7 CONNECTIONS TO WATER HEATERS Unions or similar couplings shall be provided for the connections of any service pipe to the inlet or outlet of the water heater.

4.8 PRESSURE RELIEF AND VENTING OF WATER HEATERS AND CONTAINERS Water heaters and containers shall—

- (a) *for vented storage water heaters*—have the storage container fitted with a free and unobstructed vent open to be atmosphere at all times;
- (b) *for vented heat exchange water heaters*—be fitted with a vent and protective devices as required in AS 1361;
- (c) *for unvented storage water heaters*—
 - (i) be fitted with a temperature/pressure relief valve as shown in Figures 4.9 and 4.10(a) and
 - (ii) where required by the local statutory authority, be fitted with an expansion control valve.

NOTES:

- 1 In New Zealand only, when the valve set pressure is not greater than 120 kPa, a pressure relief valve may be used in lieu of a temperature/pressure relief valve.
 - 2 In New Zealand expansion control valves are required to be fitted to all unvented (i.e. valve vented) cylinders.
- (d) *for instantaneous water heaters*—be fitted with pressure protective device(s) for the particular type of water heater; and
 - (e) *for all heaters*—be fitted with any additional protection devices specified by the manufacturer of the water heater.

Unvented pressure water containers, not designed to withstand a full vacuum, shall be fitted with a vacuum-relief valve.

NOTES:

- 1 A vacuum-relief valve is usually incorporated in the pressure-relief valve on this type of container. A separate vacuum-relief valve is only required where the manufacturer so specifies.
- 2 In New Zealand, 'valve vented', describes water heaters that are vented by valves rather than by a vent pipe.

4.9 VALVES

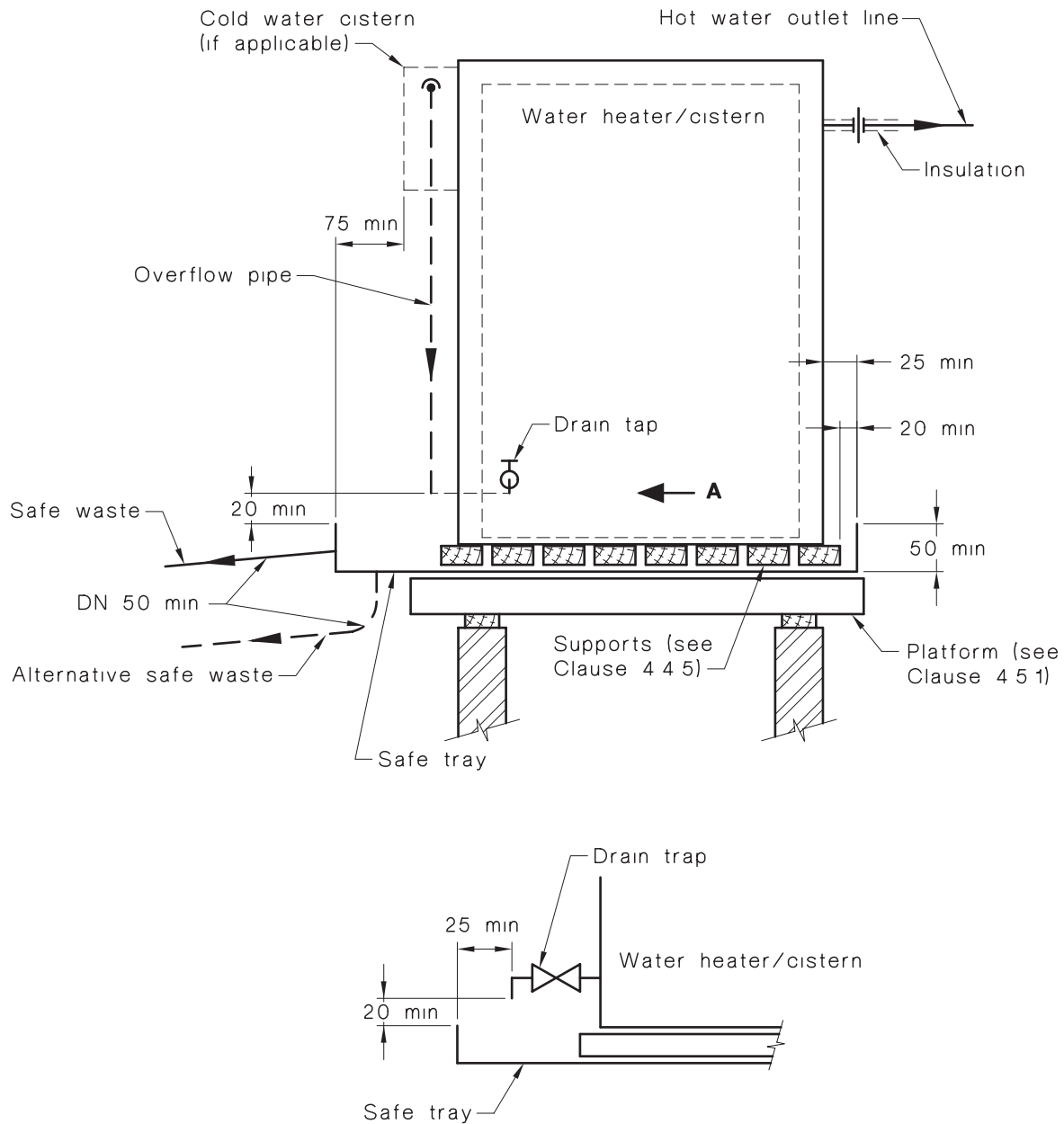
4.9.1 General The valves used in the installation of water heaters, shall comply with Tables 4.1 and 4.2.

4.9.2 Required set pressure of valves (for unvented water heaters) The required set pressure of expansion control valves and inlet pressure control valves shall be—

- (a) as specified by the water heater manufacturer; or
- (b) determined from the set pressure of the temperature and pressure relief valve supplied by the water heater manufacturer, with reference to Table 4.2.

4.9.3 Installation of valves The valves shall be installed in accordance with manufacturer's instructions and in a manner appropriate to the type of water heater being installed (see Figures 4.7 to 4.12 for typical installations). The installations shall—

- (a) have the isolating valve in a position readily accessible from floor or ground level;
- (b) have the valves in the cold water supply in the sequence as shown in Figure 4.7 as either separate or as a combined unit;
- (c) have unobstructed access for maintenance or replacement and meet the requirements of Clause 4.3.2(c) and (d);
- (d) have no heat applied to any valve which has screwed pipe connections;
- (e) have no other valve, tap or shut-off device between the temperature/pressure relief valve and the water heater;
- (f) except for the heater isolating valves required in Clause 4.10.2(h) for multiple installations, have no other valve, tap or shut-off device between any expansion control valve and the inlet to the water heater; (see Figure 4.7)
- (g) have the temperature/pressure relief valves fitted in the position specified by the water heater manufacturer;
- (h) be protected from freezing where climatic conditions require; and
- (i) unless otherwise specified by the valve manufacturer—
 - (i) have reducing valves, where fitted, a minimum of 300 mm horizontally from the water heater inlet; and
 - (ii) have reducing valves, where fitted to an unvented water heater, a minimum of 300 mm below the temperature/pressure relief valve.

**VIEW A**

DIMENSIONS IN MILLIMETRES

FIGURE 4.1 TYPICAL INSTALLATION OF A SAFE TRAY AND POSITION OF WATER HEATER OR CISTERN