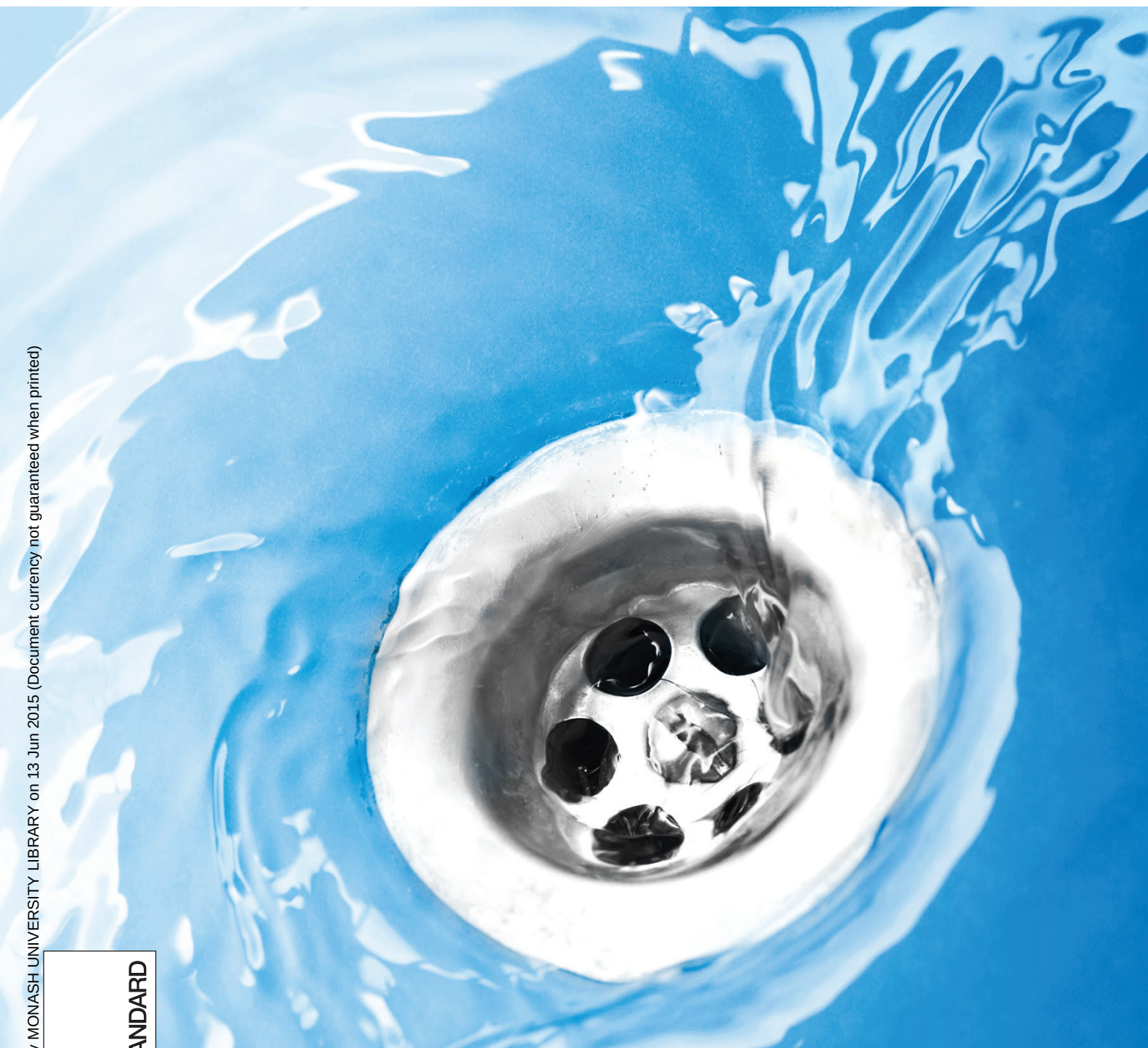


AS/NZS 3500.5:2012
Plumbing and drainage
Part 5: Housing installations



STANDARD

AS/NZS



AS/NZS 3500.5:2012

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee WS-014, National Plumbing and Drainage Code. It was approved on behalf of the Council of Standards Australia on 20 November 2012 and on behalf of the Council of Standards New Zealand on 12 October 2012.
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ACT Planning and Land Authority
Association of Accredited Certification Bodies
Association of Hydraulic Services Consultants Australia
Australian Building Codes Board
Australian Industry Group
Australian Stainless Steel Development Association
Building Codes Queensland
Building Officials Institute of New Zealand
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Australian/New Zealand Standard™

Plumbing and drainage

Part 5: Housing installations

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS-014, National Plumbing and Drainage, to supersede AS/NZS 3500.5:2000, *National plumbing and drainage, Part 5: Domestic installations*.

The objective of this Standard is to provide a quick reference document for a property that contains up to 19 Class 1a buildings as defined in the National Construction Code (NCC), BCA Vol. 2, Housing Provisions. Plumbing and drainage systems that fall outside this objective or are otherwise not covered by this Standard are provided for in the other relevant Parts of AS/NZS 3500, *Plumbing and drainage*.

In New Zealand this Standard is acceptable for complying with the New Zealand Building Code for plumbing and drainage in association with simple houses as referenced in the *Simple House Acceptable Solution*.

This revision has been published to bring the document into alignment with the requirements of AS/NZS 3500, Parts 1 to 4, as published in May 2012. All sections, apart from Section 5, *Stormwater drainage*, have been revised extensively, both in content and layout.

This Standard incorporates extracts from AS/NZS 3500.1, *Plumbing and drainage, Part 1: Water services*, AS/NZS 3500.2, *Plumbing and drainage, Part 2: Sanitary plumbing and drainage*, AS/NZS 3500.3, *Plumbing and drainage, Part 3: Stormwater drainage*, and AS/NZS 3500.4, *Plumbing and drainage, Part 4: Heated water services*, suitable for domestic type plumbing and drainage installations. Readers of this Standard are advised that some network utility operators may have additional or varied requirements to those described herein.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

Notes to the text are for information and guidance only.

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.

This Standard incorporates a Commentary on some Clauses. The Commentary directly follows the relevant clause, is designated by 'C' preceding the clause number and is printed in italics in a panel.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard Plumbing and drainage

Part 5: Housing installations

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for the design and installation of—

- (a) cold water services;
- (b) heated water services;
- (c) rainwater systems;
- (d) water supply systems that are combined with home fire sprinkler systems;
- (e) greywater systems;
- (f) sanitary plumbing and drainage systems; and
- (g) stormwater drainage systems,

for a property containing up to 19 Class 1a buildings as specified in Clause 1.4.4.

NOTE: Requirements for Class 1a multi-unit developments are given in Clause 4.12.

This Standard does not apply to requirements for dedicated firefighting systems.

NOTE: Requirements for fire hydrants and fire hose reels are covered by AS/NZS 3500.1.

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

This Standard applies to new installations as well as alterations, additions or repairs to existing installations.

1.2 NORMATIVE REFERENCES

Documents that are indispensable for the application of this Standard are listed in Appendix A.

NOTE: Documents that are referenced for informative purposes are listed in the Bibliography.

1.3 DEFINITIONS

For the purpose of this Standard the definitions given in the NCC, Volume 3, Plumbing Code of Australia and AS/NZS 3500.0 apply.

1.4 APPLICATION

1.4.1 National Construction Code Volume 3—Plumbing Code of Australia

This Standard is referenced in the Plumbing Code of Australia.

1.4.2 National Construction Code (NCC)

This Standard may be used as a means of demonstrating compliance with—

- (a) Part 3.12.5 of the BCA Vol. 2, Services of the energy efficiency provisions;
 - (b) Part 3.1.2 of the BCA Vol. 2, Drainage; and
 - (c) Part 3.5.2 of the BCA Vol. 2, Gutters and downpipes,
- of the Housing Provisions of the Building Code of Australia.

1.4.3 New Zealand Building Code

This Standard may be used as an alternative solution for compliance with the New Zealand Building Code, Clause G12, Water Supplies, Clause G13, Foul Water and Clause E1, Surface Water.

1.4.4 Classes of buildings

This Standard applies to buildings as follows:

- (a) In Australia, to Class 1a and Class 10 buildings as defined in the NCC, BCA Vol. 2, Housing Provisions.

NOTES:

- 1 The BCA Vol. 2, Housing Provisions, classifies Class 1 and Class 10 buildings as follows:

Class 1—one or more buildings, which in association constitute—

- (a) Class 1a—A single dwelling being—

- (i) a detached house; or
- (ii) one or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit; or

- (b) Class 1b

- (i) A boarding house, guest house, hostel or the like—
 - (A) with a total area of all floors not exceeding 300 m² measured over the enclosing walls of the Class 1b building; and
 - (B) in which not more than 12 persons would ordinarily be resident; or
- (ii) 4 or more single dwellings located on one allotment and used for short-term holiday accommodation,

which is not located above or below another dwelling or another Class of building other than a private garage.

Class 10—A non-habitable building or structure being—

- (i) Class 10a—A non-habitable building being a private garage, carport, shed, or the like; or
- (ii) Class 10b—A structure being a fence, mast, antenna, retaining or freestanding wall, swimming pool, or the like.

- (iii) Class 10c—A private bushfire shelter.
- 2 Users of this Standard should satisfy themselves that the BCA descriptions in Note 1 are still relevant and have not been amended.
- (b) In New Zealand, to—
 - (i) detached dwellings;
 - (ii) multi-unit dwellings not exceeding three storeys in height; and
 - (iii) communal residential community service buildings with a total floor area not exceeding 300 m².

1.5 AUTHORIZATION

C1.5 *Materials and products used in Australia for plumbing and drainage installations are required to be authorized in accordance with the Plumbing Code of Australia (PCA). In New Zealand product authorization is not required.*

1.6 SELECTION AND USE OF MATERIALS AND PRODUCTS

Materials and products in contact with drinking water, rainwater, recycled water, or any combination of these water supplies, shall comply with AS/NZS 4020. Linings and coatings shall comply with AS/NZS 4020, at a surface area to volume ratio not greater than that specified in the conditions of use. Materials and products used in a water service shall be selected to ensure fitness for their intended purpose.

Pipes and fittings used in plumbing and drainage installations shall be selected from those listed in Appendix B, Appendix C or Appendix D, as appropriate, unless otherwise approved by the authority having jurisdiction.

Factors to be taken into account in the selection shall include but are not limited to—

- (a) the type of usage likely to occur;
- (b) the nature and temperature of the water to be conveyed and the risk of corrosion, degradation and leaching;
- (c) the nature of the environment and the ground and the possibility of chemical attack and permeation therefrom;
- (d) the physical and chemical characteristics of the materials and products;
- (e) compatibility of materials and products;
- (f) frost protection in accordance with Clause 2.10; and
- (g) accessibility, for inspection, service, repair and replacement.

NOTE: Information on some above items may be obtainable from the manufacturer or supplier of the product or materials.

1.7 TERMITE MANAGEMENT

This Standard does not cover termite barriers and construction techniques to impede and discourage termite attack in buildings.

C1.7 *Within Australia termites have a wide geographic distribution and can attack cellulose products, including timber, in buildings.*

AS 3660.1 and the NCC include means of protecting new buildings from subterranean termites.

Where a building has been treated against termite attack, it is essential that care be exercised during installation of plumbing services so that both physical and chemical termite barriers are not compromised.

1.8 PLUMBING AND DRAINAGE INSTALLATIONS IN FILLED, UNSTABLE, EXPANSIVE, WATER-CHARGED OR REACTIVE GROUND

NOTES:

- 1 Prior to the commencement of work, ground conditions should be assessed by a suitably qualified person. Where ground conditions may affect the performance of any plumbing or drainage installation, the method to protect the installation should be determined by a recognized expert.
- 2 Soil classification reports should be in accordance with AS 2870.
- 3 Where soil movement may affect the performance of any plumbing or drainage installation and unless otherwise authorized by the authority having jurisdiction, a plan and specification, together with a site and soil report and all calculations showing a proposed method to protect the installation from excessive soil movement or filled unstable water-charged ground, should be determined by a recognized expert.
- 4 For proclaimed mine subsidence or landslip districts, the appropriate authority should be referred to for advice on subsidence or landslip design parameters for proposed drainage systems.

1.9 ELECTRICAL SAFETY PRECAUTIONS AND EARTHING

C1.9 *Safety precautions need to be observed when cutting into pipework or disconnecting water meters, fittings and devices on pipework. There have been fatalities and injuries that have been attributed to water services carrying an electric current.*

Where existing metallic service pipework is to be replaced in part or in its entirety by plastics pipe or other non-metallic fittings or couplings, the work should not commence until the earthing requirements have been checked by an electrical contractor, or modified if necessary.

1.10 FACILITIES FOR PEOPLE WITH DISABILITIES

The installation of sanitary facilities for people with a disability shall comply with the following:

- (a) Australia National Construction Code (NCC).
- (b) New Zealand NZS 4121 and the New Zealand Building Code.

1.11 STRUCTURAL CONCRETE OR BRICKWORK

Piping shall not be installed in any structural concrete slab, beam, column, concrete wall or loadbearing brickwork unless designed by a recognized expert.

1.12 ALTERNATIVE DESIGNS AND METHODS OF INSTALLATION

C1.12 *For Australia this Standard does not preclude the use of any design or method of installation, provided the completed system and installation meet the performance requirements of the NCC.*

Details of such systems, installations and methods should be submitted for consent to the authority having jurisdiction. Systems not covered by this Standard are usually the province of a suitably qualified expert in accordance with Clause A2.2 of the PCA.

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SECTION 2 WATER SERVICES

2.1 SCOPE

This Section specifies requirements for the design, installation and commissioning of cold water services from a point of connection to the points of discharge, and non-drinking water services from a point of connection to the points of discharge.

NOTES:

- 1 For information on water services, see AS/NZS 3500.1.
- 2 For information on home fire sprinkler systems, see AS 2118.5.

2.2 EQUIVALENT PIPE SIZES

Where the nominal size of a pipe is specified in this Standard, an equivalent pipe size appropriate to the material being used shall be selected from Appendix E.

2.3 LIMITATIONS ON THE USE OF PIPES AND FITTINGS

2.3.1 General

The following limitations shall apply to the use of pipes and fittings for water services.

- (a) Pipes and fittings up to and including DN 100 shall have a maximum allowable operating pressure (MAOP) of at least 1.2 MPa at 20°C.
- (b) Bends in pipes shall be free from wrinkling and flattening.
- (c) Semi-flexible connectors and braided flexible hoses shall be used only above surface level and in accessible locations.
- (d) Pipes and fittings shall be protected from excessive ambient heat.

NOTES:

- 1 In many parts of Australia and New Zealand, the maintenance of the property service is the responsibility of the network utility operator. Pipes used in a property service or meter assembly are installed to the network utility operator's specification.
- 2 See also Clauses 1.5 and 1.6.

2.3.2 Plastics pipes and fittings

Plastics pipes and fittings shall comply with the following requirements:

- (a) Where plastics pipes and fittings are subject to direct sunlight, they shall be installed in accordance with the specific product installation Standard.
- (b) Plastics pipes and fittings shall not be used to support valves, meters or associated pipes and fittings.

2.3.3 Metallic pipes and fittings

Copper and copper alloy pipes and fittings shall be installed in accordance with the installation requirements of AS 4809.

NOTE: For other metallic pipes and fittings, see AS/NZS 3500.1.

2.4 METHODS OF JOINTING

2.4.1 General

Only authorized piping materials and jointing methods shall be used.

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

- (a) *Removal of burr* The burr formed in cutting any pipe shall be removed.
- (b) *Joints requiring use of heat* Care shall be taken so that pipes or fittings are not damaged by the application of excessive heat.
- (c) *Use of fittings* Where straight sections of pipe of different diameter are to be joined, such increase or reduction in size shall be made by a fitting.
- (d) *Crimping* The use of crimping to reduce a larger diameter pipe when joining to a smaller diameter pipe shall not be permitted.
- (e) *Jointing of copper* Copper water service pipes of different diameter shall not be joined by filling the annular space using a filler rod.
- (f) *Fabricated fittings* Sockets and tees fabricated from copper and copper alloy pipes shall be made using tools specifically designed for such purposes and shall be silver-brazed.
- (g) *Copper tees* Tees in copper shall not be fabricated from pipe of thickness less than Type C in accordance with AS 1432.
- (h) Jointing of each proprietary piping system shall be in accordance with the relevant Standard for that proprietary system.

2.4.2 Threading

Threads shall comply with the relevant Standard for the materials to be joined, and shall be sealed with an appropriate jointing material.

2.4.3 Capillary fitting

Capillary fittings used to join copper and copper alloy pipes shall comply with AS 3688.

2.4.4 Compression joints

Compression joints shall comply with AS 3688 or AS/NZS 4129.

The use of croxed joints without rubber olives is permitted in New Zealand.

2.4.5 Silver brazing

Silver brazing shall not be used as a means of jointing taps or valves to pipes larger than DN 20. To prevent damage, the tap assembly and jumper valve shall be removed from the body of taps and valves prior to silver brazing.

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

2.4.6 Soft soldering

Soft solder 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 be used with coiled annealed pipes.

A compatible flux shall be used when making joints.

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

2.4.7 Solvent cement joints and priming fluid

Pipes and fittings of PVC material shall be joined by solvent cementing (using a suitable cleaner/primer) in accordance with AS/NZS 2032.

Solvent cements and priming fluids for PVC-U and PVC-M pipes and fittings shall comply with AS/NZS 3879.

Solvent cement shall be Type P, green colour, and priming fluid shall be red colour.

Solvent cement shall not be used without priming fluid.

2.5 PRESSURE AND FLOW RATE REQUIREMENTS OF WATER SERVICES

2.5.1 General

Provision shall be made to ensure that the maximum static pressure at any outlet, other than a fire service outlet, within a building does not exceed 500 kPa.

NOTE: Pressures above 500 kPa can cause damage from water hammer, reduced life of appliances, taps and fittings, and cause excessive noise in the system.

2.5.2 Available pressure

C2.5.2 *The approximate maximum and minimum static pressures for the water main serving the property may be obtained from the network utility operator responsible for the supply of water. Alternatively, a more accurate assessment of the water pressure will need to be made on site, from the outlet of the water meter, point of connection or neighbouring properties, at both low and peak demand periods. Pipe sizing will need to be based on the minimum pressure available, given an acceptable delivery flow rate.*

2.5.3 Minimum pressures and delivery flow rates

2.5.3.1 Pressures

The minimum working head at the furthestmost or most disadvantaged fixture in a completed plumbing installation shall be not less than 50 kPa (5 m head), at the flow rate specified in Table 2.5.3.2.

2.5.3.2 Flow rates

The following applies:

- (a) The flow rates to fixtures, appliances, taps, valves and cisterns shall be not less than the flow rates specified in Table 2.5.3.2.
- (b) The maximum flow rate from a shower, basin, kitchen sink or laundry trough outlet shall not exceed 9 L/m.

TABLE 2.5.3.2
FLOW RATES AND LOADING UNITS

Fixture/appliance	Flow rate L/s	Flow rate L/min	Loading units
Water closet cistern	0.10	6	2
Bath	0.30	18	8
Basin (standard outlet)	0.10	6	1
Spray tap	0.03	1.8	0.5
Shower	0.10	6	2
Sink (standard tap)	0.12	7	3
Sink (aerated tap)	0.10	6	2
Laundry trough	0.12	7	3
Washing/machine/dishwasher	0.20	12	3
Mains pressure water heater	0.20	12	8
Hose tap (15 nom. size)	0.20	12	4

NOTES:

- 1 In the case of valves, fixtures and appliances where test information indicates that they will function satisfactorily with a flow rate less than that shown in Table 2.5.3.2, the tested flow rate may be substituted and the loading units adjusted accordingly.
- 2 Flow rates and loading units given above are taken with cold water flowing at each individual outlet.

2.5.4 Availability of water supply

Where the available water supply cannot meet the minimum pressure and flow rates of this Section, storage tanks and/or pumps shall be installed to achieve the pressure and flow rate demands in accordance with this Section.

2.5.5 Velocity requirements

The maximum water velocity shall be 3.0 m/s. This velocity limitation shall not apply to any piping that is exclusively used for fire services.

2.5.6 Pipe size limitations

2.5.6.1 Water service

For a single dwelling, the water service pipe from the property service to branch off-takes shall have an internal diameter of not less than 15.0 mm.

NOTES:

- 1 For internal diameter of pipes, see Appendix E.
- 2 Where the installation includes home fire sprinklers or some other specialist systems, a water service of this size will be inadequate and pipe sizes will need to be determined by specific hydraulic design.

C2.5.6.1 *Minimum internal diameter sizes quoted in this Standard have been derived from copper piping systems that have proven historically to satisfy the requirements of this Standard.*

2.5.6.2 Branch off-takes

Branch off-take pipes shall—

- (a) be of a length not exceeding those in Table 2.5.6.2; and
- (b) supply only one fixture or outlet, except that—
 - (i) a branch with a minimum internal diameter of 12.5 mm may also supply a flushing device or a supply tank feeding a gravity-fed domestic type water heater; and
 - (ii) a branch with a minimum internal diameter of 10.0 mm may supply a combination bath and shower unit, or a laundry trough and washing machine, or a kitchen sink and dishwasher.

NOTE: For minimum internal diameter of pipes, see Appendix E.

TABLE 2.5.6.2
BRANCH OFF-TAKE PIPES

Internal diameter of off-take pipe	Maximum length
mm	m
12.5	6
10.0	3
7.0	1

2.5.7 Sizing of piping for dwellings

Loading units are converted to probable simultaneous flow rates for branch piping within dwellings in accordance with Table 2.5.3.2. These flow rates may be used to estimate the minimum size of piping within dwellings.

NOTES:

- 1 A method for sizing of piping for dwellings is given in Appendix F.
- 2 For multiple dwelling units, see AS/NZS 3500.1.

2.6 WATER METERS

2.6.1 General

Water meters shall be located—

- (a) so as to be readily accessible for reading, maintenance and removal;
- (b) in areas not susceptible to ponding;
- (c) in a horizontal orientation unless designed to operate otherwise;
- (d) within the property; and
- (e) positioned immediately downstream of the meter-isolating valve.

2.6.2 Installation inside buildings

Where a water meter is installed inside a building and where water damage may result from the removal of the meter, an additional isolating valve shall be fitted adjacent to the meter outlet.

2.6.3 Installation below ground

Water meters installed below ground level shall be located in a meter box that has—

- (a) a cover that can be readily removed; and
- (b) a base that enables drainage.

2.6.4 Protection from mechanical damage

Where likely to be subject to mechanical damage, water meters shall be adequately protected.

2.6.5 Frost protection

Water meters and meter assemblies located in frost-sensitive areas shall be protected against damage caused by freezing of water.

NOTE: Possible solutions include—

- (a) installation in ground; or
- (b) installation in an insulated enclosure.

2.7 PROXIMITY TO OTHER SERVICES

Where water services are to be installed in close proximity to electrical conduits, wires, cables or consumer gas pipes, drains and other existing services, the pipes shall be installed with the separations specified in Appendix G.

2.8 ISOLATING VALVES

2.8.1 General

The flow within the water service pipes shall be controlled by means of isolating valves.

2.8.2 Location

Isolating valves shall be installed in the following locations:

- (a) At the water main (at either a tapping or tee insertion) and any connection to an alternative water supply.
- (b) At the water meter inlet, or within 1 m inside the property boundary if the meter is outside the property or no water meter is fitted.
- (c) At locations as required by the authority having jurisdiction.
- (d) At each flushing cistern.
- (e) At each appliance.
- (f) At each testable backflow prevention device.
- (g) At each thermostatic mixing valve.
- (h) At each pressure-limiting or pressure-reduction valve.
- (i) At each pumping apparatus.
- (j) At each storage tank (inlet).
- (k) At each storage tank outlet (where capacity exceeds 50 L).
- (l) At each off-take point to an irrigation system.

NOTE: For isolating valves on home fire sprinkler systems, see to AS 2118.5 or NZS 4517.

2.8.3 Maintenance

Isolating valves within the property shall be installed so that they are accessible.

2.8.4 Multiple dwellings

For multiple dwellings, isolating valves shall be installed on each branch serving individual buildings and be accessible by the individual dwelling owner or occupier.

2.9 DEPTH OF COVER

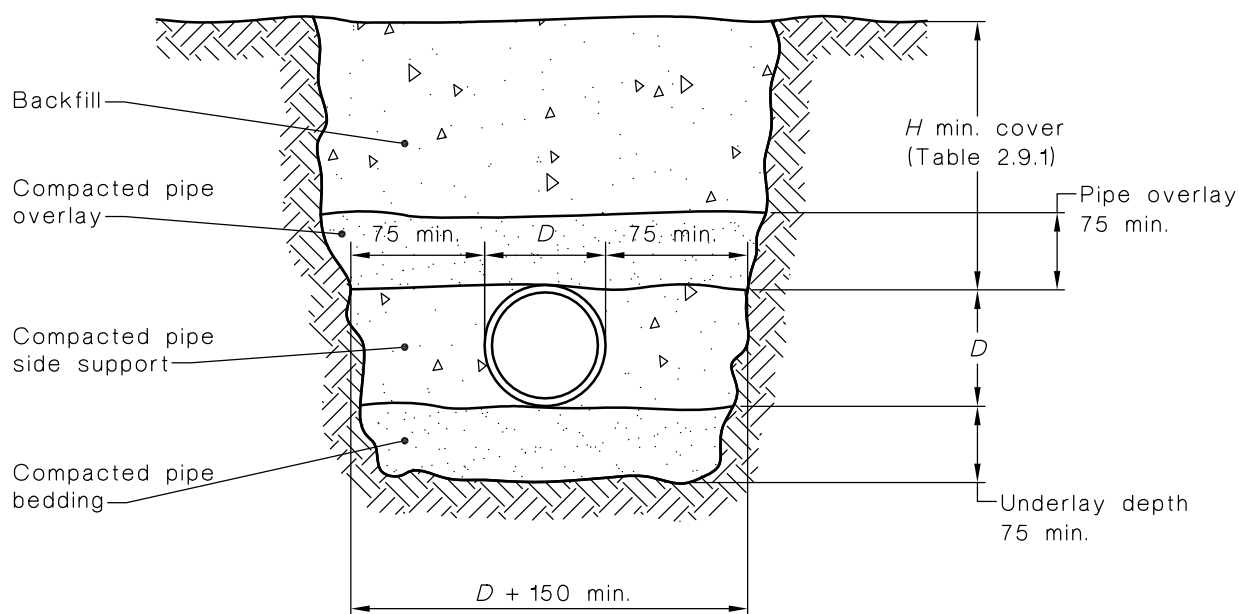
2.9.1 General

Where water services pipes are installed below ground, the minimum cover shall comply with Table 2.9.1 and Figure 2.9.1, measured from the proposed finished surface level.

TABLE 2.9.1
MINIMUM COVER IN PUBLIC AND PRIVATE AREAS
FOR BURIED PIPES

Loading conditions	Minimum cover (H) mm
Under slabs and footings (concrete)	75
Not subject to vehicular loading (excluding fire services)	300
Fire services not subject to vehicular loading	600
Subject to vehicular loading:	
(a) No carriageway	450
(b) Sealed carriageway	600
(c) Unsealed carriageway	750
Pipes in embankments or subject to construction equipment loads	750

NOTE: For minimum cover in bushfire areas, see Clause 2.11.



NOTE: For further details, see Appendix D.

DIMENSIONS IN MILLIMETRES

FIGURE 2.9.1 TYPICAL INSTALLATION IN A TRENCH

2.9.2 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 (see Figure 2.9.1).

Excavated material from the trench may be suitable for final backfill, provided it is free from rock, hard matter and organic material, and broken up so that it contains no soil lumps larger than 75 mm, which would prevent adequate compaction.

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

2.10 PROTECTION AGAINST FREEZING

2.10.1 Requirement for protection

In areas where the ambient temperature regularly falls below 0°C, care shall be taken to reduce the likelihood of the water service being damaged by water freezing within the pipes.

2.10.2 Piping located outside buildings

All pipes and fittings shall be—

- (a) buried to a minimum depth of 300 mm, measured from the proposed finished surface level; or
- (b) surrounded with waterproof thermal insulation.

2.10.3 Pipes located on metal roofs

Pipes shall not be installed in direct contact with metal roofs. Where it is necessary to run pipework across a metal roof, it shall be surrounded with insulation of the minimum thickness specified in Table 2.10.3.

NOTE: Consideration should be made for the thermal expansion and contraction of piping and the roof material.

TABLE 2.10.3
MINIMUM THICKNESSES FOR THERMAL INSULATION

Pipe size DN	Thermal conductivity of insulating material, W/m.K				
	0.03	0.04	0.05	0.06	0.07
	Minimum thickness required, mm				
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

2.10.4 Pipes located inside buildings

2.10.4.1 General

Wherever possible, pipes shall be located so as to avoid those areas of the building that 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.

2.10.4.2 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.

2.10.4.3 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.

2.10.5 Insulation of piping

Where it is necessary to install piping in any of the areas listed in Clause 2.10.4.1, the pipes and fittings shall be surrounded by an appropriate thickness of insulation.

NOTES:

- 1 Typical examples of insulating materials are listed in Table 2.10.5.
- 2 The suggested minimum thicknesses for insulation materials are given in Table 2.10.3.
- 3 If conditions are particularly severe over an extended time, additional thicknesses of insulation may be necessary to prevent water freezing.
- 4 In situations where the building, or part of the building, is not in use over the winter months and no interior heating of the inside areas is maintained, it may be necessary to drain the pipes to prevent damage by water freezing. 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 2.10.5
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	0.034–0.040
Flexible polyethylene foam pipe	0.032–0.045
Foamed nitrile rubber	0.040
Loose vermiculite (exfoliated)	0.06–0.07
Flexible foam plastic pre-insulated copper pipe	0.070–0.075

2.11 BUSHFIRE ZONES

In Australia, in areas designated as a bushfire-prone area by an authority having jurisdiction, all exposed piping shall be metal. Pipes of other materials shall be buried with a minimum depth of cover of 300 mm, measured from the proposed finished surface level.

NOTE: The NCC includes requirements for water supply piping in bushfire zones.

2.12 CORROSIVE AREAS

2.12.1 General

Where metallic pipes, metallic fittings or Type M multilayer pipes are installed in a water service in a corrosive area, they shall be externally protected by—

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

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

2.12.2 Jointing of dissimilar metallic pipes and fittings

Where ferrous and non-ferrous pipes or fittings are joined together below ground, protection against galvanic corrosion shall be provided by—

- (a) fitting a plastic connector or a short length of plastic pipe between the dissimilar metals, for threaded type joints; or
- (b) fitting an insulating gasket between flanges, insulating sleeves along the bolts, and insulating washers under the bolthead and nut, for flanged-type joints.

NOTE: For electrical safety precautions, see also Clause 1.9.

2.13 LOCATION OF PIPING

2.13.1 Location

The following applies to the installation of water service pipes:

- (a) Any water service branch, including valves, shall be located within the dwelling it serves.
- (b) Water service pipes shall not be embedded or cast into concrete structures.

NOTES:

- 1 Care should be taken to ensure that the water service is not damaged during normal building activities.
- 2 Concealed piping should be maintained under a normal water pressure while subsequent building operations, which could cause damage to the pipes, are being carried out.
- 3 All pipes should be flushed with clean water at regular intervals until the building is occupied.

- 4 To prevent any unreasonable rise in the temperature of the cold water delivered to fixtures located within a building, pipes and fittings installed above ground should be protected against the heating effects of solar radiation or other heat sources.

2.13.2 Concealed piping

Water services located in timber- or metal-framed walls of brick veneer construction shall be installed as follows:

- (a) *Timber wall framework* Holes or notches made in timber studs and plates in walls shall be in accordance with the following:
 - (i) The maximum size and spacing of holes or notches in studs shall be in accordance with Figure 2.13.2(A) and Table 2.13.2.
 - (ii) Where uninsulated pipes are used, a collar of lagging material or a neutral cure silicone sealant shall be used to fill the annular space.
- (b) *Timber beams, bearers and joists* Holes or notches made in timber beams, bearers and joists in floors shall be in accordance with Figure 2.13.2(A) and Figure 2.13.2(B).
- (c) *Metal framework* Holes drilled or formed in metal studs or plates shall be accurately sized to enable suitable grommets, insulation or a short sleeve of oversize pipe firmly secured in the framework to be inserted around the pipe, to ensure no direct contact between the pipe and framework but to allow free longitudinal movement of the pipe through the grommet, lagging or sleeve, as shown in Figures 2.13.2(C) and 2.13.2(D).

NOTE: Care should be taken to ensure that the air cavity moisture barrier within an external wall of any building is not bridged with pipe or pipe duct penetrations and porous pipe insulation materials. A clear air gap is required between the external wall and the pipe insulation material.

- (d) Pipes located in cavities shall be installed so as to prevent the transfer of moisture from the outer wall to the inner parts of the building.

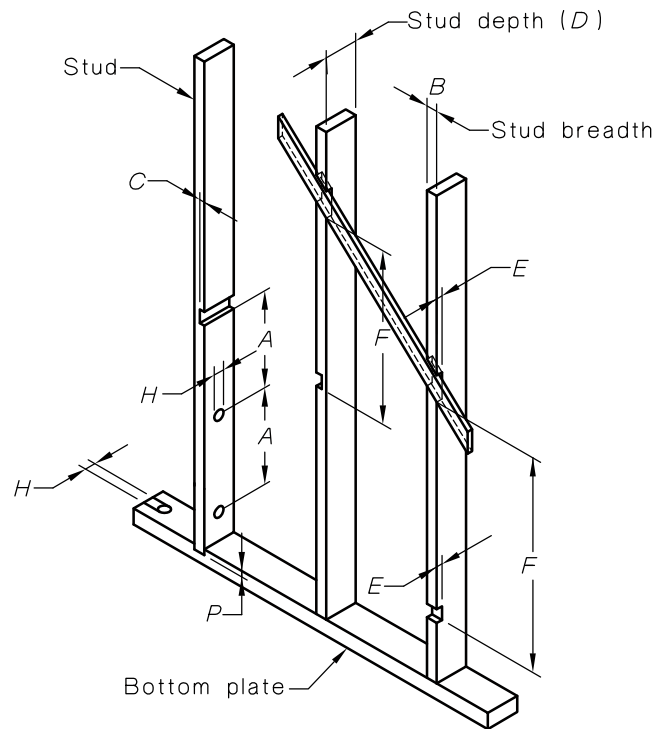
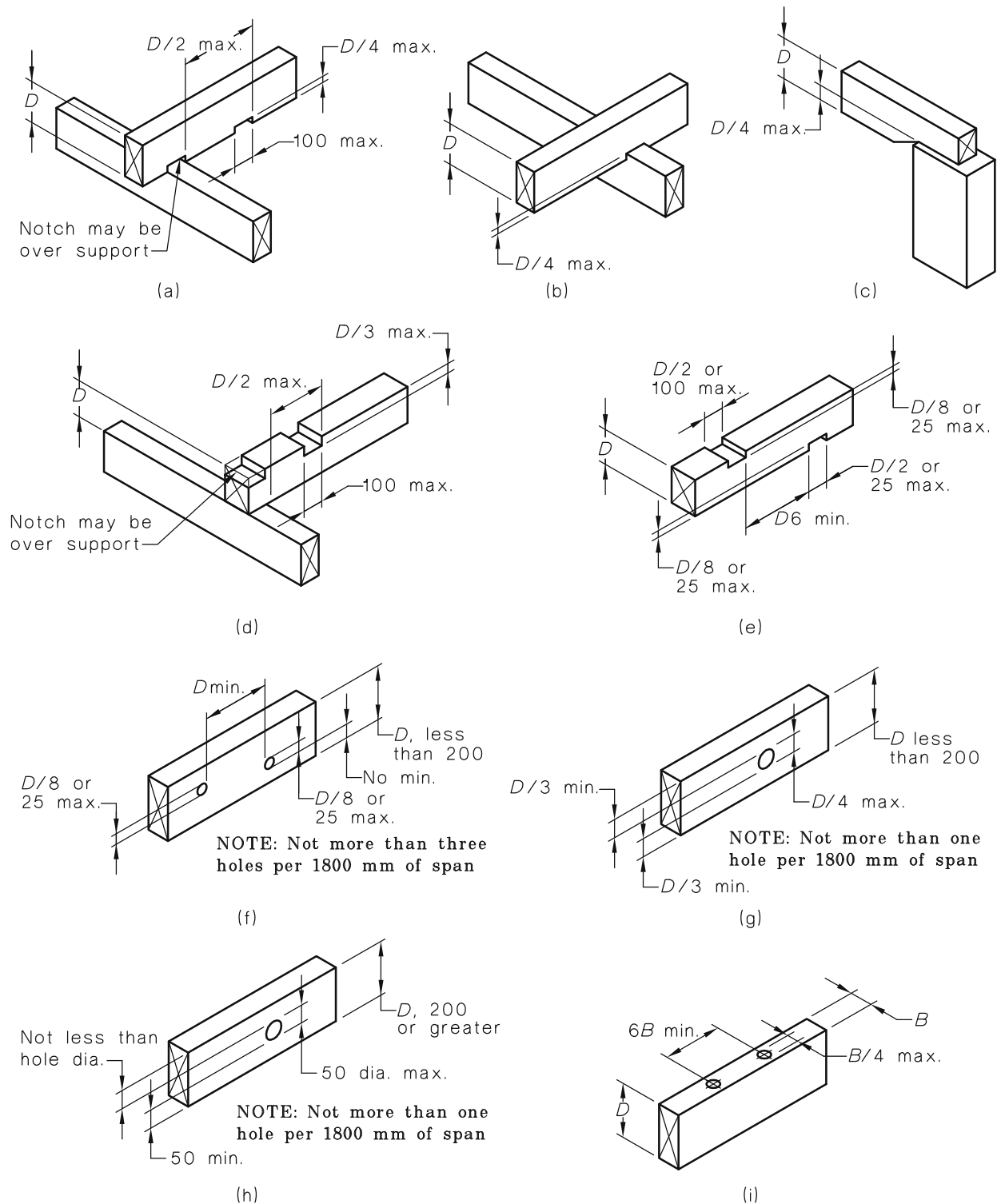


FIGURE 2.13.2(A) NOTCHING OF WALL STUDS



DIMENSIONS IN MILLIMETRES

FIGURE 2.13.2(B) NOTCHES, CUTS AND HOLES IN BEAMS, BEARERS, JOISTS, RAFTERS

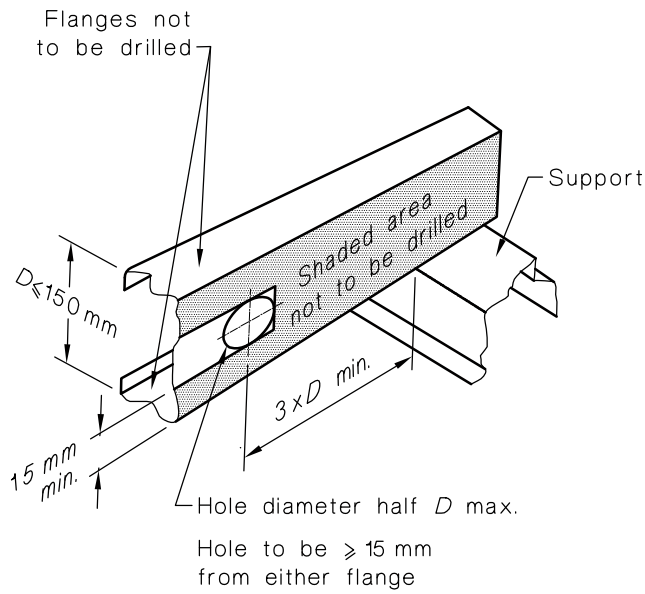
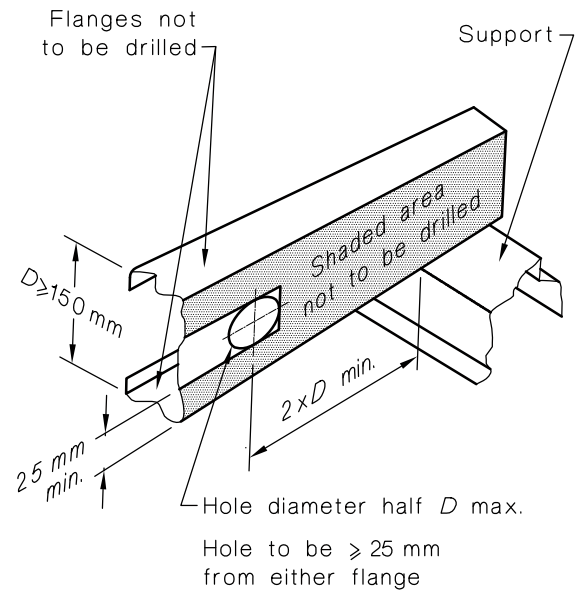
(a) Hole drilling criteria when $D \leq 150 \text{ mm}$ (b) Hole drilling criteria when $D \geq 150 \text{ mm}$

FIGURE 2.13.2(C) ACCEPTABLE PENETRATIONS TO STEEL FLOOR JOISTS

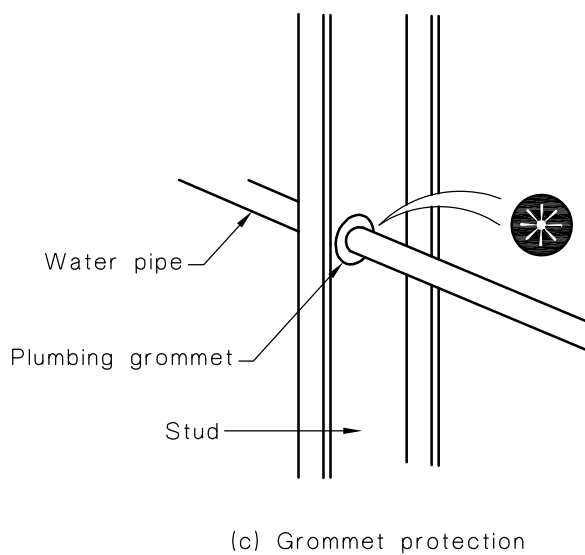
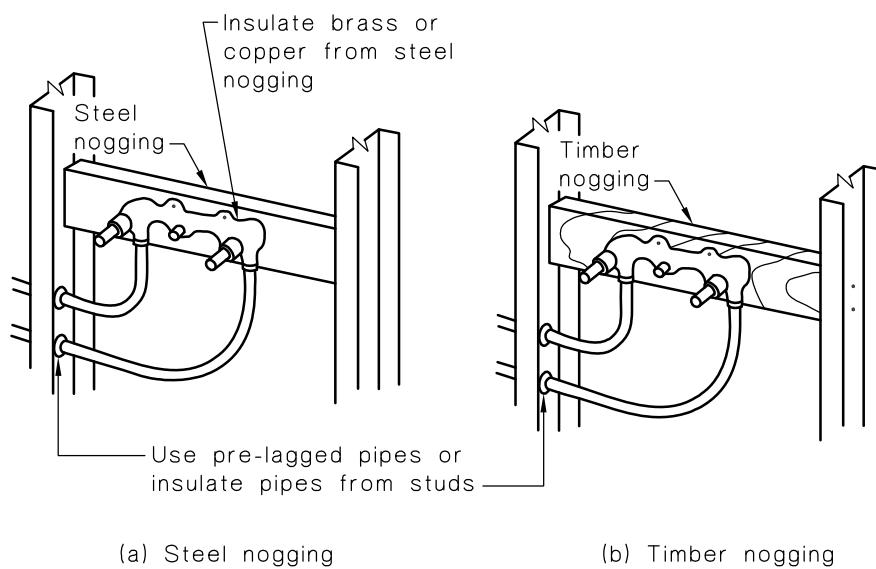


FIGURE 2.13.2(D) TYPICAL INSTALLATION AND FIXING OF SERVICES

TABLE 2.13.2
HOLES AND NOTCHES IN STUDS AND PLATES

Symbol	Description	Limits	
		Notched	Not notched
<i>A</i>	Distance between holes and/or notches in stud breadth	Min. 3 <i>D</i>	Min. 3 <i>D</i>
<i>H</i>	Hole diameter (studs and plates)	Max. 25 mm (wide face only)	Max. 25 mm (wide face only)
<i>C</i>	Notch into stud breadth	Max. 10 mm	Max. 10 mm
<i>E</i>	Notch into stud depth	Max. 20 mm (for diagonal cut in bracing only) (see Note)	Not permitted (see Note)
<i>F</i>	Distance between notches in stud depth	Min. 12 <i>B</i>	N/A
<i>P</i>	Trenches in plates	3 mm max.	

NOTE: A horizontal line of notches up to 25 mm may be provided for the installation of baths.

2.13.3 Chases, ducts or conduits

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

- Metallic pipes and metallic fittings in chases shall be continuously wrapped with an impermeable flexible material.
- Ducts shall be fitted with removable covers.
- Conduits embedded in walls or floors shall comply with the requirements of the NCC (Australia) or New Zealand Building Code, as applicable.
- Service pipes shall not be embedded or cast into concrete structures.

2.13.4 Under concrete slabs

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

- Pipes shall be laid in a narrow trench on a bed of sand or fine-grained soil placed and compacted in a manner that will not damage the piping. There shall be a minimum distance of 75 mm between the top of the pipe and the underside of the slab or slab-stiffening beam.
- 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.

- (c) Any pipework that penetrates the slab shall be at right angles to the surface of the slab and shall be lagged for the full depth of slab penetration with—
 - (i) an impermeable flexible material of not less than 6 mm thickness; or
 - (ii) impermeable plastics sleeve or conduit providing equivalent protection.
- NOTE: Where termite protection is required, the integrity of the chosen termite protection method should not be compromised.
- (d) Metal pipes shall be continuously lagged with an impermeable material.
- (e) Soft-soldered joints shall not be permitted.
- (f) The number of joints shall be kept to a minimum.

2.14 SUPPORT AND FIXING OF PIPES—ABOVE THE GROUND

2.14.1 General

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

2.14.2 Brackets, clips and hangers

Brackets, clips and hangers shall be—

- (a) formed of material compatible with pipe;
- (b) securely attached to the building structure and not to any other service;
- (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 so that the weight of the valve is not transferred to the pipe.

2.14.3 Prohibited supports

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.

2.14.4 Spacing

Water service pipes shall be supported and fixed at the intervals specified in Table 2.14.4.

TABLE 2.14.4
SPACING OF BRACKETS AND CLIPS FOR COLD
AND HEATED WATER

Nominal pipe size DN	Maximum spacing of brackets and clips, m		
	Metallic pipes	PE-X, PB, PVC-U, PVC-C, PP-R, PE, ABS, multi-layer pipes	
		Horizontal or graded pipes	Vertical pipes
10	1.5	0.50	1.00
15	1.5	0.60	1.20
16	—	0.60	1.20
18	1.5	0.60	1.20
20	1.5	0.70	1.40
22	—	0.70	1.40
25	2.0	0.75	1.50
32	2.5	0.85	1.70
40	2.5	0.90	1.80
50	3.00	1.05	2.10
63	—	1.10	2.20
65	3.00	—	—

NOTES:

- 1 Due to water pressure effects, additional brackets, clips or hangers complying with Clause 2.14.2 may be required to prevent movement.
- 2 Where larger sized pipes are used, refer to support and fixing of pipes above the ground requirements of AS/NZS 3500.1 or AS/NZS 3500.4.

2.14.5 Securing of pipes, fittings and valves

Any pipe, fitting or valve that may be subjected to strain or torsion shall be positively fastened against twisting or any other movement.

2.15 STANDPIPES

Standpipes shall be not smaller than DN 15, and shall be connected downstream of the lower outlet bend of the water meter assembly.

All standpipes connected to the water service pipe shall be securely supported by fixing to walls of buildings or other rigid supports.

Standpipe taps shall be at a height of not less than 450 mm above the finished surface level or the top of a disconnector gully, as applicable.

2.16 PROTECTION OF WATER SUPPLIES

2.16.1 Design

All water supply systems shall be designed, installed, and maintained so as to prevent contaminants from being introduced into the water supply.

2.16.2 Quality of drinking water supply

Only drinking water shall be supplied to plumbing fixtures or outlets for human consumption, food preparation, utensil washing, or personal hygiene.

NOTE: The New Zealand Building Code does not require the supply of drinking water for personal hygiene, other than oral hygiene.

2.16.3 Protection against contaminants

No device or system that may cause contamination of a water supply shall be connected directly or indirectly to any part of a water service without appropriate cross-connection or backflow prevention control suitable for the degree of hazard.

NOTE: For hazard ratings of cross-connections, see Clause 2.20.2.

2.16.4 Alternative water supplies

Alternative water supplies shall comply with the following requirements:

- (a) Where water supplied from one source is connected to another water source—
 - (i) an appropriate backflow prevention device shall be fitted; and
 - (ii) the installation shall be authorized by the authority having jurisdiction.
- NOTE: In New Zealand, a building consent is required.
- (b) Where an alternative supply is non-drinking water, piping shall be clearly and permanently marked and labelled in accordance with Clause 2.17.5.
 - (c) Piping conveying water for non-drinking water applications downstream of a backflow prevention device installed for high or medium hazard protection, other than one that is used for containment, shall be clearly and permanently marked and labelled in accordance with Clause 2.17.5.

2.17 NON-DRINKING WATER SERVICES

2.17.1 General

Clauses 2.17.2 to 2.17.5 specify the design installation requirements for non-drinking water services, including recycled water and treated greywater from the point of supply to the point of use. Clauses 2.17.2 to 2.17.5 do not apply to rainwater service.

NOTE: Rainwater systems are covered by Section 6.

Non-drinking water services shall be installed so that the drinking water system cannot be contaminated.

Before commencing any work on any non-drinking water service, reference shall be made to the network utility operator, the health authority and the environmental protection authority for the requirements determining the permitted use of non-drinking water.

NOTE: Non-drinking water is any water that is not fit for human consumption, as determined by the health authority.

2.17.2 Cross-connection control

Non-drinking water installations shall be designed, installed and maintained to prevent a cross-connection with drinking water supply. Where a property is served by a non-drinking water supply, the following shall apply:

- (a) A backflow prevention device for the degree of hazard, and sized to suit the water service, shall be fitted at the meter (or at the boundary when a meter is not installed) on the drinking water supply.
- (b) There shall be no cross-connection between any drinking or non-drinking water service.
- (c) All external tap outlets on the drinking water service shall be fitted with a low hazard backflow prevention device (such as a hose connection vacuum breaker) in accordance with Clause 2.20.3.
- (d) Cross-connection protection for any non-drinking water service shall meet the requirements of Clause 2.20.

2.17.3 Material and products

Pipework and products used in the installation of non-drinking water services shall comply with Clause 2.3.

2.17.4 Installation requirements

Installation shall be in accordance with the requirements for drinking water.

NOTE: For typical installation, see Figure 2.17.4.

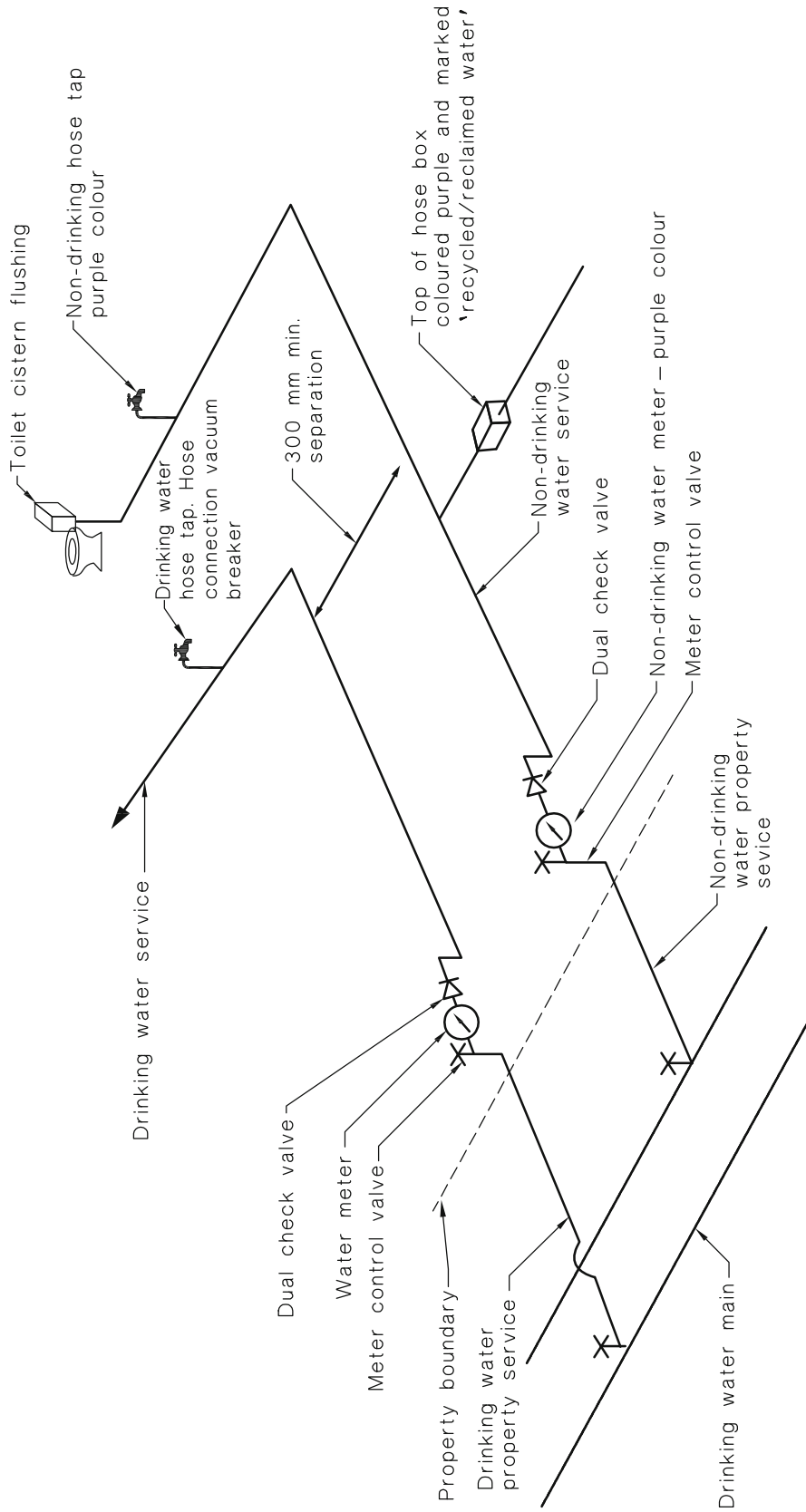


FIGURE 2.17.4 TYPICAL NON-DRINKING WATER INSTALLATION FROM A RETICULATED RECYCLED WATER SYSTEM

2.17.5 Non-drinking water services and outlets

2.17.5.1 Service pipes

All pipes shall be identified by a purple colour in accordance with AS 2700 (NZS 5807.2) being no darker than P24 jacaranda or P12 purple and no lighter than P23 lilac.

Where pipes are not integrally coloured purple, identification may be achieved by means of close-fitting durable purple-coloured sleeving, netting or spirally wrapped tape.

All buried pipes shall have an identification tape complying with AS/NZS 2648.1 and marked with the following:

- (a) Contrasting purple lettering installed on top of the pipe, running longitudinally, and fastened to the pipe at not more than 3 m intervals.
- (b) The following statement, in accordance with AS 1345:

‘WARNING: RECYCLED OR RECLAIMED—WATER—DO NOT DRINK’

In New Zealand, markings shall be in accordance with NZBC G12/AS1.

2.17.5.2 Service fittings

Fittings may be coloured purple in accordance with the colours specified in Clause 2.17.5.1.

NOTE: It is not necessary to use purple coloured fittings.

2.17.5.3 External hose tap outlets

External hose tap outlets shall comply with the following:

- (a) They shall be clearly marked with either a ‘warning sign’ in accordance with Figure 2.17.5.4 or ‘prohibition sign’ number 404 in accordance with AS 1319 or, in New Zealand, the requirements of NZBC G12/AS1.
- (b) They shall be of a type with a removable handle, except where the outlet is installed 1200 mm or more above the finished surface level.
- (c) They shall be coloured powder-coated purple.
- (d) They shall have standard threads on the inlet and outlet except where the authority having jurisdiction requires either a—
 - (i) standard inlet connecting thread and non-standard hose connection outlet (e.g. left-hand thread); or
 - (ii) non-standard inlet connecting thread (e.g. left-hand thread) and a standard hose connection outlet.

NOTE: The requirement for either a ‘warning’ type or ‘prohibition’ type sign in Item (a) and tap connection in Item (b) will be determined by the authority having jurisdiction.

2.17.5.4 Other outlets

All other outlets shall be clearly marked with either a ‘warning sign’ in accordance with Figure 2.17.5.4 or ‘prohibition sign’ number 404 in accordance to AS 1319, or in New Zealand, the requirements of NZBC G12/AS1.



NOTE: The signs shall be coloured in accordance with AS 1319.

FIGURE 2.17.5.4 WARNING SIGN AND PROHIBITION SIGN

2.17.5.5 Proximity to other services

Non-drinking water shall be installed with separations between services in accordance with Appendix G.

2.17.5.6 Water meters

The following applies:

- (a) A non-drinking water meter shall be purple in colour in accordance with AS 2700. The meter shall be fitted above the ground in an accessible position.
NOTE: The meter inlet and outlet threads are different to prevent interchange with the normal drinking water meter.
- (b) The drinking water service shall have suitable containment protection in accordance with the network utility operator's requirements.

2.18 TESTING AND COMMISSIONING A NON-DRINKING WATER SERVICE

The non-drinking water service shall be flushed and tested in accordance with Clause 2.24. It shall also be tested for cross-connection, prior to commissioning, as follows:

- (a) Turn off the drinking water supply to the property at the meter (drinking water meter and non-drinking water meter will be different colours). The non-drinking water supply to remain on.
- (b) Turn on all sink, laundry trough, bath and shower taps (both hot and cold) one by one.
NOTE: All taps should run dry after a short period of time.
- (c) After taps have run dry, flush all toilets.
NOTE: The toilets should refill as normal, provided they are connected to the non-drinking water service.
- (d) Turn on all outside taps.

NOTE: The external drinking water tap should run dry. Taps that continue to run are connected to the non-drinking water service and should be clearly identified with appropriate warning signs (see Clause 2.17.5.4).

- (e) To check appliances within the home such as dishwashers and washing machines, turn off the non-drinking water service and turn the drinking supply back on. Run the non-drinking water service dry via the outside taps or toilet flushing.
- (f) Turn on the internal appliances. If the appliances do not fill, they are connected to the incorrect supply.
- (g) Turn on non-drinking water service back on at the meter. Turn on the tap connected to the non-drinking water service that is located furthest away from the meter.
- (h) Turn the meter tap back on slowly so that all air will be purged from the pipeline while it is being recharged.

2.19 TREATED GREYWATER SERVICES

2.19.1 General

This Clause specifies requirements for the installation and maintenance of services for the supply of greywater that has been treated to an approved level from a greywater treatment system to the point of re-use.

This Clause does not cover direct diversion greywater systems.

NOTE: For direct diversion greywater systems, see AS/NZS 3500.2.

Greywater water services shall be installed so that the drinking water systems and other water services cannot be contaminated.

Before commencing any work on any greywater water service, reference shall be made to the network utility operator, the health authority and the environmental protection authority for the requirements determining the permitted use of reclaimed treated greywater.

C2.19.1 *There are a number of authorities that should be consulted where greywater use is being considered. These authorities include the following:*

- (a) *The network utility operator(s) is (are) responsible for water supply and sewerage, or both.*
- (b) *The health authority.*
- (c) *The environmental protection authority.*
- (d) *Local council.*
- (e) *State or Territory plumbing standards setting authority.*

The relevant authority will—

- (i) *determine the quality levels for the treated greywater; and*
- (ii) *the acceptable internal and external use.*

2.19.2 Cross-connection control

Greywater installations shall be designed, installed and maintained to prevent a cross-connection with the drinking water supply. Where a property is served by a greywater supply, the following shall apply:

- (a) A backflow prevention device for the degree of hazard shall be fitted at the meter (or at the boundary when a meter is not installed) on the drinking water supply.
- (b) Each external tap on the drinking water service shall be fitted with a low hazard backflow prevention device, as specified in Clause 2.20.

NOTE: An example of a low hazard backflow prevention device is a hose connection vacuum breaker.

- (c) Cross-connecting protection for any greywater service shall meet the requirements of Clause 2.20.

2.19.3 Protection of other water supplies from treated greywater

Where provision is made for augmentation of supply of treated greywater by either the top-up of a treated water storage tank or by connection of another supply, the installation shall include backflow protection connected to the alternative water supply system in accordance with Clause 2.20.

NOTE: The other water supply may be a drinking water supply or an alternative water supply.

2.19.4 Materials and products

Materials and products used in the installation of greywater water services shall comply with Clause 2.3.

2.19.5 Installation

Installation of a water supply system from a greywater treatment unit shall comply with Clauses 2.17 and 2.18.

2.20 PROVISION OF BACKFLOW PREVENTION DEVICES

2.20.1 General

The backflow protection required shall be determined by first identifying the individual hazard(s) within the premises. Then, working upstream from each hazard, the water shall be regarded as non-drinking until a backflow prevention device suitable to the degree of hazard is provided.

Backflow prevention devices shall comply with AS/NZS 2845.1.

NOTE: Hazards or risk management may be identified as follows:

- (a) In assessing a potential backflow condition, consideration should be given to the complexity of piping, the probability of piping change, and negligent or incorrect use of equipment resulting in a backflow condition.
- (b) Typical cross-connections in domestic installations are connection of the drinking water service to—
 - (i) haemodialysis machines;
 - (ii) bidets;

- (iii) water-operated venturi-type ejectors attached to garden hoses where used to empty or clean out sullage pits, septic tanks, gullies, stormwater sumps, or any submerged outlets;
- (iv) discharge point of the water service in sanitary flushing cisterns;
- (v) garden hoses supplying water to swimming pools, ornamental ponds or fish ponds;
- (vi) hose taps below the flood level rim of any fixture, or located below finished surface level;
- (vii) top-up to storage tanks for rainwater or greywater;
- (viii) greywater systems; or
- (ix) on-site wastewater treatment systems.

2.20.2 Cross-connection hazard rating

Cross-connections are rated using three degrees of hazard, as follows:

- (a) *High hazard* Any condition, device or practice which, in connection with the water supply system, has the potential to cause death.
- (b) *Medium hazard* Any condition, device or practice which, in connection with the water supply system, has the potential to endanger health.
- (c) *Low hazard* Any condition, device or practice which, in connection with the water supply system, would constitute a nuisance but does not endanger health or cause injury.

2.20.3 Type of backflow protection

Backflow prevention devices shall be provided in accordance with—

- (a) the hazard rating given in Clause 2.20.2; and
- (b) the suitability of the device as shown in Table 2.20.3.

TABLE 2.20.3
SUITABILITY OF DEVICES

Registered or testable backflow prevention device	Cross- connection hazard rating	Protection against backpressure	Protection against back-siphonage
(a) Registered testable devices			
Registered break tank (RBT)	High/medium/low	Yes	Yes
Registered air gap (RAG)	High/medium/low	Yes	Yes
Reduced pressure zone device (RPZD)*	High/medium/low	Yes	Yes
Reduced pressure detector assembly (RPDA)*	High/medium/low	Yes	Yes
Double-check valve assembly (DCV)*	Medium/low	Yes	Yes
Double-check detector assembly (DCDA)*	Medium/low	Yes	Yes
Spill-resistant pressure type vacuum breakers (SPVB)*†	High/Medium/low	No	Yes
Pressure type vacuum breaker (PVB)*	Medium/low	No	Yes
(b) Non-testable devices			
Dual-check valve with atmospheric port (DCAP)‡	Low	Yes	Yes
Dual-check valve (DUAL CV)‡	Low	Yes	Yes
Dual-check valve with intermediate vent (DuCV)‡	Low	Yes	Yes
Air gap (AG)	Low	Yes	Yes
Break tank (BT)	Low	No	Yes
Atmospheric vacuum breaker (AVB)‡	Low	No	Yes
Hose connection vacuum breaker (HCVB)‡ (see Note 3)	Low	No	Yes
Beverage dispenser dual-check valve (BDDC)	Low	Yes	Yes
Pipe interrupter device (PID)	Low	No	Yes

* Backflow prevention devices that are provided with test taps for the purposes of testing the operation of the devices, which do not necessarily include isolating valves

† Spill-resistant pressure vacuum breakers are suitable for high-hazard installation for mains pressure flushing valves only

‡ Backflow prevention devices that are not provided with test taps for the purposes of testing the operation of the devices

NOTES:

- Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they may require a significantly higher pressure to reseal and should only be installed in systems that provide pressures sufficient to ensure full closing of the valve and should not be installed close to water outlets where low pressures could be encountered.
- In areas where water spillage may cause nuisance, tundishes or alternative drainage should be installed to receive the discharge from—
 - reduced-pressure zone devices;
 - pressure type vacuum breakers;
 - dual check valves with atmospheric port; or
 - atmospheric vacuum breakers.
- Hose connection vacuum breakers are designed to withstand the small amount of backpressure that would occur if the end of the hose is higher than the hose tap.
- Pressure type vacuum breakers, atmospheric vacuum breakers, hose connection vacuum breakers and pipe interrupter devices should only be used to protect against back-siphonage.

2.20.4 Registered break tanks and registered air gaps

Registered break tanks and registered air gaps shall comply with AS/NZS 3500.1.

2.21 BIDET, BIDEtte AND TOILET SEAT DOUCHE

2.21.1 Bidet

A bidet shall be installed with a registered break tank or a testable device complying with AS/NZS 2845.1 or AS 2845.2.

2.21.2 Bidette

A bidette shall be installed with a non-testable device or a 25 mm air gap.

2.21.3 Toilet seat douche

Where the douche outlet is, in all positions, at least 25 mm above the overflow level of the pan, no backflow prevention is required.

Where the outlet, in any position, is less than 25 mm above the overflow of the pan, a high-hazard backflow prevention device complying with AS/NZS 2845.1 or AS 2845.2 shall be installed. This device shall be either part of the douche or installed separately.

2.22 WATER CLOSET FLUSHING VOLUMES

2.22.1 Flushing volumes

Cistern installed for the purpose of flushing water closet pans shall have a dual flush operation not greater than 6/3 L toilet flush volumes as specified in AS 1172.2.

2.22.2 Performance compatibility of cisterns and pans

Compatibility of a water closet cistern and pan shall be ascertained from either of the following criteria:

- (a) The water closet cistern is certified for use with the pan.
- (b) The pan is certified for use with the water closet cistern.

NOTE: AS 1172.1 and AS 1172.2 require that product labelling indicate matching set model identification where not supplied as close coupled.

2.23 IRRIGATION AND LAWN WATERING

2.23.1 System types

2.23.1.1 General

Irrigation systems, including hose-tap-connected systems, shall be categorized as one of the following types:

- (a) *Type A systems* All permanently open outlets (sprinkler heads) and piping more than 150 mm above finished surface level, not subject to ponding or backpressure and not involving injection systems. No backflow prevention is required [see Figure 2.23.1.1(A)].

- (b) *Type B systems* Any irrigation system in domestic or residential buildings with piping or outlets (sprinkler heads) installed less than 150 mm above finished surface level and not involving injection systems, as shown in Figures 2.23.1.1(B), 2.23.1.1(C) and 2.23.1.1(D).
- (c) *Type C systems* Any irrigation system in other than domestic or residential buildings with piping or outlets less than 150 mm above finished surface level and not involving injection systems (see AS/NZS 3500.1).
- (d) *Type D systems* Any irrigation system where fertilizers, herbicides, nematicides or the like are injected or siphoned into the system (see AS/NZS 3500.1).

2.23.1.2 Materials

All materials, valves and fittings on the upstream side of, and including the last pressurized valve on each line, shall comply with Clause 2.3.

2.23.2 Type B system

The following requirements apply:

- (a) Where the system is not subject to backpressure, a low hazard valve shall be fitted either—
 - (i) in the case of a hose connection vacuum breaker, at the standpipe outlet and 450 mm above the highest sprinkler head, as shown in Figure 2.23.1.1(B); or
 - (ii) in the case of an atmospheric vacuum breaker, 150 mm above the highest sprinkler head, as shown in Figure 2.23.1.1(D).
- (b) Where the system is subject to backpressure, a low hazard dual check valve shall be fitted, as shown in Figure 2.23.1.1(C).

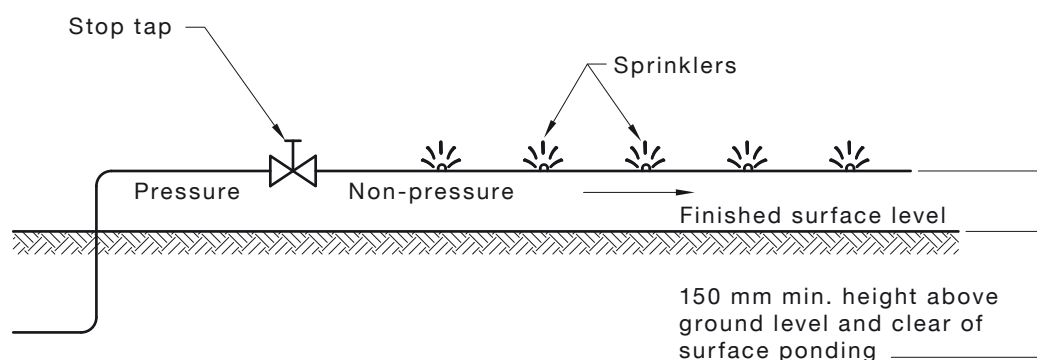
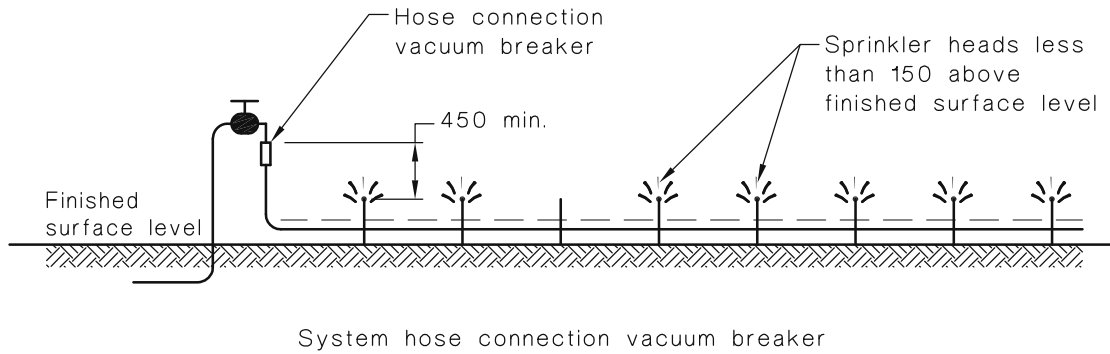


FIGURE 2.23.1.1(A) TYPE A SYSTEM—NO BACKFLOW PREVENTION REQUIRED



DIMENSIONS IN MILLIMETRES

FIGURE 2.23.1.1(B) TYPE B SYSTEM—NON-TESTABLE DEVICES—NO BACKPRESSURE

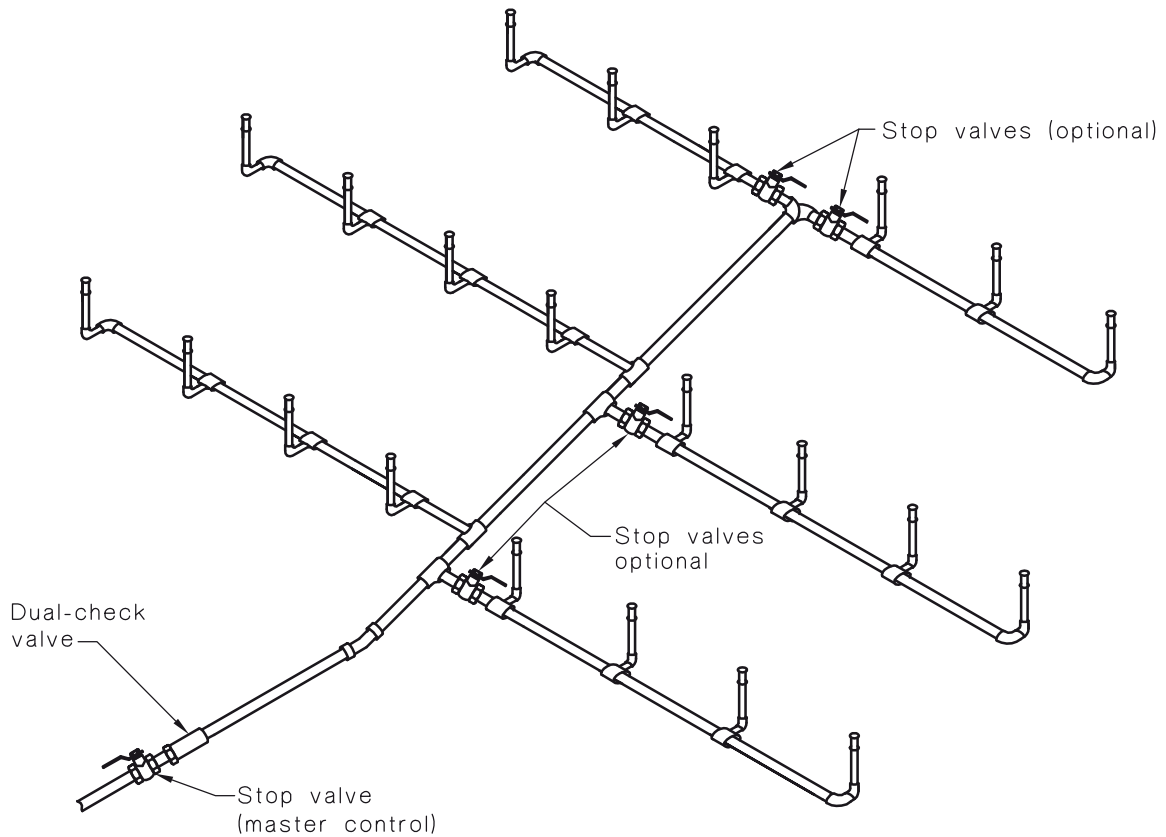
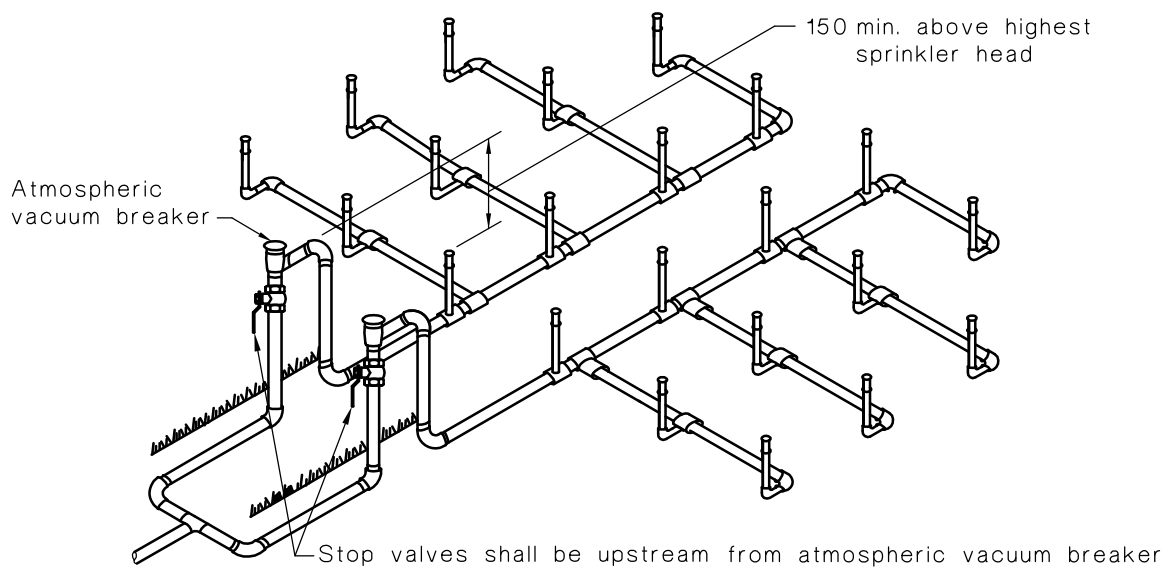
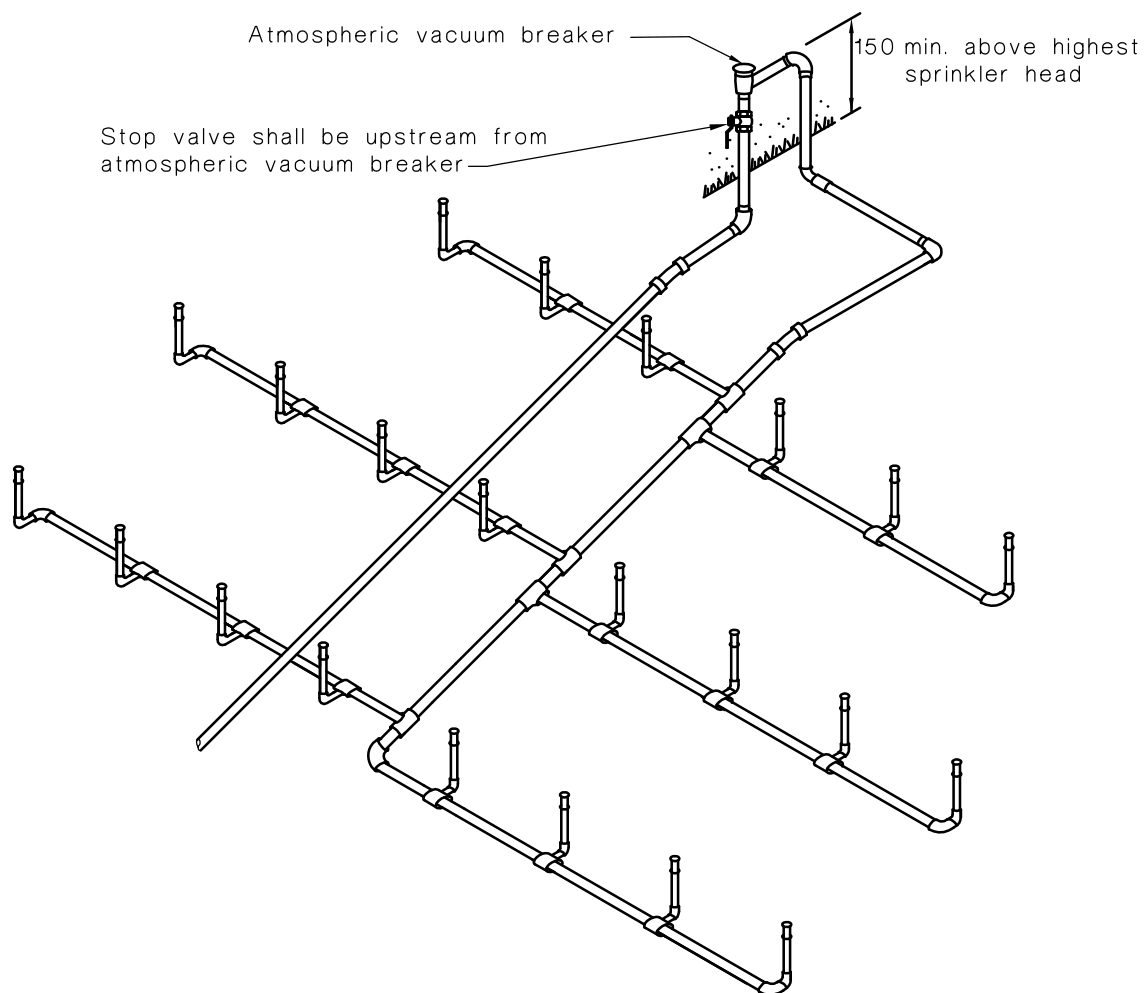


FIGURE 2.23.1.1(C) TYPE B SYSTEM—NON-TESTABLE DEVICES—SUITABLE FOR BACKPRESSURE



(a) Level terrain — Multi-zone system using atmospheric vacuum breaker



(b) Hillside system using atmospheric vacuum breaker

DIMENSIONS IN MILLIMETRES

FIGURE 2.23.1.1(D) TYPE B SYSTEM—NON-TESTABLE DEVICES—
NO BACKPRESSURE

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2.24 TESTING AND COMMISSIONING

2.24.1 General

Testing and commissioning of a water service shall be in accordance with Clauses 2.24.2 and 2.24.3.

2.24.2 Flushing

At the completion of the water service installation and prior to hydrostatic testing, the system shall be thoroughly flushed to a free outlet to remove any foreign matter. The flushing shall be undertaken in accordance with Paragraph H3 of Appendix H and continue until the flushed water runs completely clear. The system shall then be pressure-tested in accordance with Clause 2.24.3.1.

The water service that is used to supply drinking water shall be protected against contamination in accordance with Appendix H.

NOTE: For testing and commissioning non-drinking water services, see also Clause 2.18.

2.24.3 Testing

2.24.3.1 *Hydrostatic test*

Water services shall not show any leakage when subjected to a hydrostatic pressure of 1500 kPa for a period of not less than 30 min.

The test shall be performed on installed piping prior to burial or concealment.

NOTES:

- 1 When a pressure test is carried out, it may be necessary to disconnect and cap the water service to isolate it from the water main, fixtures and appliances, which may be damaged by the applied test pressure.
- 2 In case of fabricated assemblies (e.g. shower/bath or laundry assemblies), the complete assembly should be subjected to the hydrostatic pressure test, that is all pipes (including feed to shower rose, etc.) are subjected to the pressure test.

2.24.3.2 *Storage tanks (except rainwater tanks)*

Storage tanks (except rainwater tanks) shall be filled until they overflow for a period of not less than 1 min. The overflow shall discharge to the satisfaction of the relevant environmental protection legislation.

Compliance with the air gap criteria shall be verified (see Clause 2.20.4).

2.25 DISINFECTION

2.25.1 Disinfection of water services

The disinfection of water services shall be carried out in accordance with Appendix H.

2.25.2 Disinfection of drinking water storage tanks

The disinfection of drinking water storage tanks shall be carried out in accordance with Appendix I.

2.26 COMMISSIONING

At the completion and testing of the water service, the operation of all valves, cisterns, taps, pressure-relief valves and other components shall be checked to confirm their correct performance.

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NOTES

SECTION 3 HEATED WATER SERVICES

3.1 SCOPE AND GENERAL

3.1.1 Scope

This Section sets out the requirements for the design, installation and commissioning of heated water services using drinking water or rainwater or a combination thereof. It includes aspects of the installation from, and including, the valve(s) on the cold water inlet to any cold water storage tank or water heater and the downstream fixtures and fittings. It applies to new installations as well as alterations, additions and repairs to existing installations.

NOTE: For further information, see AS/NZS 3500.4.

This Section applies to the installation of the following types of water heaters:

- (a) Storage water heaters with a rated delivery or capacity of up to 700 L per heater.
- (b) Heat exchange water heaters.
NOTE: Electric heat exchange water heaters are defined in AS/NZS 4692.1, and other fuel sources are covered in the applicable Standards (e.g. AS/NZS 2712, AS 4552).
- (c) Instantaneous (continuous flow) water heaters.
- (d) Solar water heaters.
- (e) All authorized water heaters.

3.1.2 Water quality

Water quality can have a significant effect on the performance and life of water heaters and other items forming part of or connected to the heated water system.

Information on the quality of reticulated water should be available from the network utility operator. Where there is doubt about the suitability of products for connection to the available water supply, advice shall be sought from the manufacturers.

C3.1.2 *Where rainwater is used in heated water systems, it is particularly important that consumers are made aware of the advice from en-Health (see the document 'Guidance on Use of Rainwater Tanks', published on the en-Health website) and the manufacturers of items forming part of, or connected to, the heated water system.*

3.1.3 Equivalent pipe sizes

Equivalent pipe sizes shall be in accordance with Clause 2.2.

3.2 WATER TEMPERATURE

3.2.1 Storage temperature

Heated water shall be stored and delivered under conditions that avoid the likelihood of the growth of Legionella bacteria. This may be achieved by—

- (a) storing heated water at a temperature above 60°C; or
- (b) installing a water heater certified to AS 3498 (Australia only).

NOTE: In Australia, AS 5200.000 requires that water heaters and hot water storage tanks comply with AS 3498.

3.2.2 Delivery temperature at sanitary fixtures

All new heated water installations shall deliver heated water not exceeding 50°C at the outlet of all sanitary fixtures that are used primarily for personal hygiene purposes.

NOTES:

- 1 Sanitary fixtures used for personal hygiene purposes include showers, baths, handbasins and bidets.
- 2 The delivery temperature requirements in facilities for young, aged, sick or people with disabilities is 45°C (see AS/NZS 3500.4).

3.2.3 Acceptable solutions for control of delivery temperatures

The installation shall be deemed to comply with Clause 3.2.2 if all sanitary fixtures used primarily for personal hygiene purposes are supplied from any of the following:

- (a) A thermostatic mixing valve complying with AS 4032.1 and adjusted to an outlet temperature not exceeding 50°C at each outlet supplied from the thermostatic mixing valve.
- (b) A tempering valve complying with AS 4032.2 and adjusted to an outlet temperature not exceeding 50°C at each outlet supplied from the tempering valve.
- (c) A water heater complying with AS 3498 and marked with the following:
'WARNING: THIS APPLIANCE DELIVERS WATER NOT EXCEEDING 50°C IN ACCORDANCE WITH AS 3498.'

NOTES:

- 1 Temperature control devices require routine maintenance and performance testing. For maintenance, see AS 4032.3.
- 2 It is the property owner's responsibility to ensure that the routine maintenance is carried out.

3.3 LIMITATIONS ON THE USE OF PIPES AND FITTINGS

3.3.1 General

The following limitations shall apply to the use of pipes and fittings for heated water services:

- (a) Pipes and fittings shall have a maximum allowable operating pressure of at least 1.0 MPa at 60°C.
- (b) Bends in pipes shall be free from wrinkling and flattening.