

AS/NZS 3500.1:2021



Australian/New Zealand Standard™

Plumbing and drainage

Part 1: Water services



AS/NZS 3500.1:2021

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- Australian Building Codes Board
- Australian Industry Group
- Australian Stainless Steel Development Association
- Backflow Prevention Association of Australia
- Engineers Australia
- Hydraulic Consultants Association Australasia
- International Copper Association Australia
- Master Plumbers Australia and New Zealand
- Master Plumbers, Gasfitters and Drainlayers New Zealand
- Ministry of Business, Innovation and Employment (NZ)
- Plastics Industry Pipe Association of Australia
- Plastics New Zealand
- Plumbers, Gasfitters and Drainlayers Board (NZ)
- Plumbing Distributors Association of New Zealand
- Plumbing Products Industry Group
- The Institute of Plumbing Australia
- Water New Zealand
- Water Services Association of Australia

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Plumbing and drainage

Part 1: Water services

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Preface

This Standard was prepared by the joint Standards Australia/Standards New Zealand Committee WS-014, Plumbing and Drainage, to supersede AS/NZS 3500.1:2018.

The objective of this document is to provide installers with Deemed-to-Satisfy solutions to comply with —

- (a) the National Construction Code (NCC) Volume Three, Plumbing Code of Australia (PCA); and
- (b) the New Zealand Building Code (NZBC), Clause G12 Water Supplies.

A list of all parts in the AS/NZS 3500 series for plumbing and drainage can be found in the Standards Australia and Standards New Zealand online catalogues.

The major changes in this revision are as follows:

- (i) Conformance to individual product standards has been removed. All products used in plumbing and drainage systems in Australia need to comply with the PCA and, in New Zealand, the NZBC, see [Appendix B](#) for further information. Removal of specific product standard conformance requirements avoids inconsistencies and contradictions between this document and the PCA and NZBC.
- (ii) Definitions have been relocated to AS/NZS 3500.0. This was done for consistency across the series.
- (iii) A number of the backflow prevention provisions, which were considered matters of public policy, have been elevated to PCA Part B5 Cross Connection Control. To remove duplication between PCA 2019 and AS/NZS 3500.1, the provisions relating to cross-connection hazards and the corresponding hazard rating have been removed. This also avoids inconsistencies between the cross-connection hazards and the corresponding hazard rating in this document and in NZBC Acceptable Solution G12/AS1. Consequently, [Appendix F](#) has been deleted, and all remaining backflow provisions have been consolidated in [Section 4](#).
- (iv) Jointing requirements for plastics pipes have been clarified and expanded to allow different methods.
- (v) Changes to the requirements for the marking of pipes in commercial buildings to assist in the better identification of pipework and avoid cross connections.
- (vi) Changes to the requirements for the installation of water services located in metal-framed walls to bring the provisions in line with those of the National Association of Steel-framed Housing.
- (vii) [Clause 5.4](#) relating to bushfire zones has been removed in anticipation of requirements relating to bushfire prone areas being elevated to the PCA.
- (viii) [Section 12](#) relating to special connections for specific fixtures has been removed. With backflow requirements being moved to the PCA, listing these few examples would be inappropriate. The WaterMark specifications for the product would identify what backflow devices were required.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

Notes or footnotes to tables or figures that are expressed in mandatory terms are deemed to be requirements of this document.

Notes to clauses in this document are informative only and do not include requirements.

This document includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by "C" preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the document.

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NOTES

Australian/New Zealand Standard

Plumbing and drainage

Part 1: Water services

Section 1 Scope and general

1.1 Scope

This document specifies requirements for the design, installation and commissioning of cold water services from a point of connection to the points of discharge, and for non-drinking water from a point of connection to the points of discharge. It applies to new installations as well as alterations, additions and repairs to existing installations.

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

NOTE 1 Refer to AS/NZS 3500.4 for requirements for heated water services.

NOTE 2 See [Figure 14.2](#) for typical installation of a property service and water service.

1.2 Application

1.2.1 Australia

This document shall be read in conjunction with the National Construction Code (NCC), primarily Volume Three, the Plumbing Code of Australia (PCA).

Where alternative Australian or New Zealand Standards are referenced (e.g. AS 1345) the Australian Standard shall be used for Australia.

1.2.2 New Zealand

This document shall be read in conjunction with the New Zealand Building Code. This document may be used to demonstrate compliance with the New Zealand Building Code, Clause G12 Water Supplies.

Where alternative New Zealand Standards are referenced (e.g. NZS 5807), the New Zealand Standard shall be used for New Zealand.

1.3 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

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

AS 1345, *Identification of the contents of pipes, conduits and ducts*

AS 2419.1, *Fire hydrant installations, Part 1: System design, installation and commissioning*

AS 2845.2, *Water supply — Backflow prevention devices, Part 2: Registered airgaps and registered break tanks*

AS 4809, *Copper pipe and fittings — Installation and commissioning*

AS/NZS 2032, *Installation of PVC pipe systems*

AS/NZS 2033, *Installation of polyethylene pipe systems*

AS/NZS 2648.1, *Underground marking tape, Part 1: Non-detectable tape*

AS/NZS 2845.3, *Water supply — Backflow prevention devices, Part 3: Field testing and maintenance of testable devices*

AS/NZS 3500.0, *Plumbing and drainage, Part 0: Glossary*

AS/NZS 3500.4, *Plumbing and drainage, Part 4: Heated water services*

AS/NZS 3690, *Installation of ABS pipe systems*

NZS 4219, *Seismic performance of engineering systems in buildings*

NZS 5807, *Code of practice for industrial identification by colour, wording or other coding*

ANSI AWWA C651, *Disinfecting Water Mains*

EN 10312, *Welded stainless steel tubes for the conveyance of aqueous liquids including water for human consumption — Technical delivery conditions*

ASME B36.19M, *Stainless Steel Pipe*

WSAA WSA 03, *Water supply code of Australia*

New Zealand Building Code (NZBC), *Acceptable Solution G12/AS1*

1.4 Terms and definitions

For the purposes of this document, the definitions given in AS/NZS 3500.0 apply.

1.5 Abbreviations

The following plastics abbreviations are used in this document.

ABS	Acrylonitrile butadiene styrene
PB	Polybutylene
PE	Polyethylene
PE-X	Cross-linked polyethylene
PP	Polypropylene
PVC-C	Chlorinated polyvinyl chloride
PVC-M	Modified polyvinyl chloride
PVC-O	Oriented polyvinyl chloride
PVC-U	Unplasticized polyvinyl chloride

1.6 Equivalent pipe sizes

Where the nominal size of a pipe is specified in this document, an equivalent pipe size, appropriate to the material being used, shall be selected from [Appendix A](#).

1.7 Facilities for people with disabilities

Requirements for the installation of sanitary facilities for people with disabilities are specified in:

- (a) For Australia — the National Construction Code (NCC).

- (b) For New Zealand — the New Zealand Building Code (NZBC), Clause G1 Personal Hygiene.

1.8 Termite management

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

C1.8 *Within Australia, termites have a wide geographic distribution and can attack cellulose products, including timber, in service in buildings.*

AS 3660.1 and the NCC contain information on protection of 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.

Section 2 Materials and products

2.1 Scope of section

This section specifies requirements for materials and products used in cold water services.

2.2 General

Materials and products used in a cold water service shall be selected to ensure they are fit for their intended purpose.

NOTE 1 See [Appendix B](#) for more information.

In New Zealand, materials and products in contact with water that are intended for human consumption, food preparation, utensil washing, personal hygiene or oral hygiene shall conform to AS/NZS 4020. Linings and coatings shall conform to AS/NZS 4020, at a surface area to volume ratio not greater than that applicable to the installation.

NOTE 2 In New Zealand, the requirements for materials and products are contained in NZBC Clauses B2 Durability and G13 Foul Water.

NOTE 3 In Australia, the requirements for materials and products in contact with drinking water are contained in the Plumbing Code of Australia.

2.3 Pipes and fittings — General limitations

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

- (a) Pipes and fittings —
 - (i) up to and including DN 100 shall have a maximum allowable operating pressure (MAOP) of at least 1.2 MPa at 20 °C; and
 - (ii) where larger than DN 100 shall be selected to satisfy design criteria for the system.
- (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 external heat sources that limit the service life of the pipes.
- (e) Soft solder jointing shall not be used for new joints.

NOTE For the repair of existing joints, soft solder should not contain more than 0.1 % lead by weight.

2.4 Metallic pipes and fittings

2.4.1 Cold water services

Where metallic pipes and fittings are used in a cold water service, they shall be of the following material types:

- (a) Cast iron fittings (grey cast iron).
- (b) Copper pipes and fittings.
- (c) Copper alloy fittings.
- (d) Ductile iron pipes and fittings.

- (e) Stainless steel (SS) pipes and fittings.

NOTE 1 See [Appendix B](#) for information on demonstrating products and materials are fit for purpose.

NOTE 2 The following Standards contain additional information:

- (a) AS 3795 — copper alloy tubes.
- (b) AS 1432 — copper tubes.
- (c) NZS 3501 — copper tubes.
- (d) AS/NZS 2280 — ductile iron pipes and fittings.
- (e) AS 5200.053 — stainless steel pipes and tubes.

2.4.2 Firefighting water services

Where metallic pipes and fittings are used in firefighting water services, they shall be of the following material types:

- (a) Cast iron fittings (grey cast iron).
- (b) Copper pipes and fittings.
- (c) Copper alloy fittings.
- (d) Ductile iron pipes and fittings.
- (e) Galvanized steel pipes and fittings.
- (f) Stainless steel (SS) pipes and fittings.

2.4.3 Limitations

Metallic pipes and fittings shall conform to the following:

- (a) Ductile iron pipes and fittings shall be lined and provided with an outer protective coating.
- (b) Cast iron pipes and fittings shall be lined with cement mortar and provided with an outer protective coating.
- (c) Galvanized pipes and fittings shall be used only in non-drinking water systems that are installed above ground. The internal and external galvanizing coating shall be a minimum of 300 g/m² hot-dipped galvanizing.

NOTE 1 The risk of rapid corrosion should be considered when selecting galvanized steel pipes for any application.

Where galvanized steel fire hydrant or booster riser pipes are to be buried below ground in accordance with AS 2419.1, the pipes shall be of heavy thickness up to and including DN 80 and not less than medium thickness over DN 80.

The maximum length of fire hydrant or booster riser pipe below ground shall be 1.5 m. The buried section of pipe shall be protected against corrosion by continuous wrapping in petrolatum tape.

NOTE 2 See [Section 6](#) for information on fire services.

NOTE 3 Refer to ANSI/AWWA C217 for information on petrolatum and petroleum wax tape.

- (d) Fittings used to join stainless steel (SS) pipes shall be dezincification resistant (DR) copper alloy or stainless steel.

NOTE 4 Refer to AS 3688 for information on metallic fittings and end connectors.

- (e) For corrosion resistance, the composition of stainless-steel pipes, tubes and fittings shall have a minimum pitting resistance equivalent number (PREN) of 22.

NOTE 5 The PREN may be calculated as follows:

$$\text{PREN} = \% \text{Cr} + (3.3 \times \% \text{Mo}) + (16 \times \% \text{N}).$$

NOTE 6 A PREN of 18 is approximately equivalent to Grade 304, and a PREN of 23 is approximately equivalent to Grade 316.

- (f) Copper pipes shall only be of Type A, B or C.

NOTE 7 Refer to AS 1432 for information on copper types (A, B or C).

NOTE 8 Copper pipes manufactured in accordance with NZS 3501 are also suitable for use in New Zealand.

2.5 Plastics pipes and fittings

2.5.1 Cold water service

Where plastic pipes and fittings are used in a cold water service, they shall be of the following material types:

- (a) Acrylonitrile butadiene styrene (ABS).
- (b) Polybutylene (PB) pipes and fittings.
- (c) Polyethylene (PE) pipes and fittings.
- (d) Cross-linked polyethylene (PE-X) pipes and fittings.
- (e) Multilayer pipes (MLP) and fittings.
- (f) Unplasticized polyvinyl chloride (PVC-U) pipes and fittings.
- (g) Modified polyvinyl chloride (PVC-M) pipes and fittings.
- (h) Oriented polyvinyl chloride (PVC-O) pipes and fittings.
- (i) Polypropylene (PP) pipes and fittings.

NOTE 1 See [Appendix B](#) for information on demonstrating products and materials are fit for purpose.

NOTE 2 The following Standards contain additional information:

- (a) AS/NZS 3518 — Acrylonitrile butadiene styrene (ABS) compounds, pipes and fittings.
- (b) AS/NZS 2642.2 or AS 5082.1 — hot and cold. water polybutylene (PB) pipes.
- (c) AS/NZS 2642.3 or AS 5082.2 — mechanical jointing fittings for use in PB piping systems.
- (d) AS/NZS 4129 — Polyethylene (PE) fittings and AS/NZS 4130 — PE pipes for pressure applications.
- (e) AS/NZS 2492 — Cross-linked polyethylene (PE-X) pipes for pressure applications.
- (f) AS/NZS 2537 (Parts 1, 2 and 5) — mechanical jointing fittings for use with PE-X pipes.
- (g) AS 4176 (Parts 1, 2, 3, 5 and 7) — multilayer pipes (MLP) and fittings for pressure applications.
- (h) AS/NZS 1477 — Unplasticized polyvinyl chloride (PVC-U) pipes and fittings.
- (i) AS/NZS 4765 — Modified polyvinyl chloride (PVC-M) pipes and fittings.
- (j) AS/NZS 4441 — Oriented polyvinyl chloride (PVC-O) pipes and fittings.

- (k) ISO 15874 (all parts) — Polypropylene (PP) pipes and fittings.
- (l) ASTM D2846 — Chlorinated polyvinyl chloride (PVC-C) pipes and fittings.

2.5.2 Firefighting water services

Where plastic pipes and fittings are used in firefighting water services, they shall be of the following material types:

- (a) Chlorinated polyvinyl chloride (PVC-C) pipes and fittings.
- (b) Unplasticized polyvinyl chloride (PVC-U) pipes and fittings.
- (c) Modified polyvinyl chloride (PVC-M) pipes and fittings.
- (d) Oriented polyvinyl chloride (PVC-O) pipes and fittings.
- (e) Polyethylene (PE) pipes and fittings.

2.5.3 Limitations

Plastics pipes and fittings shall conform to the following:

- (a) Where plastics pipes and fittings are subject to direct sunlight, the following apply to the installation:
 - (i) Coloured, striped and jacketed pipes and fittings shall be protected, see [Clause 2.5.3\(b\)](#) Notes 1 to 3. (Solid black PE pipes and fittings are not required to be protected.)
 - (ii) ABS is not required to be protected.
 - (iii) Coloured, striped and jacketed PE-X pipes and fittings shall be protected. (Solid black PE-X pressure pipe is not required to be protected.)
 - (iv) Plastics pipes of other materials including PVC, PB, PP and MLP shall be protected, see [Clause 2.5.3\(b\)](#) Note 2.
- (b) Plastics pipes and fittings shall not be used to support valves, meters or associated pipes and fittings.

NOTE 1 Examples of protection include sleeving with metal or plastics pipes or conduit or lagging.

NOTE 2 Refer to AS/NZS 2032 for the use, handling and transportation and storage requirements for PVC pipes and fittings.

NOTE 3 Refer to AS/NZS 2033 for the transport, handling and storage requirements for PE pipes and fittings.
- (c) The minimum pressure rating for plastics pipes used in a cold water service is PN 12.
- (d) The minimum pressure rating for plastics pipes used in a firefighting water service is PN 16.
- (e) The minimum pressure rating for plastics pipes used in a fire sprinkler system is PN 12 for above ground and PN 16 for below ground.

2.6 Safe-tray materials

Safe-trays shall be —

- (a) fabricated from 0.60 mm thick galvanized steel sheet having a minimal nominal zinc coating mass of 275 g/m²; or

- (b) made from other materials with corrosion properties not inferior to the requirements of (a).

2.7 Joints

2.7.1 Flanged joints

Where flanged joints are used, they shall be of the following material types:

- (a) PVC-U.
- (b) Polyethylene.
- (c) Ductile iron, cast iron and grey cast iron.
- (d) Copper alloy and composite.
- (e) Steel.

NOTE The following Standards contain additional information:

- (a) AS 2129 — flanges for metal pipes, valves and fittings.
- (b) AS/NZS 4331.1 — steel flanges.
- (c) AS/NZS 4331.2 — cast iron flanges.
- (d) AS/NZS 4331.3 — copper and copper alloy composite flanges.
- (e) AS/NZS 4087 — metallic flanges for waterworks purposes.
- (f) AS/NZS 1477 — PVC pipes and fittings for pressure applications.
- (g) AS/NZS 2280 — ductile iron pipes and fittings.
- (h) AS/NZS 2544 — grey iron pressure fittings.

2.7.2 Elastomeric seals

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

NOTE Refer to AS 1646 for information on elastomeric seals for waterworks purposes.

2.7.3 Silver brazing alloy

2.7.3.1 Copper and copper alloys

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

NOTE Refer to AS/NZS 1167.1 for information on filler metal for brazing and braze welding.

2.7.3.2 Stainless steels

Silver brazing alloys for capillary jointing of stainless-steel pipes and fittings shall contain a minimum of 38 % silver and a maximum of 0.05 % cadmium.

NOTE Refer to AS/NZS 1167.1 for information on filler metal for brazing and braze welding.

2.7.4 Solvent cement and priming fluid

Solvent cement and priming fluid shall be used for the solvent cement jointing of PVC-U and PVC-M pipes and fittings. Solvent cement shall not be used without priming fluid.

NOTE 1 The colour of the priming fluid should be different from the colour of the solvent cement and the pipe to which it is applied. Generally, the priming fluid is pink, and the solvent cement is generally —

- (a) for Type P PVC, green (Australia) or blue or gold (New Zealand);
- (b) for Type N PVC, blue (Australia) or clear (New Zealand);
- (c) for Type P ABS, grey; and
- (d) for Type G, clear.

NOTE 2 See [Clause 5.6.9](#) for plastics pipes jointing requirements.

2.7.5 Filler rods for stainless steel joints

Welded 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.

NOTE Refer to AS/NZS 1167.2 for information on filler metals for welding.

2.8 Miscellaneous materials

2.8.1 Concrete mix

Ready-mixed concrete shall have a minimum characteristic compressive strength of 20 MPa. Site-mixed concrete shall consist of cement, fine aggregate and coarse aggregate, all measured by volume with sufficient water added to make the mix workable. Site-mixed concrete shall have a minimum characteristic compressive strength of 20 MPa.

NOTE 1 Refer to AS 1379 for information on the specification and supply of concrete.

NOTE 2 The compressive strength of concrete is defined in —

- (a) AS 3600 in Australia; and
- (b) NZS 3109 and NZS 3124 in New Zealand.

NOTE 3 Refer to AS/NZS 4671 for information on steel reinforcing materials.

2.8.2 Cement mortar

Cement mortar shall consist of one part cement and two parts of fine aggregate, all measured by volume and properly mixed with the minimum amount of water necessary to render the mix workable. However, for bedding pipes, a mixture consisting of one part cement to four parts fine aggregate may be used.

Cement mortar that has been mixed and left standing for more than 1 h shall not be used.

NOTE Refer to AS 1478.1 for information on chemical admixtures, mortar and grout.

2.8.3 Water for concrete and mortar

Water used for mixing concrete and cement mortar shall be free from impurities that are harmful to the mixture, the reinforcement, or any other items embedded within the concrete or mortar.

2.8.4 Timber

2.8.4.1 Timber in Australia

In Australia, timber exposed to the weather shall be of Durability Class 2 or treated with an appropriate preservative. Timber in contact with the ground shall be of Durability Class 1.

NOTE 1 Refer to AS/NZS 2878 for information on timber classification into strength groups.

NOTE 2 Refer to AS/NZS 1604 for information on preservative treatment of sawn and round timber.

2.8.4.2 Timber in New Zealand

In New Zealand, timber exposed to the weather shall be treated to H3 (CCA). Timber in contact with the ground shall be treated to H4 (CCA).

NOTE 1 Refer to NZS 3631 for information on timber grading rules.

NOTE 2 Refer to NZS 3640 for information on chemical preservation of round and sawn timber.

2.8.5 External protective coatings

External coatings used for the protection of pipes and fittings buried in corrosive areas shall —

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

NOTE Polyethylene sleeving used to protect underground pipes and fittings may require additional protection if installed in rock or stony ground.

2.8.6 Marking tape

Where required, marking tape conforming to AS/NZS 2648.1 shall clearly identify the contents of the service.

Section 3 Sizing of water services

3.1 Scope of section

This section specifies requirements for the sizing of pipes for water service installations.

3.2 Flow requirements

3.2.1 Flow rates

The flow rates to fixtures, appliances, taps, valves and cisterns shall be not less than the flow rates specified in [Table 3.2.1](#).

A cold water outlet from a shower, basin, kitchen sink or laundry trough shall have a maximum flow rate of not more than 9 L/min. These requirements do not apply to a shower intended to provide rapid drenching of a person for emergency purposes, such as chemical removal.

Table 3.2.1 — Minimum 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 (20 nom. size)	0.30	18	8
Hose tap (15 nom. size)	0.20	12	4
NOTE 1 In the case of valves and appliances where test information indicates that they will function satisfactorily with a flow rate less than that shown in this Table, the tested flow rate may be substituted and the loading units adjusted accordingly.			
NOTE 2 Flow rates and loading units given above are taken with cold water flowing from each individual outlet.			

3.2.2 Loading units

Loading units are factors that take into account the flow rate, length of time in use, and frequency of use of the fixture or appliance. Loading units shall be as specified in [Table 3.2.1](#).

3.2.3 Probable simultaneous demand

The probable simultaneous demand (PSD) for dwellings shall be not less than that specified in [Table 3.2.3](#).

The minimum flow rates specified in [Table 3.2.3](#) shall be used to estimate the size of the supply pipe for dwellings.

NOTE See [Appendix C](#) for a method of sizing supply piping for dwellings.

Table 3.2.3 — Minimum probable simultaneous demand for dwellings

Number of units or dwellings	Flow rate L/s	Number of units or dwellings	Flow rate L/s	Number of units or dwellings	Flow rate L/s
1	0.48	35	3.74	68	5.79
2	0.70	36	3.81	69	5.85
3	0.88	37	3.88	70	5.91
4	1.03	38	3.95	71	5.96
5	1.17	39	4.01	72	6.02
6	1.30	40	4.08	73	6.08
7	1.41	41	4.14	74	6.13
8	1.53	42	4.21	75	6.19
9	1.64	43	4.27	76	6.25
10	1.74	44	4.34	77	6.30
11	1.84	45	4.40	78	6.36
12	1.94	46	4.47	79	6.41
13	2.03	47	4.53	80	6.47
14	2.12	48	4.59	81	6.53
15	2.21	49	4.66	82	6.58
16	2.30	50	4.72	83	6.64
17	2.39	51	4.78	84	6.69
18	2.47	52	4.84	85	6.75
19	2.55	53	4.90	86	6.80
20	2.64	54	4.96	87	6.86
21	2.72	55	5.02	88	6.91
22	2.79	56	5.09	89	6.96
23	2.87	57	5.15	90	7.02
24	2.95	58	5.21	91	7.07
25	3.03	59	5.27	92	7.12
26	3.10	60	5.32	93	7.18
27	3.17	61	5.38	94	7.23
28	3.25	62	5.44	95	7.29
29	3.32	63	5.50	96	7.34
30	3.39	64	5.56	97	7.39
31	3.46	65	5.62	98	7.44
32	3.53	66	5.68	99	7.50
33	3.60	67	5.73	100	7.55
34	3.67	—	—	—	—

NOTE 1 The minimum flow rates shown in this table are based on domestic installations. If it is expected that the dwelling(s) will have a greater demand, then the probable simultaneous flow rates may be estimated using the loading unit method outlined in [Appendix D](#).

Table 3.2.3 (continued)

Number of units or dwellings	Flow rate L/s	Number of units or dwellings	Flow rate L/s	Number of units or dwellings	Flow rate L/s
NOTE 2 Determination of PSD for dwellings exceeding the scope of this table may be estimated using the following equation: $Q = 0.03 n + 0.4554 \sqrt{n}$ where Q = flow rate, in litres per second n = number of dwellings					

3.2.4 Probable simultaneous flow rates

Conversion of loading units to probable simultaneous flow rates (PSFRs) for branch piping within dwellings is given in [Table 3.2.4](#).

NOTE 1 A method for sizing of piping within dwellings is given in [Appendix D](#).

NOTE 2 The flow rates given in [Table 3.2.4](#) may be used to estimate the minimum size of piping within dwellings.

Table 3.2.4 — Probable simultaneous flow rates

Loading units	PSFR L/s	Loading units	PSFR L/s	Loading units	PSFR L/s
1	0.09	21	0.39	41	0.55
2	0.12	22	0.40	42	0.56
3	0.14	23	0.41	43	0.57
4	0.16	24	0.42	44	0.58
5	0.18	25	0.43	45	0.58
6	0.20	26	0.43	46	0.59
7	0.22	27	0.44	47	0.60
8	0.24	28	0.45	48	0.60
9	0.25	29	0.46	49	0.61
10	0.26	30	0.47	50	0.62
11	0.28	31	0.48	51	0.62
12	0.29	32	0.49	52	0.63
13	0.30	33	0.49	53	0.64
14	0.31	34	0.50	54	0.64
15	0.33	35	0.51	55	0.65
16	0.34	36	0.52	56	0.65
17	0.35	37	0.52	57	0.66
18	0.36	38	0.53	58	0.67
19	0.37	39	0.54	59	0.67
20	0.38	40	0.55	60	0.68

3.3 Pressure requirements

3.3.1 Available pressure

Pipe sizing shall be based on the minimum available pressure.

NOTE The maximum and minimum pressures for the water main serving the property may be obtained from the utility responsible for the supply of water.

3.3.2 Pressure at outlets

The minimum working pressure at the furthestmost or most disadvantaged fixture or outlet shall be not less than 50 kPa (5 m head), at the flow rate specified in [Table 3.2.1](#).

NOTE 1 Storage tanks conforming to [Section 8](#) or booster pumps conforming to [Section 13](#) may be required to achieve the minimum pressure.

NOTE 2 Some fixtures may require more than 50 kPa supply pressure in order to function.

3.3.3 Pressure losses

Allowance shall be made for pressure losses through pipes, valves, fittings, meters and any other equipment present in the installation.

NOTE The methods used in [Appendices C](#) and [D](#) make an allowance of 50 % additional pipe length for pressure losses through fittings.

3.3.4 Maximum pressure within buildings

The maximum static pressure at any outlet, other than a fire service outlet, within a building shall 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.

3.3.5 Availability of water supply

Where the available water supply cannot meet the minimum pressure and flow rates of this section, storage tanks with or without pumps shall be installed to achieve the pressure and flow rate demands in accordance with this section.

3.4 Velocity requirements

The maximum water velocity in piping shall be 3.0 m/s.

The velocity limitation shall not apply to any piping that is exclusively used for fire services, whether independently served by a main or combined with a domestic water supply.

3.5 Pipe size limitations

3.5.1 Water service

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

Internal diameter of pipes shall be as specified in [Appendix A](#).

NOTE 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.

C3.5.1 *Minimum internal diameter sizes quoted in this document have been derived from copper piping systems.*

3.5.2 Branch offtakes

Branch offtake pipes shall —

- (a) be of a length not exceeding those specified in [Table 3.5.2](#); 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 See [Appendix A](#) for minimum internal diameter of pipes.

Table 3.5.2 — Branch offtake pipe-length

Internal diameter of offtake pipe mm	Maximum length m
12.5	6
10.0	3
7.0	1

Section 4 Cross-connection control and backflow prevention

4.1 Scope of section

This section specifies requirements and methods for the prevention of contamination of the drinking water within the water service and the water main and provides for the selection and installation of backflow prevention devices.

NOTE See [Appendix E](#) for typical examples of potential cross-connections.

4.2 Protection of water supplies

4.2.1 Design

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

4.2.2 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.

4.2.3 Combined tanks

Combined tanks storing drinking water and water for other purposes shall achieve separation of the storage compartments by the internal installation of double partition walls. The space between the partition walls shall be arranged to ensure that any leakage is not able to enter the other compartment of the tank and is drained such that any discharge is external to the tank and readily noticed.

4.2.4 Alternative water supplies

Where water supplied from one source is connected to another water source, appropriate backflow prevention shall be provided.

NOTE This includes connections between drinking and non-drinking water supplies or multiple non-drinking water supplies.

4.2.5 Integral backflow prevention

Where backflow prevention devices are provided as an integral part of a fixture, appliance or apparatus and are appropriate for the cross-connection hazard generated by that fixture, appliance or apparatus, no additional backflow prevention is required upstream of the point of connection to the water supply system.

NOTE Where a cross-connection is found in the water service at any property or if the water service is installed in a manner that will enable backflow to occur, such cross-connection should be reported to the water utility in Australia and territorial authority in New Zealand.

4.3 Cross-connection hazard rating

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

- (a) *High hazard* — Any condition, device or practice that, in connection with the water supply system, has the potential to cause death.
- (b) *Medium hazard* — Any condition, device or practice that, in connection with the water supply system, has the potential to endanger health.

- (c) *Low hazard* — Any condition, device or practice that, in connection with the water supply system, constitutes a nuisance but does not endanger health or cause injury.

4.4 Provision of backflow prevention devices

4.4.1 General

The required backflow protection shall be determined by 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 for the degree of hazard, is provided.

NOTE 1 See [Figure 4.4.1](#) for typical backflow prevention.

The drinking water supply shall be protected from the hazard(s) by installing —

- (a) individual protection at each hazard with a device listed in [Table 4.4.1](#), depending on the hazard rating;
- (b) zone protection with a device listed in [Table 4.4.1](#), depending on the hazard rating, and pipework identified in accordance with [Clause 4.4.5](#);
- (c) containment protection including devices for fire service installations with a device listed in [Table 4.4.1](#); or
- (d) combinations of (a), (b) and (c).

Registered air gaps and registered break tanks shall conform to AS 2845.2.

NOTE 2 In New Zealand, NZBC Acceptable Solution G12/AS1 includes acceptable test methods for backflow prevention devices and verification of air gaps.

NOTE 3 In assessing a 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.

NOTE 4 Refer to AS/NZS 2845.1 for information on materials, design and performance requirements for backflow prevention devices.

NOTE 5 See [Appendix E](#) for typical examples of potential cross-connection.

4.4.1 *Types of backflow prevention may include —*

- (a) *individual protection provided at individual fixtures, appliances or apparatus;*
- (b) *zone protection provided at the connection to specific sections of a water supply system within a building or a facility;*
- (c) *containment protection provided at the property boundary to protect the network utility operator's water supply; or*
- (d) *combinations of (a), (b) and (c).*

Table 4.4.1 — Suitability of devices

Registered or testable backflow prevention device	Cross-connection hazard rating	Protection against back-pressure	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) ^a	High/medium/low	Yes	Yes
Reduced pressure detector assembly (RPDA) ^a	High/medium/low	Yes	Yes
Double-check valve assembly (DCV) ^a	Medium/low	Yes	Yes
Double-check detector assembly (DCDA) ^a	Medium/low	Yes	Yes
Spill resistant pressure type vacuum breaker (SPVB) ^a	High/medium/low	No	Yes
Pressure type vacuum breaker (PVB) ^a	High/medium/low	No	Yes
(b) Non-testable devices			
Dual-check valve with atmospheric port (DCAP) ^b	Low	Yes	Yes
Dual-check valve (DUAL CV) ^b	Low	Yes	Yes
Dual-check valve with intermediate vent (DuCV) ^b	Low	Yes	Yes
Air gap (AG)	High/medium/low	No	Yes
Break tank (BT)	Low	No	Yes
Atmospheric vacuum breaker (AVB) ^b	High/medium/low	No	Yes
Hose connection vacuum breaker (HCVB) ^{b, c}	Low	No	Yes
Beverage dispenser dual-check valve (BDDC) ^b	Low	Yes	Yes
Pipe interrupter device (PID)	Low	No	Yes
(c) Fire services in Australia only			
Single check valve (testable) (SCVT) ^a	Low	Yes	Yes
Single check detector assembly (testable) (SCDAT) ^a	Low	Yes	Yes

^a 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.

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

^c HCVBs are designed to withstand the small amount of back-pressure that would occur if the end of the hose is higher than the hose tap.

NOTE 1 PVBs are designed to vent at 7 kPa or less; however, they may require a significantly higher pressure to reseal and should be installed only 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 may be encountered.

NOTE 2 In areas where water spillage may cause nuisance, tundishes or alternative drainage should be installed to receive the discharge from — (a) RPZDs; (b) PVBs; (c) DCAP; or (d) AVBs.

NOTE 3 SPVBs, PVBs, AVBs, HCVBs and PIDs should only be used to protect against back-siphonage.

4.4.2 Type of backflow protection

Backflow prevention devices shall be provided as appropriate to —

- (a) the hazard rating given in [Clause 4.3](#); and
- (b) the suitability of the device listed in [Table 4.4.1](#).

NOTE 1 In Australia, the requirements for cross-connection control are contained in the Plumbing Code of Australia.

NOTE 2 In New Zealand, refer to New Zealand Building Code Acceptable Solution G12/AS1 for examples of cross connection hazards and applicable hazard ratings.

4.4.3 Hose taps

Hose taps within 18 m of a zone-protected area within the same premises shall have a backflow protection device of the same hazard rating as the zone protection adjacent to which they are installed.

4.4.4 Additional backflow protection

Where cross-connections are identified, zone(s) or individual backflow prevention devices appropriate to the hazard rating given in [Clause 4.3](#) shall be installed.

NOTE 1 For typical examples of potential cross-connections, see [Figure 4.4.1](#) and [Appendix E](#).

NOTE 2 Additional backflow protection may also be required by the network utility operator.

4.4.5 Water downstream of backflow prevention device

Water downstream of a containment device is considered to be drinking water unless there are unprotected hazards within the premises.

Individual or zone protection against these hazards shall be provided to prevent contamination of the water supply.

The water service downstream of a backflow prevention device shall not be reconnected to the water service upstream of the backflow prevention device without the installation of a backflow prevention device of the same hazard rating.

Piping conveying water downstream of a backflow prevention device, installed for high or medium hazard protection, other than a backflow prevention device used for containment, shall be clearly and permanently labelled at every outlet with a prohibition sign conforming to [Clause 9.7.2](#).

NOTE See [Section 9](#) for requirements for non-drinking water.

4.4.6 Commissioning

Testable backflow prevention devices shall be commissioned and tested in accordance with AS/NZS 2845.3 after installation and prior to service. Reduced pressure zone devices, double check valve assemblies, pressure type vacuum breakers, registered break tanks and registered air gaps shall only be used with a maintenance program for device registration and test certification.

Where there is no such program, these devices shall not be fitted and the standard requirements for air gaps shall apply.

NOTE 1 In New Zealand, the testing of automatic backflow protection devices is required for compliance with the Building Act 2004 as part of issuing a building compliance schedule and annual building warrant of fitness.

NOTE 2 In Australia, ongoing field testing and maintenance may be prescribed by state and territory legislation.

4.4.7 Heated water systems

The requirements of this section for backflow prevention devices apply equally to heated water supply systems and cold water supply services. The backflow prevention device used in heated water systems shall be suitable for the specific heated water installation.

4.5 Suitability of devices for hazards

[Table 4.4.1](#) lists devices suitable for each hazard rating and indicates whether protection is provided against back-pressure or back-siphonage.

The type of device selected for each hazard rating shall conform to [Table 4.4.1](#).

4.6 Installation of backflow prevention devices

4.6.1 General installation requirements

The installation of each backflow prevention device shall conform to the following:

- (a) Heat shall not be applied to any device during installation.
- (b) Except for fire services, the following shall be fitted with line strainers:
 - (i) Pressure type vacuum breaker (PVB).
 - (ii) Spill resistant pressure type vacuum breaker (SPVB).
 - (iii) Double check valve (DCV).
 - (iv) Double detector check valve (DDCV).
 - (v) Reduced pressure zone device (RPZD).
 - (vi) Detector reduced pressure zone device (DRPZD).
- (c) Line strainer elements shall be as specified in [Table 4.6.1](#).
- (d) For all testable devices, resilient-seated (drop tight when closed) isolating valves shall be installed —
 - (i) immediately upstream of the line strainer or immediately upstream of the device in cases where no integral line strainer is fitted [see Item (b)]; and
 - (ii) immediately downstream of the device.
- (e) Piping shall be flushed before devices are connected.
- (f) Unprotected bypasses shall not be installed around backflow prevention devices.
- (g) The devices shall be installed in accordance with [Clause 4.6.3](#).
- (h) The devices shall be protected from damage, including freezing.
- (i) Where continuous water supply is essential, devices shall be installed in parallel to permit shutdown of a device.
- (j) In-line devices shall be capable of being removed and replaced.

Table 4.6.1 — Maximum orifice diameters and maximum centre distances of line strainer element perforations

Size DN	Maximum orifice diameter mm	Maximum centre distance mm
20	1.6	2.4
25	1.6	2.4
32, 40, 50	3.25	5.6
80, 100, 150	4.6	5.6
200, 250, 300	4.6	5.6

4.6.2 Location of devices

4.6.2.1 General

The location of each backflow prevention device shall conform to the following:

- (a) Backflow prevention devices shall not be located in a corrosive or polluted atmosphere where the contaminated air can enter the piping system through the air gap or open vent port or cause the device to malfunction.
- (b) Insulation or any other protection of a backflow prevention device shall not interfere with its operation, testing or maintenance.
- (c) Vented testable backflow prevention devices shall not be located in cabinets without drainage or in pits without drainage.
- (d) Backflow prevention devices shall not be buried in the ground.
- (e) Where water hammer occurs, it shall be rectified by the installation of a surge protector or water hammer arrestor.
- (f) All in-line devices shall be installed with connections to permit the removal and replacement of the device.
- (g) Containment devices shall be located as close as practicable to the point of connection and downstream of any water meter. There shall be no branch connection between the meter and device.

4.6.2.2 Accessibility

All devices shall be readily accessible for ease of maintenance or testing without the need to work from ladders or scaffolding.

Where the device is fitted with test taps, their location shall ensure the clearance necessary for the performance of the applicable test procedure and maintenance.

4.6.2.3 Drainage and leakage

Backflow prevention devices shall be positioned so that any leakage from air ports of vacuum breakers and openings on pipe interrupter devices, or discharge from reduced pressure zone devices and dual-check valves with atmospheric port, is readily visible, but does not constitute a hazard or nuisance.

4.6.3 Specific installation requirements for testable and non-testable devices

4.6.3.1 General

Backflow prevention devices shall be installed in accordance with [Clauses 4.6.1, 4.6.3.2 and 4.6.3.3](#).

4.6.3.2 Testable devices

Testable devices shall be installed as follows:

- (a) *Registered break tank (RBT) and registered air gap (RAG)* — RBTs shall conform to [Section 8](#) of this document and incorporate the following air gap requirements:
 - (i) The unobstructed vertical distance through the free atmosphere between the lowest opening of a water service pipe or fixed outlet supplying water to an RBT and the highest possible water level of such RBT shall be as given in [Table 4.6.3.2](#).
 - (ii) Where any break tank receives water from two or more water services of different diameter, the air gap shall be not less than the air gap required for the largest effective opening of the water service outlets as given in [Table 4.6.3.2](#).
- (b) *Pressure type vacuum breaker (PVB)* — PVBs shall —
 - (i) be located not less than 300 mm above the highest outlet;
 - (ii) be ventilated to the atmosphere at all times; and
 - (iii) not be located in an area that may be subjected to ponding or freezing.
- (c) *Double-check valve (DCV) assembly* — DCV assemblies shall be located so as not to be subject to freezing.
- (d) *Reduced pressure zone device (RPZD)* — RPZDs shall —
 - (i) have free ventilation to the atmosphere for the relief valve outlet, at all times;
 - (ii) not be located in an area that may be subjected to ponding or freezing;
 - (iii) have the relief drain outlet located not less than 300 mm above the finished surface level.
- (e) *Double-check detector assembly (DCDA)* — DCDA shall be located so that they are not subjected to freezing.
- (f) *Reduced pressure detector assembly (RPDA)* — RPDA shall —
 - (i) have free ventilation to the atmosphere for the relief valve, at all times;
 - (ii) not be located in an area subject to ponding or freezing;
 - (iii) have the relief drain outlet located not less than 300 mm above the finished surface level.
- (g) *Spill resistant pressure vacuum breaker (SPVB)* — SPVBs shall —
 - (i) be located not less than 300 mm above the highest outlet;
 - (ii) be ventilated to atmosphere at all times; and
 - (iii) not be located in areas that may be subjected to ponding.
- (h) *Single check valve (testable) (SCVT)* — SCVTs shall —
 - (i) be located so as not to be subjected to freezing;
 - (ii) have isolating valves installed immediately upstream and downstream of the device;
 - (iii) be fitted in an accessible position; and

- (iv) be used only in fire services.
- (i) *Single check detector assembly (testable) (SCDAT)* — SCDATs shall —
 - (i) be located so as not to be subjected to freezing;
 - (ii) have isolating valves installed immediately upstream and downstream of the device;
 - (iii) be fitted in an accessible position; and
 - (iv) be used only in fire services.

Table 4.6.3.2 — Minimum air gap

Diameter of the effective opening of water service outlet	Minimum air gap, mm	
	When not affected by near wall	When affected by near wall
≤ 9	20	25
> 9 ≤ 12	25	40
> 12 ≤ 20	40	55
> 20 ≤ 25	50	75
> 25	2 × effective opening	3 × effective opening

4.6.3.3 Non-testable devices

Non-testable devices shall be installed as follows:

- (a) *Atmospheric vacuum breaker (AVB)* — AVBs shall —
 - (i) be located not less than 150 mm above the highest outlet;
 - (ii) have no isolating valves located downstream of the vacuum breaker;
 - (iii) under normal operation, not remain continuously pressurized for more than 12 h;
 - (iv) be ventilated to the atmosphere, at all times;
 - (v) not be located in an area that may be subject to ponding; and
 - (vi) be located in-line and be at least the same size as the supply and discharge piping.
- (b) *Hose connection vacuum breaker (HCVB)* — HCVBs shall —
 - (i) be located downstream of the isolating valve;
 - (ii) not, under normal operation, remain continuously pressurized with water for more than 12 h; and
 - (iii) be ventilated to the atmosphere at all times.
- (c) *Dual-check valve with atmospheric port (DCAP)* — DCAPs shall —
 - (i) not be located in an area that is subject to ponding or freezing; and
 - (ii) have the vent port located not less than 300 mm above the finished surface level so that the device is freely drained or over a tundish.

NOTE 1 See [Clause 4.6.2.3](#) for information on leakage from devices.

- (d) *Dual check valve (DUAL CV)* — DUAL CVs shall not be located in an area subject to freezing.

- (e) *Dual check valve with intermediate vent (DuCV)* — DuCVs shall —
- (i) not be located in an area that is subject to ponding; and
 - (ii) have the vent port located not less than 300 mm above the finished surface level so that the device is freely drained or over a tundish.
- NOTE 2 See [Clause 4.6.2.3](#) for information on leakage from devices.
- (f) *Beverage dispenser dual-check valve (BDDC)* — BDDCs shall —
- (i) not be located in an area that is subject to freezing; and
 - (ii) have the vent port located not less than 300 mm above the finished surface level so that the device can drain freely.
- NOTE 3 See [Clause 4.6.2.3](#) for information on leakage from devices.
- (g) *Single-check valve — Spring loaded (Australia only)* — Spring-loaded single-check valves shall —
- (i) have an isolating valve installed upstream and adjacent to the device;
 - (ii) be fitted in an accessible position; and
 - (iii) only be used in fire services.
- (h) *Pipe interrupter device (PID)* — PIDs shall —
- (i) not be installed in a continuous pressure system; and
 - (ii) be located not less than 300 mm above the finished surface level so the device can drain freely.

NOTE 4 See [Clause 4.6.2.3](#) for information on leakage from devices.

Section 5 Installation of cold water services

5.1 Scope of section

This section specifies requirements for the installation of pipes, fittings, and apparatus used in cold water services.

NOTE Refer to AS/NZS 3500.4 for information on installation of heated water services.

C5.1 *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 electrical 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 and modified if necessary.

5.2 Installation of pipes and fittings

5.2.1 Copper pipes and fittings

Copper pipes and fittings shall be installed in accordance with AS 4809.

5.2.2 Plastics pipes and fittings

5.2.2.1 Installation of PVC pipe systems

PVC pipe systems shall be installed in accordance with AS/NZS 2032.

NOTE PVC materials include PCV-U, PCV-M, PVC-O and PVC-C.

5.2.2.2 Installation of ABS pipe systems

ABS pipe systems shall be installed in accordance with AS/NZS 3690.

5.2.2.3 Installation of PE pipe systems

PE pipe systems shall be installed in accordance with AS/NZS 2033.

5.2.2.4 Installation of other plastics pipe systems

NOTE Installation should take into account manufacturer's instructions.

5.3 Proximity to other services

5.3.1 General

Where electrical conduits, wires, cables or consumer gas pipes, drains and other services are in place, pipes shall be installed in accordance with the requirements of [Clauses 5.3.2 to 5.3.5](#).

5.3.2 Above-ground services

Separation of at least 25 mm shall be maintained between any above-ground water service and any of the following services:

- (a) Electrical or telecommunications conduits.

- (b) Electrical or telecommunications wires or cables.
- (c) Consumer gas pipes.
- (d) Sanitary plumbing and drainage.
- (e) Storm water drainage.
- (f) Other above-ground water services.
- (g) Any other services.

Where a pipe is insulated, the measurement shall be from the outer edge of any insulation or wrapped material applied to the pipework.

5.3.3 Below-ground services

5.3.3.1 Electrical

The following shall apply:

- (a) The separation between any underground water service pipe and an electrical supply cable, shall be at least —
 - (i) 100 mm for a water service pipe not greater than DN 65, where the electrical supply cable is indicated along its length with orange marker tape and is mechanically protected;
 - (ii) 300 mm for a water service pipe greater than DN 65, where the electrical supply cable is indicated along its length with orange marker tape and is mechanically protected; or
 - (iii) 600 mm where the electrical supply cable is neither indicated nor protected in accordance with Items (a) or (b).
- (b) The separation between any underground water service pipe and an extra-low voltage, not exceeding 50 V a.c. or 120 V ripple-free d.c. electrical supply, shall be at least 100 mm.

NOTE 1 Refer to AS/NZS 3000 for a definition of high voltage cable.

- (c) For an electrical supply not exceeding 1 000 V, the separation between any underground water service pipe and an electrical earthing electrode shall be at least 500 mm.

NOTE 2 Mechanical protection may be provided by concrete slabs, continuous concrete pour, polymeric cover strips, or bricks designed for protecting electrical supply cables and may include a suitable conduit.

NOTE 3 For an electrical supply exceeding 1 000 V, refer to the relevant regulatory authority for a ruling.

5.3.3.2 Gas

The separation between any underground water service pipe and consumer gas pipes shall be at least —

- (a) 100 mm for a water service pipe not greater than DN 65, provided the consumer gas pipe is indicated along its length with marker tape conforming to AS/NZS 2648.1 and laid 150 mm above the installed pipe;
- (b) 300 mm for a water service pipe greater than DN 65, provided the consumer gas pipe is indicated along its length with marker tape conforming to AS/NZS 2648.1 and laid 150 mm above the installed pipe; or

- (c) 600 mm where the consumer gas pipe is neither indicated nor mechanically protected.

NOTE See [Clause 5.3.3.3](#) for information on clearance from a communication cable.

5.3.3.3 Communication services

The separation between any underground water service pipe and a communication cable shall be at least 100 mm.

5.3.3.4 Stormwater and sanitary drainage

The following apply:

- (a) Water services pipes shall not be laid in or through any drain.
- (b) A water service pipe may be laid in the same trench as a drain, provided the following conditions are observed:
 - (i) The water service pipe is located on a shelf or ledge, excavated at one side of the trench not less than 50 mm from the continuation of the trench, or on compacted bedding such that the horizontal separation of the two pipes is not less than 100 mm and the required depth of cover is maintained.
 - (ii) The underside of the water pipe is at least 100 mm above the top of the drain.

NOTE See [Figure 5.3.3.4](#) for the laying of water supply piping in the same trench as a drain.

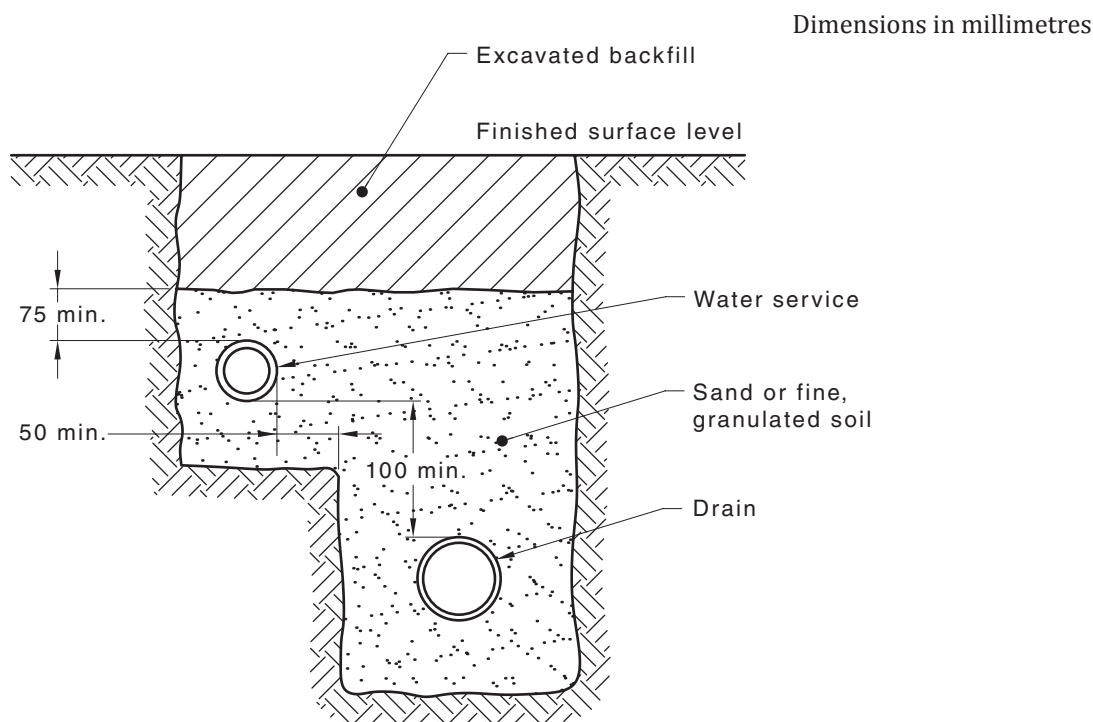


Figure 5.3.3.4 — Laying of water supply piping in same trench as a drain

5.3.3.5 Non-drinking water

Water services shall be separated from a non-drinking water service in accordance with [Clause 9.3.2](#).