



## Pipe sizing and commissioning

This technical note is to inform the plumbing industry about water supply pipe sizing and the commissioning of water supply services as set out in AS/NZS 3500.1:2021. Additional requirements for water services are listed in the Plumbing Code of Australia and the Plumbers Licensing and Plumbing Regulations 2000.

### Pipe sizing and commissioning

In order to supply adequate flows and pressures to plumbing fixtures it is important to correctly size and commission water supply pipes to all outlets.

Section 3 of AS/NZS 3500.1:2021 sets out minimum and maximum standards, pipe sizing methods as well as other sizing requirements. For example, for a single dwelling, water service pipes from the property service to branch off-takes shall have an internal diameter of not less than 15.0 mm.

A list of equivalent pipe sizes for materials other than copper is given in AS/NZS 3500.1:2021, appendix A.

### Pipe sizing information

The following information will be required to correctly pipe size:

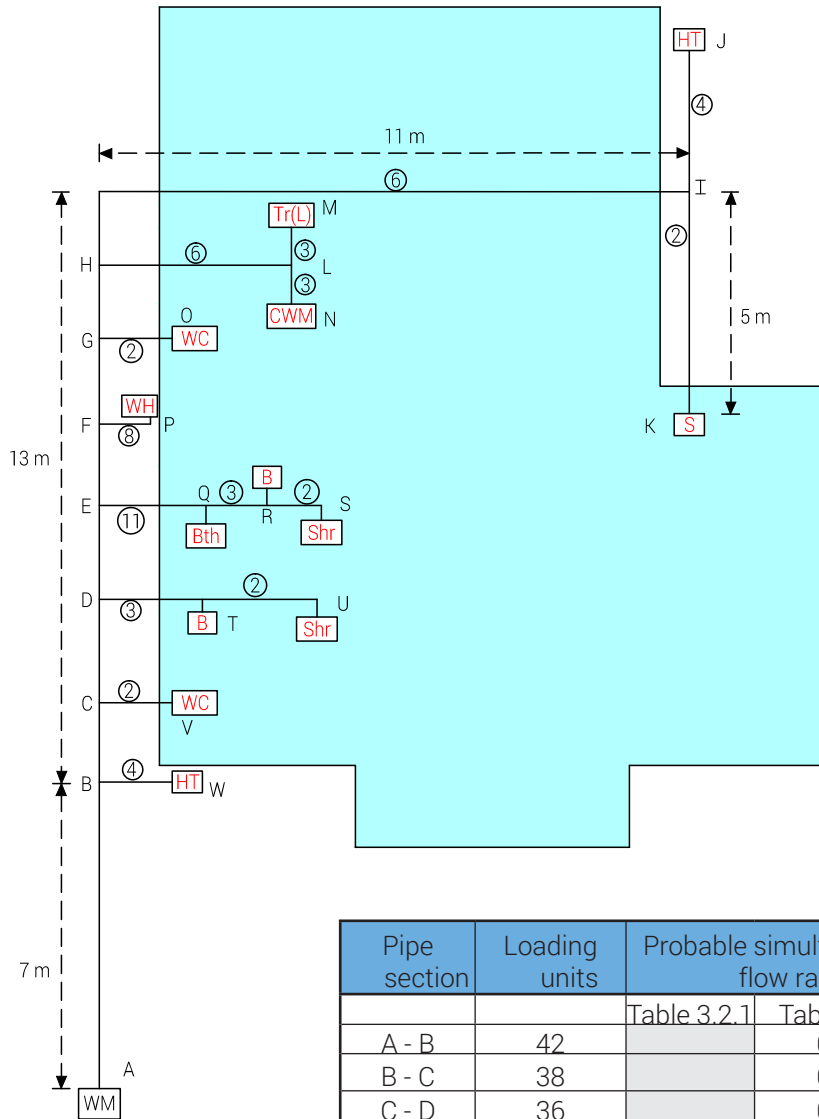
- |                                   |  |
|-----------------------------------|--|
| a) The pipe index length:-        | The distance from the water meter to the furthest outlet expressed in metres (m).  |
| b) The highest outlet:-           | The vertical height from the water meter to the highest outlet expressed in metres (m).  |
| c) Required pressure:-            | The minimum pressure allowable at the most disadvantaged outlet expressed in metres (m). Clause 3.3.2 requires a minimum pressure of 50 kPa (5m head). |
| d) Available pressure:-           | The minimum pressure that water is supplied by the water services provider expressed in metres (m).  |
| e) Flow rates and loading units:- | Specific flow rates and loading units of fixtures and appliances from AS/NZS 3500.1:2021, tables 3.2.1 and 3.2.4.                                      |

### Pipe sizing

Once you have the required information above, pipes can be sized using the following steps:

1. Create a drawing of the installation, label the pipe sections and draw a sizing table.
2. Insert loading units from table 3.2.1 into your table and onto your drawing.
3. Insert flow rates from table 3.2.1 for a single outlet and probable simultaneous flow rates from table 3.2.4 for multiple outlets into your table.
4. Determine the available pressure.
5. Calculate the pressure drop.
6. Calculate the index length.
7. Using the correct C1 table from appendix C for the pressure drop in head and the correct index length column in metres, pipe size each section of pipework in your table.

## Steps 1, 2 and 3



B	Basin
Bth	Bath
CWM	Clothes washing machine
HT	Hose tap
WH	Water heater
S	Kitchen sink
Shr	Shower
Tr(L)	Laundry trough
WC	Water closet
WM	Water meter

Pipe section	Loading units	Probable simultaneous flow rates		Nominal pipe size DN
		Table 3.2.1	Table 3.2.4	
A - B	42		0.56	20
B - C	38		0.53	20
C - D	36		0.52	20
D - E	33		0.49	20
E - F	22		0.40	20
F - G	14		0.31	18
G - H	12		0.29	18
H - I	6		0.20	18
I - J	4	0.20		18
I - K	2	0.10		15
H - L	6		0.20	18
L - N	3	0.20		18
L - M	3	0.12		15
G - O	2	0.10		15
F - P	8	0.20		18
E - Q	11		0.28	18
Q - R	3		0.14	15
R - S	2	0.10		15
D - T	3		0.14	15
T - U	2	0.10		15
C - V	2	0.10		15
B - W	4	0.20		18

### Note:

1. Water services providers have minimum flow rates and pressures that must be supplied under their operating licence. For example the Water Corporation charter is to supply a minimum flow rate of 20 litres per minute at a minimum pressure of 150 kPa in the metropolitan area and 130 kPa in rural areas. Always check the static pressure at the water meter before sizing any water service and make allowances for fluctuations in both flow and pressure depending on peak demand. It is good practice to take a minimum of two readings at different times of the day to assess variations in flow and pressures in the area.

#### Step 4:

The water service provider may be able to specify the minimum pressure available. For this example the minimum pressure available is 400 kPa or 40 m head.

#### Step 5:

The pressure drop is calculated using the following formula:

Pressure drop (PD)	=	Minimum available Head at water meter (m)	-	Height above water meter of highest outlet (m)	-	Minimum required head at outlets (m)
PD	=	40	-	2	-	5
PD	=	33				

As a 33 metre head pressure drop table does not exist, using the next lower pressure drop table ensures a safety margin will be included. To pipe size this example the 30 metre head pressure drop table from AS/NZS 3500.1:2021, appendix C will be used to size water supply pipes to all outlets.

#### Step 6:

$$\begin{aligned} \text{Pipe index length (m)} &= 7\text{m} + 13\text{m} + 11\text{m} + 5\text{m} \\ &= 36\text{m} \end{aligned}$$

If the pipe index length is between columns in table C1 (30m head), using the next higher pipe index length column again ensures a safety margin is included. To pipe size this example the 30 metre head pressure drop table and the 40 metre index length column will be used.

#### Step 7:

- Size each individual pipe length by reading down the correct index length column (40 m) to find a probable simultaneous flow rate equal to or greater than the probable simultaneous flow rate that has been entered into your table.
- Read across table C1 (30 m head) to the left hand column to find the appropriate pipe size for each length.
- Enter the pipe size into your table.

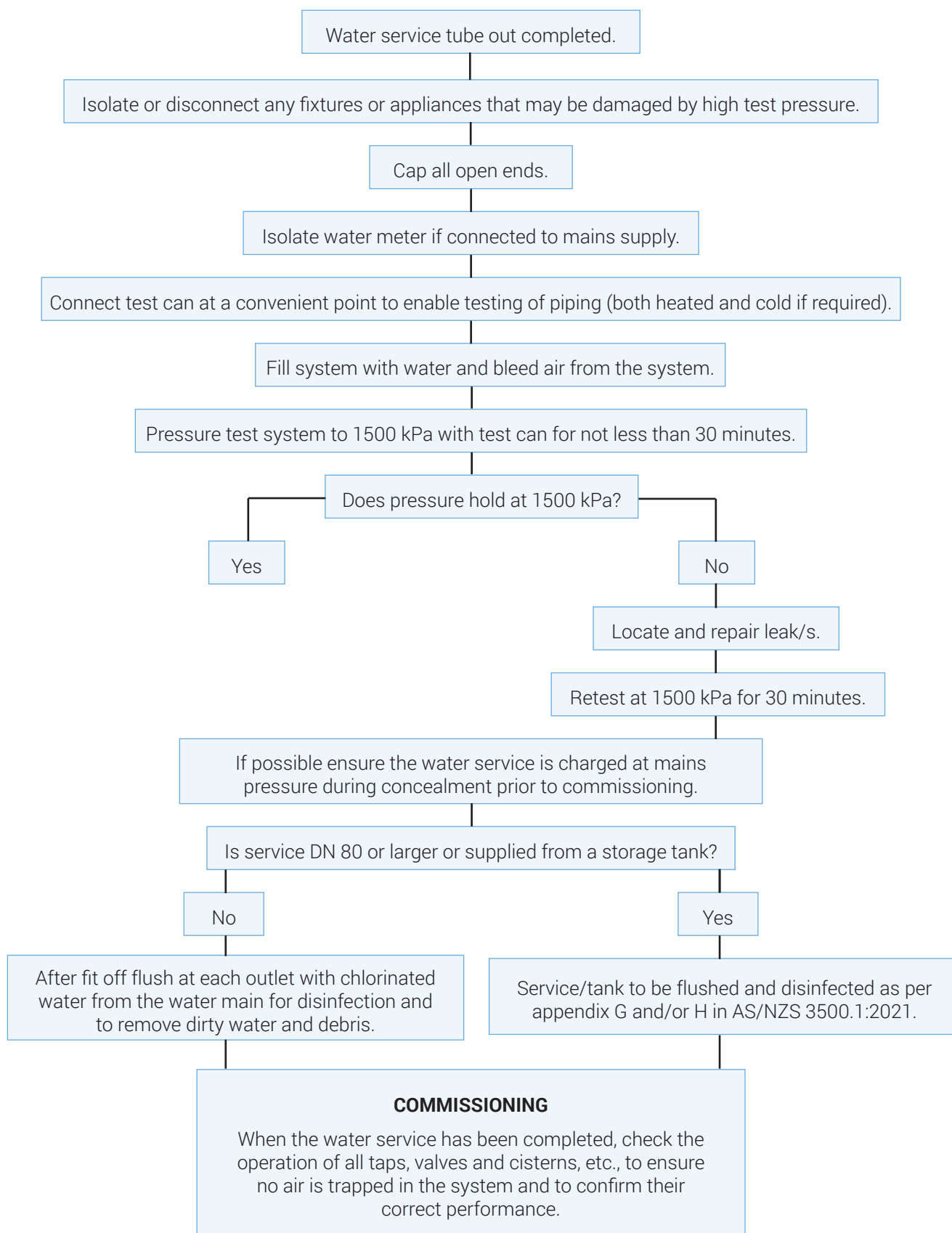
#### Equivalent Pipe Sizes:

This pipe sizing method uses copper as copper tube has traditionally proven to satisfy both the requirements for correct pipe sizing and the requirements of the Australian Standard. Therefore, the nominal pipe sizes (DN) and the minimum internal bore of the chosen material must then be checked against appendix A to ensure correct sizes if materials other than copper are used. Failure to do this may mean pressures, flow rates and velocities will not comply with AS/NZS 3500.1:2021. If in doubt ask the manufacturer to clarify the internal diameter of the pipe they are distributing.

#### Notes:

- If the nominal pipe size is required to be DN18 and copper tubing is used, the nominal pipe size may be reduced to DN 15 provided the cold water is being supplied to one (1) outlet only.
- If the nominal pipe size is required to be DN18 and copper tubing is used, the nominal pipe size shall be increased to DN 20 when cold water is being supplied to two (2) or more outlets.
- DN 15 may also supply cold water to a combination bath shower assembly, a laundry trough and clothes washing machine, or a kitchen sink and dishwasher configuration.
- Multiple dwellings - The probable simultaneous demand for multiple dwellings shall be not less than that shown in AS/NZS 3500.1:2021, table 3.2.3. These minimum flow rates shall be used to size the main supply piping for multiple dwellings and multi-storey buildings.
- It should be noted that the standards were formulated before water saving measures were implemented and therefore other pipe sizing methods may be more appropriate. Pipe sizing examples given in AS/NZS 3500.1:2021 are not mandatory and other methods may be used as long as the minimum flow rates stated in AS/NZS 3500.1:2021, table 3.2.1 and the PSD in AS/NZS 3500.1:2021, table 3.2.3 are met for domestic buildings or multi-unit developments.
- Accurate pipe sizing in multi-storey or other commercial buildings may be achieved using full hydraulic calculations or engineered water demand calculators calibrated for modern plumbing systems.

## Testing and commissioning of water services



## Flushing of water services

At the completion of the water service installation and prior to hydrostatic testing, the system and pipework shall be thoroughly flushed to remove any foreign matter. The flushing shall be undertaken in accordance with in appendix H, paragraph H3 and continue until the flushed water runs completely clear. The system shall then be pressure tested in accordance with AS/NZS 3500.1:2021, clause 17.2.

## Testing of water services

Water services shall not show any leakage when subjected to a hydrostatic pressure of 1500 kPa for a period of not less than 30 minutes. The test shall be performed on installed piping prior to burial or concealment. In the case of pipe systems with elastomeric seals, the piping shall be backfilled leaving the joints exposed until completion of the test.

It may be necessary to first disconnect and cap the water service to isolate it from the water main, fixtures and appliances, which may be damaged by the test pressure applied. It should be noted that fire services may require testing to higher pressures and for varied periods of time.

## Testing of plastic water services

Although plastic pipes shall be tested in accordance with AS/NZS 3500.1:2021, section 17, it may not always be possible to maintain the required test pressure of 1500 kPa for 30 minutes. The pressure may drop due to a number of factors including a creep response or stress relaxation in materials like polyethylene. When testing plastic water services it is acceptable to allow the test gauge to stabilise to a lower pressure, for example 1250 kPa, and if no leaks are present after 30 minutes the test is successful. Manufacturer's requirements should be taken into consideration and the following factors may affect a hydrostatic test:

- ▶ Length of section and diameter of pipe.
- ▶ Presence of air.
- ▶ Ambient temperature changes during the testing.
- ▶ Calibration of the test equipment

## Cleaning and disinfection of storage tanks and water services

AS/NZS 3500.1:2021, appendix G and appendix H set out procedures for the correct cleaning and disinfection of storage tanks and water services, prior to initial use and whenever the tank is taken out of service for inspection, repairs, painting or other activity that might lead to contamination of water.

## Commissioning of water services

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

### Notes

The technical note series is issued by the Plumbers Licensing Board to assist the plumbing industry to comply with the Plumbers Licensing and Plumbing Standards Regulations 2000 (the Regulations) applicable to plumbing work in Western Australia.

Each technical note is to be read in conjunction with Part 6 of the Regulations that currently adopt the Plumbing Code of Australia (PCA) and the deemed to satisfy provisions of AS/NZS 3500:2021, parts 0, 1, 2 and 4 but modified in certain matters to suit the State's building approach and other local conditions.

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