

1) AS/NZS 3500.4:2003

4.14 INSTALLATION OF HEATED WATER SERVICES

4.14.1 Design and installation

Heated water pipes in a non-circulatory heated water services shall be designed and installed to—

- (a) reduce to a minimum the amount of dead (cold) water drawn off before hot water commences to flow at any tap;
- (b) be sufficient to give the required flow at all outlets (including branches from noncirculatory services);
- (c) be by the shortest practicable route for the main flow heated water pipes and branches to the heated water outlets;
- (d) be the minimum necessary diameter of the heated water pipes required to supply the outlet drawoff; and
- (e) provide a water velocity not exceeding 3 m/s.

**NO recommendations for maximum water velocities in
Hot Potable Water Reticulation Systems (HWRS).
HWRS are simply not covered under AS3500.4:2003.**

**2) The (CDA) Plumbers Handbook 8th Edition July 2008,
page 30:**

RECOMMENDED WATER VELOCITIES

Section of Water Service Installation	Acceptable Velocity (m/s)
1. Pipelines at mains pressure	1.0 to 3.0
2. Pipelines from storage tanks serving: - the next two floors - below the next two floors	0.1 to 0.5 1.0 to 1.5
3. Pipelines (pumped supply): - suction pipelines - delivery pipelines	1.2 to 2.0 1.5 to 3.0

Exclusive of fire services, the recommended maximum water velocity in piping shall be 3 m/s.

These velocities relate to acceptable sound levels of moving water containing entrained air and the minimization of the effects of erosion. Erosion in water tubing results from the impingement of rapidly moving water, sometimes containing air bubbles or suspended solids, and can result in the complete penetration of the tube wall. The problem of impingement is more noticeable at sharp changes in direction (bends, tees) where localised turbulence can lead to high water velocities.


Irregularities in the pipe bore due to dents, misalignment, distortion at bends, solder globules, etc, can lead to erosion damage downstream.

**NO recommended maximum water velocity for
“Pipelines for Recirculated Heated water”**

**3) The “Hydraulic Service Design Guide 1st Edition
April 2014” of the ICAA (CDA Australia):**

Recommended Water Velocities				
Service	Velocity Range m/s.			
	Recommended Design Velocity m/s	Institute of Plumbing Australia Selection and Sizing of Copper Tubes for Water Piping Systems	Australian Standards AS 3500.4 2003 +Amend 1&2	British Standard BS 6700:2006 +A1:2009
Cold Water - Mains pressure water services pipelines	Up to 2.4 Up to 1.6 within Dwelling / Apartment	1.0 to 2.1	Max. 3.0	Max. 3.0
Cold Water - Gravity flow pipelines from upper level storage tanks – Top two floors only	0.1 to 0.4	0.1 to 0.4	Max. 3.0	Max. 3.0
Cold Water - Gravity flow pipelines from upper level storage tanks – below top two floors	1.0 to 2.1	1.0 to 2.1	Max. 3.0	Max. 3.0
Cold Water - Pump suction pipelines	1.2 to 2.1	1.2 to 2.1	Max. 3.0	Max. 3.0
Cold Water - Pump delivery pipelines	1.5 to 2.1	1.5 to 2.1	Max. 3.0	Max. 3.0
Heated water - Flow and return – circulating system	1.0	Not Specified	Not Specified	Max. 3.0
Heated water - Non-circulatory systems	2.0	1.0 to 2.1	Max. 3.0	Max. 3.0

*Table 17.1
Recommended Water Velocities for Cold and Heated Water Supplies*

 International Copper Association Australia
Copper Alliance

Recommended design velocity
“Heated water-Flow and return-circulatory system” 1.0 m/s
(“Not specified under AS/NZS 3500.4:2003”)

4) AS/NZS 3500.4:2015

AS/NZS 3500.4:2015

1.8 VELOCITY REQUIREMENTS

The maximum water velocity in piping shall be in accordance with Table 1.8.

TABLE 1.8
MAXIMUM ALLOWABLE FLOW VELOCITIES

Piping	Maximum flow velocities m/s	
	Copper pipes	Other materials
Circulatory	1.2	2.0
Other	3.0	3.0

NOTES:

- 1 Circulatory piping means piping where there is forced circulation of heated water.
- 2 Circulatory piping does not include—
 - (a) systems where the circulatory flow only occurs in response to activation by a user; and
 - (b) primary circulation in a solar water heater.
- 3 In circulatory piping, the maximum flow velocity is derived from the sum of forced circulation and probable simultaneous demand flow in the relevant section of piping.

A new table 1.8 “velocity requirements” was included in the AS/NZS 3500.4:2015

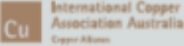
Maximum allowable water velocities in Hot Potable Water Reticulation Systems (HWRS) 1.2 m/s

(overruling the recommended design velocity mentioned in the “Hydraulic Service Design Guide 1st Edition April 2014” of the ICAA (CDA Australia)).

5) The “Hydraulic Service Design Guide April 2014 (plus amendments 2015)” of the ICAA:

Recommended Water Velocities				
Service	Velocity Range m/s.			
	Recommended Design Velocity m/s	Institute of Plumbing Australia Selection and Sizing of Copper Tubes for Water Piping Systems	Australian Standards AS 3500.4 2015	British Standard BS 6700:2006 +A1:2009
Cold Water - Mains pressure water services pipelines	Up to 2.4 Up to 1.6 within Dwelling / Apartment	1.0 to 2.1	Max. 3.0	Max. 3.0
Cold Water - Gravity flow pipelines from upper level storage tanks – Top two floors only	0.1 to 0.4	0.1 to 0.4	Max. 3.0	Max. 3.0
Cold Water - Gravity flow pipelines from upper level storage tanks – below top two floors	1.0 to 2.1	1.0 to 2.1	Max. 3.0	Max. 3.0
Cold Water - Pump suction pipelines	1.2 to 2.1	1.2 to 2.1	Max. 3.0	Max. 3.0
Cold Water - Pump delivery pipelines	1.5 to 2.1	1.5 to 2.1	Max. 3.0	Max. 3.0
Heated water - Flow and return – circulating system	1.0	Not Specified	Max. 1.2	Max. 3.0
Heated water - Non-circulatory systems	2.0	1.0 to 2.1	Max. 3.0	Max. 3.0

Table 17.1
Recommended Water Velocities for Cold and Heated Water Supplies

 International Copper Association Australia
Copper Alliance

Recommended design velocity
“Heated water-Flow and return-circulatory system” 1.0 m/s
(“AS/NZS 3500.4:2015 max. 1.2 m/s”)

**6) (ICAA) Plumbers Handbook 9th Edition March 2016,
page 39:**

Recommended Water Velocities

SECTION OF WATER SERVICE INSTALLATION	ACCEPTABLE VELOCITY (M/S)
1. Pipelines at mains pressure	1.0 to 3.0
2. Pipelines from storage tanks serving: - the next two floors - below the next two floors	0.1 to 0.5 1.0 to 1.5
3. Pipelines (pumped supply): - suction pipelines - delivery pipelines	1.2 to 2.0 1.5 to 3.0
4. Pipelines for Recirculated Heated Water	0.5 to 1.2

Exclusive of fire services, the recommended maximum water velocity in piping shall be 3 m/s.

These velocities relate to acceptable sound levels of moving water containing entrained air and the minimization of the effects of erosion. Erosion in water tubing results from the impingement of rapidly moving water, sometimes containing air bubbles or suspended solids, and can result in the complete penetration of the tube wall. The problem of impingement is more noticeable at sharp changes in direction (bends, tees) where localised turbulence can lead to high water velocities.

Irregularities in the pipe bore due to dents, misalignment, distortion at bends, solder globules, etc, can lead to erosion damage downstream.

4. “Pipelines for Recirculated Heated water” 0.5 to 1.2 m/s

Isn't this what Aquatherm Australia has been trying to tell the Australian Hydraulics market for years by publishing their Cautionary Note for mixed Cu/PP-R Hot Potable Water Reticulation Systems (HWRS)?

7) AS/NZS 3500.4:2018

1.8 VELOCITY REQUIREMENTS

The maximum water velocity in piping up to 65°C shall be in accordance with Table 1.8.

TABLE 1.8
MAXIMUM ALLOWABLE VELOCITIES

Piping	Maximum velocities m/s	
	Copper pipes	Other materials
Circulatory (flow)	1.2	2.0
Circulatory return line	1.0	1.0
Non-circulatory (flow)	3.0	3.0

NOTES:

- 1 Circulatory piping means piping where there is forced circulation of heated water.
- 2 Circulatory piping does not include—
 - (a) systems where the circulatory flow only occurs in response to activation by a user; and
 - (b) primary circulation in a solar water heater.
- 3 In circulatory piping, the maximum flow velocity is derived from the sum of forced circulation and probable simultaneous demand flow in the relevant section of piping.
- 4 Pipework should be designed for velocities lower than the maximum to allow for variations in flow.