

Technical Solution Sheet 6.10

6: Hot Water Plumbing

Thermal Insulation of Heated Water Pipework

AIM

The aim of this technical solution is to provide guidance on the minimum insulation requirements for new heated water reticulation systems from storage water heaters, heat exchange water heaters, instantaneous water heaters and all other authorized water heaters. This technical solution does not apply to central heating systems. For central heating systems, refer to the *Building Code of Australia*.

PLUMBING REGULATIONS 2008

The *Plumbing Code of Australia* (PCA) is adopted by and forms part of the *Plumbing Regulations 2008*. Part B2 of the PCA specifies the objectives and performance requirements related to the installation of heated water services. [AS/NZS 3500.4: Plumbing and drainage Part 4: Heated water services](#), is a “deemed to satisfy” document listed in Part B2 of the PCA and contains a section on “Water and energy efficiency”.

BACKGROUND

In the typical household, heated water is one of the biggest consumers of energy. It is therefore imperative for designers and installers of heated water systems to minimise waste of energy on keeping water hot or, heating water longer than necessary. The loss of heat from heated water piping adds to the energy input required for heating water, and it is vital that adequate thermal insulation is fitted when the piping is installed.

How is insulating effect measured?

Insulation materials have a low thermal conductivity and are rated by their resistance to heat flow (R) as calculated by the following formula:

Where:

R	=	thermal resistance (m ² K/W)
X _i	=	thickness of insulation (m)
k _i	=	thermal conductivity of insulation material (W/m K)
m ²	=	area in square metres
K	=	degrees Kelvin (or °C may be used)
W	=	energy flow in Watts

$$R = \frac{X_i}{k_i}$$

What R rating is required?

The minimum R rating for piping insulation is 0.3m² K/W. This is equivalent (but not limited) to 13mm thick closed cell polymer insulation.

Does this R 0.3m² K/W rating apply in all regions of Victoria?

The R rating required will depend on whether the piping is internal or external, and also the region in Victoria. For example Victoria is mostly classified as Climate Region B and external piping between a storage water heater and primary kitchen sink will require insulation

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with an R rating of 0.6m² K/W. This is equivalent (but not limited) to 25mm thick closed cell polymer insulation.

What pipe materials need to be insulated?

All pipe materials approved for use in heated water services in all classes of buildings as per [AS/NZS 3500.4](#).

What installed piping needs to be insulated?

[AS/NZS 3500.4](#) specifies the following insulation requirements and locations:

- Both inlet and outlet pipes connected to a storage water heater for a minimum distance of 500 mm (see Figure 1).
- The outlet pipe from a storage water heater for the first 500mm or, where an external heat trap is fitted, to a point 150mm down the first vertical leg of the heat trap (see Figures 1 and 2).
- The primary flow and return pipes between an auxiliary heater and a storage water heater (see Figure 3).
- All vent pipes to 300mm above the maximum operating water level of the heated water system (see Figure 4).
- On multiple installations, the whole heated water manifold to a point at least 500mm past the heated water outlet branch from the last water heater (see Figure 5).

Non-circulating heated water piping

- All piping within a conduit encased within a concrete floor slab.
- All external piping from the water heater to the primary kitchen sink. Note: An external location of a building is an unenclosed area such as an open sub floor or open veranda, carport or the like (see Figure 6).

Circulating heated water piping

- All piping within a conduit encased within a concrete floor slab (except for piping which is part of a floor heating system).

- All (external and internal) flow and return piping including 500mm along any branch from the flow and return piping (see Figure 7).

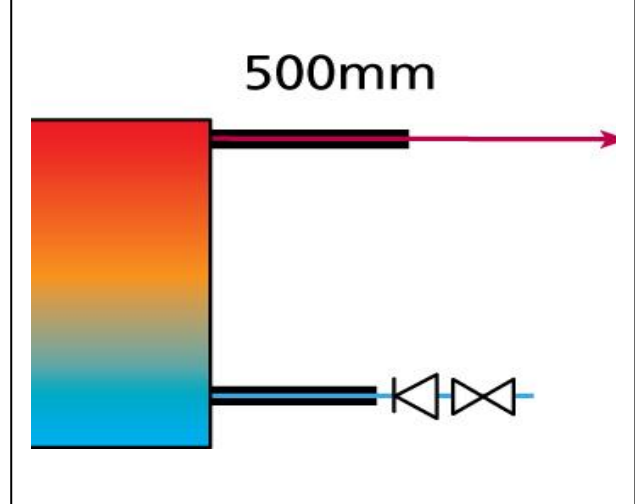
What are the insulation requirements for a solar heated water installation?

- The hot water flow and return pipes between the collector and the water heater storage container must be insulated and achieve a minimum R rating of 0.3m² K/W (see Figure 8). If the piping is external, the insulation requirements may need to be increased to 0.6 or 1.0m² K/W.

Does insulation exposed to weather require protection?

- Yes. Where insulation is exposed to the weather it must be of a weather resistant type or surrounded by a weather resistant enclosure. Note that there are proprietary application products that are available to provide weather resistant properties to closed cell polymer type insulation.

FIGURE 1 - STORAGE WATER HEATER WITHOUT HEAT TRAP



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FIGURE 2 - STORAGE WATER HEATER WITH HEAT TRAP

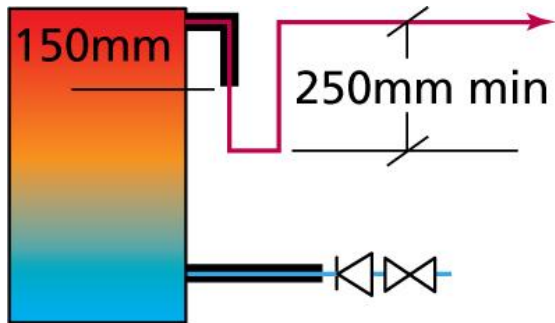


FIGURE 3 - PRIMARY FLOW AND RETURN PIPES

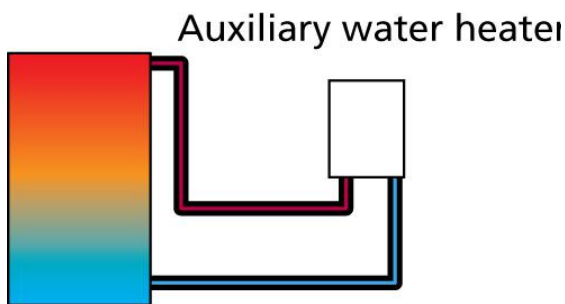


FIGURE 4 - VENTED WATER HEATER

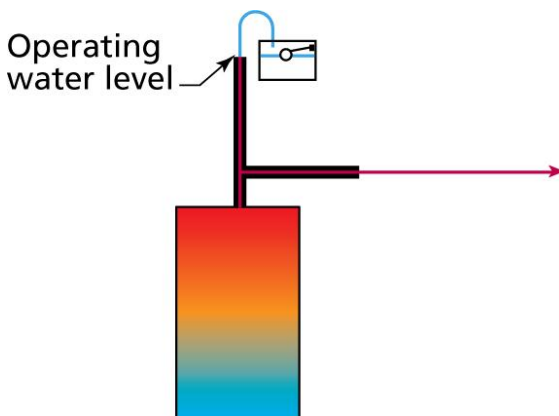


FIGURE 5 - MANIFOLD MULTIPLE INSTALLATIONS

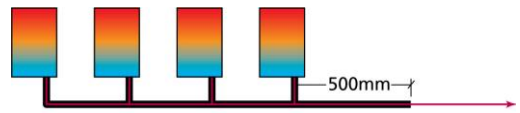


FIGURE 6 - NON-CIRCULATING STORAGE TANK TO PRIMARY KITCHEN SINK

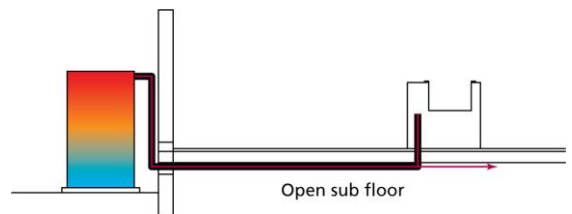


FIGURE 7 - CIRCULATED HEATING WATER FLOW AND RETURN PIPING

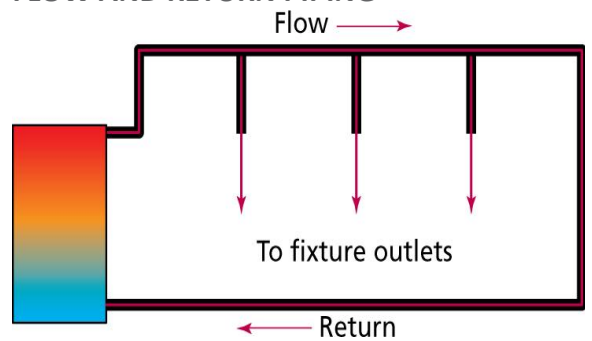


FIGURE 8 - SOLAR WATER HEATER

