TECHNEWS

aquatherm
state of the pipe

Edition No.5 2017

DR AS/NZS 3500.4:2017

New requirements for hot potable water temperatures of forced circulation heated water reticulation (HWRS) installations.

1) First Australian Standard covering Hot Water Reticulation Systems.

After a couple of false starts (2003 & 2015) and too many years we finally have an (draft) Australian Standard that provides some guidance for the design, installation and commissioning of forced circulation heated water systems (HWRS).
The amended draft standard *AS/NZS3500.4 Heated water services* is now open for public comment (5th October – 7th December 2017) listed on www.standards.org.au .

COMMITTEE WS-014-04

DR AS/NZS 3500.4:2017 Project ID: 104091

Draft for Public Comment
Australian/New Zealand Standard

LIABLE TO ALTERATION—DO NOT USE AS A STANDARD

BEGINNING DATE FOR COMMENT: 5 October 2017

CLOSING DATE FOR COMMENT: 7 December 2017

Plumbing and drainage
Part 4: Heated water services
(Revision of AS/NZS 3500.4:2015)

In section 10 of the new DR AS/NZS 3500.4:2017 it sets out some minimum requirements for the sizing and installation of forced circulation heated water reticulation (HWRS) installations.

Section 10.1 tells us that "the delivery temperature flowing from a water heater, bank of water heaters or a heated water storage vessel shall be no less than 60°C and shall **not exceed 65°C**. The return water temperature to the water heater, bank of heaters or heated water storage vessel shall be no less than 55°C".

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2) What are the consequences of these new HWRS water temperature requirements for the building owners?

By complying to the above new water temperature requirements, we now "only" have to heat up the cold potable water (approx. 20°C), incoming from the street mains, to the maximum 65°C. This will only be in times of hot/warm water demand, like in the morning (showers) and early evening (showers & dinner); let's say 1 hour in total per day.
Our experiences over the previous years have been that the delivery temperature of the hot potable water flowing from a water heater, bank of water heaters or a heated water storage vessel, were sometimes **in excess of 70°C**.

How much do we actually pay for energy per year for supplying warm water (45°C/50°C) at the tap?

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Energy cost (savings) for Hot potable Water Reticulation Systems (HWRS)

(Energy costs based on gas fired hot water units with a 100% efficiency)

Calculation conditions:

$Q = \emptyset_m \times C_w \times \Delta T$

Q = Energy required [kW]
$\emptyset_m$ = Mass flow rate [kg/s] or Volume flow rate [l/s] x density [1 kg/ltr. water]
C_w = Specific heat capacity of water. 4.187 kJ/kgK
(to heat up 1 kg (litre) of water by 1°C (1K) you require 4,187 kJ of energy.)
ΔT = Required hot water flow temperature - cold water mains temperature.

Energy cost based on gas fired hot water units (with a 100% efficiency)

1 Nm^3 of natural gas provides approx. 10.83 kWh or 39 MJ of energy.
Average current gas price per MJ (= 0.278 kWh) $0.040
Average price per 1 kWh based on current gas price $0.144

Case 1 (flow water at high temperature)			Case 2 (flow water at low temperature)		
Only the green cells can be amended			Only the green cells can be amended		
Required warm water temperature at tap	50	°C	Required warm water temperature at tap	50	°C
Warm water demand	9.13	l/s	Warm water demand	9.13	l/s
Hours of warm water demand per day	1	hour(s)	Hours of warm water demand per day	1	hour(s)
Hot water temperature set at hot water unit(s)	70	°C	Hot water temperature set at hot water unit(s)	65	°C
Mains cold water temperature	15	°C	Mains cold water temperature	15	°C
Required hot water flow rate	5.81	l/s	Required hot water flow rate	6.39	l/s
Required cold water flow rate	3.32	l/s	Required cold water flow rate	2.74	l/s
Energy required per day	1337.96 kWh		Energy required per day	1337.96 kWh	
Energy Cost per day (based on current gas price)	$192.51		Energy Cost per day (based on current gas price)	$192.51	
Energy Cost per year (based on current gas price)	$70,266.75		Energy Cost per year (based on current gas price)	$70,266.75	

Energy Savings per year $0.00

(= excl. the cost savings due to the lower heat loss [kWh], when conveying hot potable water through the pipe system at a lower hot water temperature).

The user of this program ultimately remains responsible for the interpretation of the data.
Aquatherm Australia Pty Ltd can in no way be held liable for the incorrect interpretation of these data.

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See: www.aquatherm.com.au under "Technical/Aquatherm Service Programs"

"**Energy Costs Hot Potable Water Systems**"

The above Excel sheet will help you to calculate the (minimum) costs (savings), for supplying warm water at the tap. These energy cost (savings) are excluding energy costs for pumps and the energy cost savings due to the reduced heat loss through the pipe system, by using a lower hot water temperature. These "reduced heat loss energy savings" depend on various parameters such as pipe sizing, pipe layout, ambient temperature, surrounding air speed and (type of) insulation.

See: www.aquatherm.com.au under "Technical/Aquatherm Service Programs"

"**Heat Exchange & Energy Costs**"

Reducing the water temperature will also:

- Extend the longevity of the whole Hot Potable Water System.
  - Pipe system (Polymer or Copper).
  - Hot water units.
  - Heated water storage vessels.
  - Circulation pumps.
  - Flexible hoses, gaskets and O-rings.
- Reduce the chance of oxidative stress cracking of Polyolefin (PP-R, PE-X, PE and PB) and embrittlement of elastomers (rubbers).
- Reduce the chance of erosion-corrosion of Copper pipes and fittings.
- Reduced chance of scalding.
- Burning off less chlorine (chemical disinfection).

Why would we want to heat up hot potable water to excessive temperatures and mix it with cold potable water at the TMV's (taps) to deliver warm potable water at a temperature of maximum 45°C or 50°C (as per AS/NZS3500)?