

Standing Heat Losses from household hot water cylinders

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1. The chart below specifies minimum performance standards for hot water cylinders in Australia:

Bold figures show typical size domestic hot water cylinder in Tasmanian homes.

Note that **2.5 kwh** is equivalent to boiling an electric kettle for 1.5 hours constantly.

Click [HERE](#) for more details on these standards.

(Testing is undertaken according to Australian test standard specified [here](#).)

Capacity of hot water cylinder (litres)	Maximum Allowable Standing Heat Loss (kilowatt hours/day) October 2005
100	1.61
125	1.75
160	1.96
200	2.17
250	2.38
315	2.66
400	2.87

Maximum Heat Loss for Electric Storage Water Heaters (unvented tanks without an attached feed tank)

2. The research below comes from New Zealand, which has similar standards to that applying here.

The graph shows standing heat losses from various tested systems. Hot water cylinders were tested in laboratory conditions (represented by lines on the graph) and a number of households were tested on site.

The typical cylinder will lose about one third of the energy that goes into it. This is mostly radiated from the cylinder shell. It is a sobering thought that in the middle of winter you will lose more heat from standing losses than you will gain from solar input.

The graph shows two lines, the lower one is for modern, A Grade, cylinders. The higher line is for older B Grade cylinders.

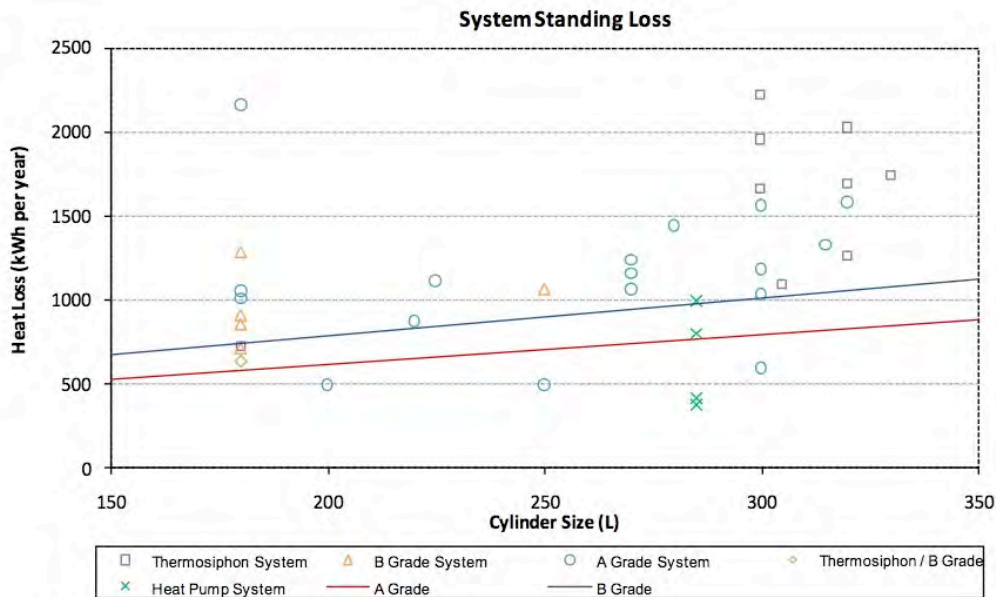


Figure 13. Estimated system standing losses and the volume of the hot water cylinder for which the energy balance was calculated (System H04, 6400 kWh for a 160 L cylinder, has not been plotted)

Those lines represent heat losses from just the cylinder, not associated piping. (The other various dots on the graph are individually tested cylinders, but include losses from the hot water pipes as well, and therefore sit mostly above the line graphs.)

You will note that heat losses from the cylinder alone varies from about **500 kilowatt hours per year** to about **1200 kilowatt hours per year**. A big difference for sure, but even the best performing cylinders lose a large amount of heat - equivalent to running a one-bar radiator for 500 hours.

This is to be expected since the temperature gradient across the HW cylinder insulation (from inside the cylinder to the outside air) is often as high as 70 degrees (on a cold night), and on average about 55 degrees (across a 60 cm gap). Compare this to ceiling insulation where the temperature gradient across the insulation is typically 25 degrees on a very cold night.

Cylinders located outside the home envelope tend to lose much

more because they are exposed to colder air and any heat losses are not captured for other uses, such as drying clothes or helping to warm the kitchen etc.

It is partly for the above reasons that the federal government is regulating to ban the installation of new electric hot water cylinders in the near future (unless they are solar boosted). Instant gas heating does not suffer from these standing losses.

In summary: Every encouragement should be given to people to reduce heat losses from their HW cylinder and associated pipework.

(Above study was Study conducted by A R Pollard & J Zhao 2008)

3. To check the validity of this in Australia, we approached a major Australian manufacturer (Everlast Hot Water cylinders).

Basically their laboratory report shows **2.74** kwh per day losses from a large 310 litre cylinder and **2.32** kwh per day heat losses from a 250 litre cylinder (when the thermal gradient is set at 55 degrees).

Note that this is equivalent to **846 kwh per year**, and apply to hot water cylinders connected to solar systems. Additional heat losses are also attributable to circulation pipes.

Note also that thermal gradient (difference between hot water temperature and outside air temperature) from inside hot water cylinder and outside air) is tested at 55 degrees. On a cold night the temperature gradient would range between 60 degrees and 80 degrees. In summer the range would be between 30 degrees and 50 degrees. Average day and night thermal gradient across all 4 seasons would be approx 60 degrees for cylinders that are located outside in the weather and 50 degrees for one located inside the building shell, so this is a reasonable test standard.

Relationship between standing heat losses and thermal gradient is non linear square relationship indicating high benefit from setting low thermostat temperature. Much less heat is lost from a system that is set at the recommended 60 degree thermostat setting.

4. See also this resource from Sustainability Victoria

Click [Here](#) to see.

5. Reducing heat losses in local homes.

Whilst conducting our Climate Connect Project we tested the casing surface temperature of a number of hot water cylinders in Hobart area, using a digital thermometer.

Although the casings felt like room temperature (to the hand) typical surface temperature was about 4 degrees above ambient air temperature, indicating a high level of heat loss. Some were as high as 8 degrees.

To demonstrate these losses to householders, a home hot water cylinder was encased in an insulated plywood box and a thermometer inserted into the box shows a typical temperature of 30 degrees in the cavity, well above ambient, and showing a high level of heat saving by this insulation method. Some cylinders have also been 'wrapped'.

For cylinders sited outside the building envelope we have been urging people to either construct a similar box or to purchase cylinder wrap. South Hobart community has taken this further by offering to its community members a bulk discount on cylinder insulation wrap.

At the very least it is highly advisable for all households to service their hot water cylinder (inside and outside ones) by having the thermostat re-set and to insulate immediate ancillary piping well. Most installed systems have inadequate pipe lagging on hot water outlet pipe. This is a 15 minute job.

The above applies to all domestic hot water cylinders, not just solar boosted ones.

For safety reasons it is advisable for a registered electrician to re-set temperature thermostats owing to exposure to live wiring.