



Requirements for the correct and safe installation of a Cold Water Storage Cistern and Indirect Copper Cylinder

On 30th May 2003, two occupants of a house in Penzance were scalded by a large quantity of high temperature water that poured onto them through their bedroom ceiling. One later died from the injuries received. The house had a hot water cylinder heated by an electric immersion heater. The cylinder was supplied with water from a 227 litre (50 gallon) cold water storage cistern in the roofspace. The standard 3kW electric element and thermostat was set at 60°C. The circular plastic 227litre cistern had deformed and the contents had been released onto the bedroom ceiling that collapsed. It is thought that two primary but linked issues caused the accident.

1. There was a failure of the immersion heater and thermostat that subsequently led to the over heating of the cylinder water. The water eventually reached boiling point, forced itself up the open vent pipe and into the cistern. Cold water continued to be gravity fed into the cylinder via the cold feed pipe leading to a 'circulation' effect between the two vessels.

2. The standard for the cold water cistern in the roofspace required that it be tested to withstand up to 500 hours whilst containing boiling water without deforming, **if fully supported across its entire base area.** However, it was found that the 800mm dia circular cistern had been placed upon board of only 600mm width. 200mm of the cistern hung out over one edge of the board.

The combination of the high temperature water caused by the thermostat failure and lack of support on one side of the cistern

deformation of the cistern and spillage of the hot water onto the ceiling on the unsupported side. The primary failure of the thermostat to limit the water to its maximum set temperature of 60°C, plus the related inadequate support for the cold water cistern in the roofspace, lead to the incident and ultimately to a death.

This case highlights the potential for disaster when an immersion heater thermostat fails. In the interests of safety, i.e. preventing users of hot water being scalded any immersion heater being installed either in new installations or as replacements for existing, should incorporate a thermostat with the latest energy cut out.

RDT re-settable type immersion heater thermostats combine temperature control and an independent cut out facility providing protection against boiling water in compliance with Clauses 19 and 22 of BS EN 60335 – 73, if the temperature control fails. This standard requires that immersion heaters must be fitted with an independent, non self-resetting over temperature cut out in order that the water temperature does not exceed 90°C.

Note: Vertical and horizontal RDT's are different and so the appropriate one must be fitted.

Cylinder thermostats controlling motorised valves should be strapped on or immersion type, and have a manual re-set limit thermostat with a range of 25 – 95°C.

AMDEA are advising that the phasing out of old style thermostats without a cut-out should be considered and that this should

The incident has also led to BSi recommending that a stronger warning be included on new cistern labels, stating the need for adequate and uniform support for cistern installation.

The following drawing and notes have been prepared for guidance to the safe installation of a typical cold water storage cistern and indirect copper cylinder.

Cold Water Storage Cisterns

Cisterns should be installed in compliance with Schedule 2, Section 7, paragraph 16 (including guidance and recommendation clauses) of the Water supply (Water Fittings) Regulations 1999 and the Water Byelaws 2000, Scotland and BS 6700 : 1997.

A cistern used only to feed the hot water supply system should have a capacity at least equal to that of the hot water cylinder. If the cistern is also used to supply the Cold Water distribution, it should have a capacity of at least 227 litres.

Cold feed pipe (from CWSC)

The cold feed pipe to the cylinder should be sized correctly in accordance with BS 6700. It should discharge near the bottom of the cylinder and should not supply any other fitting. A quarter turn lever operated full-bore service valve should be provided in a convenient and accessible position.

Cylinders fed from a feed cistern

Cylinders should be installed in compliance with Schedule 2, Section 8, paragraphs 18, 20 and 21 (including guidance and recommendation clauses) of the Water supply (Water Fittings) Regulations 1999

and the Water Byelaws 2000, Scotland, BS 6700 : 1997 and Part L of the Building Regulations.

The amount of hot water to be stored should be related to the likely consumption and recovery rate.

Open vent pipe

The vent pipe should be taken from the top of the HWS cylinder and rise continuously to the highest point over the cistern (unless the cistern is also used for the distribution of wholesome water).

It should be no less than 19mm and have no valve fitted to it.

An offset should be included, close to its point of connection to the cylinder to reduce parasitic (one pipe) circulation and loss of heat in the vent pipe. The minimum offset recommended is 450mm.

The open vent and cold feed serve separate functions and should not be connected together.

The following formula is to calculate the height (*H*) that the open vent should be above the cistern, to prevent expanded water from entering the cistern for gravity systems.

$$H \text{ (mm)} = 150\text{mm} + 40\text{mm per metre of system height (m)}$$

Where;
H = vent height required above cistern water line

System height = distance between cistern water line and cold feed cylinder entry point

