

Good Practices for Equipment & Installers

The Installers' Newsletter – Solar Thermal

Welcome to SEAI's thirteenth newsletter for Greener Homes Scheme Installers. The purpose of this newsletter is to inform you of findings identified during quality inspections and best practice guidelines for solar thermal installations. Should you have a query on any aspect of this newsletter please contact us at greenerhomes@seai.ie or 1850 734 734.

System Sizing

It is important to size a solar system to meet the hot water demand of the occupants of the house, while not over sizing the system such that it stagnates during summer months. A common rule of thumb for the northern half of Europe including Ireland is an aperture area of 1.5m²/person. In the case of evacuated tubes a smaller aperture area may be used.

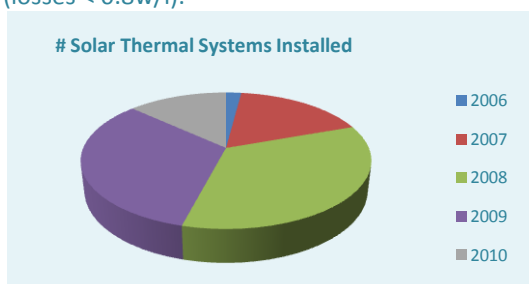
Please ensure the commissioning report for solar panels records the correct aperture area installed. Please refer to GHS Installer Newsletter No. 12.

Cylinder Volume

The minimum volume of the solar cylinder should be 50 litres per m² (*Solar heating: design and installation guide: Domestic Building Services Panel/CIBSE 2007*) of solar panel area, with an improved performance achievable from 70-100 litres per m². Smaller cylinder capacities will limit the benefit from the system and may cause the solar system to frequently overheat. In some houses the space may be too restricted to install a large cylinder which should limit the solar panel area which can be installed.

The solar cylinder is expected to comply with the regulations for new builds i.e. the standing losses of the cylinder must be as per the domestic heating and hot water guidelines: *table 31 parts F and G*:

<http://www.environ.ie/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownload,18691,en.pdf> and at least compliant with section 1.4.4.2 of TGD L: 2008 (losses < 0.8w/l).



Solar Controller Settings

Soft mains water: Maximum cylinder temperature should be set at 70°C if measured at the bottom of the cylinder or 80/90°C if measured at the top of the cylinder. If the controller has an output-limiting function (allowing further input above the maximum setting but at higher solar panel temperatures) a 60°C setting is better.

Hard mains water: Maximum cylinder temperature should be set at 60°C when measured at the bottom. To compensate for the reduced heat storage capacity, a minimum cylinder capacity of 70 litres per m² is recommended.

Delta T (ΔT) "on" setting should be no higher than 8°C except for very long pipe runs.

Minimum collector temperature setting (certain makes of controllers only) should be than or equal to 25°C to enable pre-heating (pump will not start before delta T setting is attained in any case).

Maximum collector temperature setting (sometimes called "Emergency shutdown") should be set between 110°C and 140°C.

Boiler temperature should be set slightly lower than maximum solar temperature, if the latter is sensed at or above the boiler coil level. Otherwise the solar system may stop circulating even though it could still deliver heat to the lower part of the cylinder.

For scalding protection, **thermostatic mixing valves** are recommended.

Electrical supply

A permanent power supply to the solar controller is essential for functioning (*Electrical Installations should be carried out to ET101/2006*). It should have a dedicated power supply via a dedicated circuit from the fuse board that is not protected by the RCD. In an existing house a fused spur taken from a socket or lighting circuit is acceptable, however the fused spur will require earthing. Any socket or switch used for the power supply should not be used for other purposes and should be labelled "Do not disconnect". Extension leads or multi-plug adapters are not suitable.

Power Outage

EN12976 requires solar systems to be able to handle temporary circulation failure and return to functioning without any action by the user or installer.

There are several ways of achieving this; the most common and most reliable being the use of an 'oversized' expansion vessel which can accommodate the entire content of the solar panels plus the adjoining pipes.

Electrical Cables

All cables should be fixed in position with strain relief if necessary. Cylinder sensors and sensor cables must be secured in place such that they cannot be pulled out accidentally. Mains power cables (PVC insulated) must not be in contact with hot pipes.

Pipe work

Take extra care to ensure all pipe joints are properly sealed. Unlike central heating systems, a solar system cannot use automatic filler valves because of the anti-freeze content. Therefore, even the slightest 'slow' leak will lead to pressure loss and malfunctioning over time. For sealing threads hemp or flax is recommended rather than PTFE tape. Propylene Glycol i.e. solar anti-freeze can reduce the liquid's surface tension leading to possible leaks at PTFE sealed joints.

Pipes and fittings near the solar panel should be rated 200°C i.e. no standard plastic pipework should be used in this location. Items with a lower rating e.g. pump or expansion vessel should be installed in the return pipe at a low level, at least 4metres of pipe run from the solar panels.

All external pipe work should be insulated to withstand collector stagnation temperatures, UV degradation and vermin (Energy Saving Trust CE 131: Solar water heating systems – guidance for professionals, conventional indirect models). Ensure internal solar loop is fully insulated including valves and bends.

Customer Care & after Sales Service

It is each installer's responsibility to ensure that each system is appropriately sized to meet the likely needs of the householders. Homeowners should be made fully aware of the likely benefits of their system relative to the installed capacity of the system. All homeowners should be correctly trained in using the solar controller, have been provided with full details of product and parts warranty and have been made aware of any maintenance or servicing requirements. Periodically SEAI would like to provide updates to you via email so please provide your correct email address if not already done so.

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Expansion Vessel

Expansion Vessel sizing

EN12976 requires solar systems to be able recover from stagnation without any action by the user or installer.

Systems with insufficient expansion vessels are liable to fail after stagnation. If the system circulation stops the solar collectors will boil leading to a much larger expansion than usual. Therefore the expansion vessel should be sized to allow it to hold the entire content of the solar collectors, adjoining pipes plus thermal expansion of the liquid and gas. As calculating this individually is very complicated simple charts have been made for sizing expansion vessels:

- up to 6m² solar area: 18litres
- up to 10m² solar area: 25litres
- up to 15m² solar area: 35litres

These figures apply for static heights up to 10 metres (hardly exceeded in Irish dwellings) and a 6 bar safety valve.

Expansion Vessel location

Even the best solar expansion vessels have a temperature limit of only 130°C. Therefore it is good practice to place the expansion vessel a minimum of 4 metres (pipe run) from the solar collectors. Alternatively install a collection vessel between the solar loop and the expansion vessel. Solar expansion vessels should always be facing down (connection at the top) to prevent steam from entering.

Pressure Relief Valve (PRV)

The outlet of the pressure relief valve should be piped to ground level into an open vented and securely fixed heat-resistant container (Energy Saving Trust CE 131: Solar water heating systems – guidance for professionals, conventional indirect models). A non-galvanised steel container is the safest option but plastic vessels are acceptable provided the pressure relief valve is located in the return pipe and not immediately beside the solar panel. Installers should make sure the vessel is fixed in a way it cannot be knocked over accidentally or removed by the homeowner.

Air-Lock in solar loop

Please ensure no air is left in the solar loop. As small air pockets may not be detected during initial commissioning, it is recommended to vent the solar loop again after 2-3 weeks of operation. Air in the system will make heat transfer less efficient and may in some cases prevent it from circulating altogether.