Best Practice note on application of Building Regulations

Solar Domestic Hot Water Systems

Introduction

This advice note offers further guidance on the installation and operation of solar collector panels mounted on roof slopes that provide hot water to replace or supplement the existing hot water supply to a house. Detailed information on photovoltaic panels are covered in the LABC best practice note 'Retrofitting solar panels' reference MG0020511 which can be found on www.labc.uk.com

The solar hot water panels will ideally face south but could face east and west, the panels may seat directly on to the tile battens replacing an area of roof tiles, or be mounted on brackets above the existing roof covering. In all cases it is imperative the suitability of the fixing method and condition of materials to be fixed to are checked prior to installation.

How does the solar water heating work?

Flow and return pipes comprising thermally insulated 22mm diameter copper or stainless steel tubing are run internally to connect the roof mounted collector panels to a hot water storage vessel situated in the roof space, hall, landing or a room.

An electric pump is used to circulate Glycol based solar fluid heated by the sun. Glycol is a premixed heat exchange fluid with a very low freezing point. The liquid is pumped round a sealed circuit under 3 to 4Bar working pressure. Gauges fitted to the flow and return pipe work are contained within a pump housing and can be used to monitor the system. Working fluctuations in pressure caused by the expansion of the glycol as the sun heats the liquid are controlled by a 12 - 18 litre capacity 2.5Bar expansion vessel fitted on the cooler return side of the pipe work near to the pump.

A spring loaded safety pressure relief valve operates at 6Bar to guard against excessive pressure build up in the system resulting from temperatures rising above the design working temperature of approximately 170 degrees centigrade. A condition referred to as stagnation occurs when excessive temperatures are generated by the solar collector panels, which could be as a result of high summer temperatures and low demand for the heated water or failure of the circulating pump.

The blow off from the safety valve in many systems is directed to a 25 litre capacity plastic drum located within the roof space, this usually being the same drum that contained the premixed glycol fluid to site, and appears to be an industry norm. In most instances the plastic drum is resistant to high temperatures and has sufficient capacity to safely contain the blow off; however a suitably qualified solar heating engineer must investigate any malfunction before refilling and resetting the system. Unlike an unvented hot water storage cylinder which is connected to a mains water supply and will replenish itself, the sealed solar heating system has no means of automatically refilling itself. Therefore when an over heat blow off occurs and the pressure is temporarily relieved, the blow off will stop and start, but is unlikely to entirely empty the system of its Glycol fluid.

The indirect hot water storage vessel is typically a 200 - 300 litre cylinder containing at least two coils, with the lower coil circulating the solar heated glycol and the upper coil connected to an alternative heating source i.e. a boiler. The storage cylinder may be either vented or unvented.

An electric digital controller positioned within the dwelling controls the system. Sensors are fitted to the solar collector panels and storage cylinders

which control the operation of the circulation pump dependant on the temperature difference between glycol in the collector panel and the stored water in the cylinder, and the homeowner is able to monitor the system via the controller display. It is important for the efficient operation of the system that the digital controller is correctly programmed by the heating engineer when commissioning the system.

Application of the Building Regulations

The installation of a solar hot water systems is defined in Reg. 3 as 'building work' controlled under the Building Regulation by virtue of Reg. 3(1)(b) the provision or extension of a controlled service.

Reg. 4(1) Requirements relating to building work tells us that 'building work' shall be carried out so that (a) it complies with the applicable requirements contained in Schedule 1; and (b) in complying with any such requirement there is no failure to comply with any other such requirement.

This work can be carried out under a Competent Persons Scheme as detailed in Schedule 3 of the regulations, or an application can be submitted to a Building Control Body.

The Schedule 1 requirements that may apply to a solar domestic hot water system are:

Part A – Structure, Part C – Resistance to Moisture, Part G – Hot Water Storage, Part L – Conservation of Fuel and Power and Part P – Electrical.

Each Part is considered in turn:

Part A – Structure

If the components of the solar heating system impose a greater loading on roof members then it is reasonable to consider if strengthening work is needed. This could apply to the solar panels on the roof slope especially when mounted above the tile covering or to the heavy replacement hot water storage vessel within the roof.

Adequate fixings to prevent wind uplift may also be a consideration in exposed and/or coastal locations.

Part C – Resistance to Moisture

Were the existing roof covering is penetrated by fixings and pipe work then it is reasonable to look for suitable flashings. Where panels replace roof tiles and lie directly on the tile battens, the panels and flashings must be shown to be capable of excluding wind and rain.

Part – G3 Hot Water Storage

G3 is intended to apply to unvented hot water storage systems.

The limits of application (a) states that it is not intended to apply to a hot water storage system that has a 'storage vessel' with a capacity of 15 litres or less.

Most solar domestic hot water systems are unvented and pressurised, with a fluid capacity of slightly more than 15 litres distributed through-out the panels, pipework and expansion vessel. However the **panels, pipe work and expansion vessel** cannot be construed as a store for the glycol fluid and therefore **not subject to control under Part G**. The fluid is merely contained for the purposes of conveying heat from the panels to the stored water within the much larger hot water cylinder. It is considered control is restricted to the 200litre - 300litre capacity unvented hot water storage cylinder.

Part L – Conservation of Fuel and Power

AD L1B Clause 35 Controlled services – where the work involves the provision of a hot water system reasonable provision would be:

Clause 35(a) the installation of an energy efficient appliance as recommended in the Domestic Building Services Guide.

Clause 35(b) the provision of controls that meet the Domestic Building Services Guide.

Clause 36 requires the controlled service to be

properly commissioned to maximise efficiency, and notice given to the Local Authority of the commissioning within a maximum time frame.

Clause 37 refers to the Domestic Building Services Guide for commissioning procedures.

Clause 38 Notices given to the Local Authority signed by a suitably qualified person to include a declaration that manufacturers commissioning procedures have been followed.

Clause 39 calls for adequate insulation of pipes to the standards given in the Domestic Building Services Guide.

Domestic Building Services Guide Section 11 specifically covers solar water heating and Table 37 of the guide lists min. efficiency provisions for a system. Table 38 lists min. commissioning provisions. Table 39 covers pipe insulation.

Part P – Electrical Safety

The pump and digital controller require a 3amp fused three-pin plug and an un-switched shuttered socket outlet to power the pump and controller. If this were spurred off the existing ring main circuit Part P would not apply to the electrical work.

Regulation 7 – Materials and Workmanship

Fit for purpose.