

Solar PV fixings and wind loading

Installing solar PV systems is fairly disruption-free and most systems are installed in two or three days. Unless your building is single storey, you'll need to have scaffolding put up.

The fixing system used to hold solar PV panels on your roof must be strong enough to support the weight of the panels in all weather conditions, including strong wind. They also need to be able to withstand a wide range of temperatures and to be installed so that they don't let water get in through your roof. The type of fixing system used will depend on whether the solar PV panels are going to be:

- retrofitted onto an existing roof
- roof integrated – used instead of tiles or other roofing materials
- installed on a flat roof
- ground mounted.

Retrofitted roof panels

Solar PV panels can be retrofitted onto an existing roof, on top of the tiles or other roofing materials, using roof anchors (also called roof-hooks or brackets), mounting rails and clamps. Mounting rails are usually made of aluminium (due to its lightness) and other components from aluminium or stainless steel. The mounting rails are fixed to the roof anchors using a locking system and the panels are then fixed to the mounting rails using clamps. Most makes of solar panel have their own clamping system.

Roof anchors

The type of roof anchor needed will depend on the existing roof tiles, and the height and spacing of the roof battens.

- On roofs with thick or ridge tiles, the roof anchors are usually fixed to the rafters by lifting (and then replacing) the existing tiles.
- On slate roofs, the roof anchors may be fixed by drilling through the slate to the rafters (rather than lifting the tile). This needs to be done with care – to avoid cracking the tile, to ensure that around the hole is sealed so that water cannot penetrate, and to not over-tighten the bolt, which could later result in either the panel or the tile cracking. Roof anchors should not be fixed to the tiling battens, as they are not designed to cope with the additional weight of solar PV panels.

Guidelines

MCS regulations govern how MCS-certified installers must install solar PV:

“All roof penetrations (whether for solar PV modules, cables or bracketry) must be durably sealed using purpose-made products capable of accommodating the movement and temperatures to which they may be subjected. In all circumstances the building's weather tightness must be maintained. Holes drilled through roofing felt or roof tiles or slates sealed with mastic or silicone sealant are not considered durable. Purpose-made roof tiles and flashings for the routing of cables from a solar PV module are examples of durable solutions.”

The guidelines also say that provision must be made for ventilation behind the solar PV modules to provide cooling.

With the introduction of MCS012 in March 2012 we would now expect all MCS certified installers of solar PV systems to install solar PV systems on pitched roofs using only MCS012 certified roof fixings.

[Download the latest MCS Standard MCS012 - Requirements for contractors undertaking the supply, design, installation, set to work commissioning and handover of solar photovoltaic \(PV\) microgeneration systems.](#)

Anti-theft fixings

If theft of your solar PV panels is a concern it is worth asking your installer whether anti-theft fixings are being fitted as standard and if not, asking for these to be included. Security measures might include:

- ✔ security bolts made from heat-treated steel with heads that can only be undone with a special drill bit
- ✔ a serrated edge under the bolt head (making it difficult to get underneath the head to saw it off)
- ✔ an alarm system which joins the panels together using a plastic optical fibre
- ✔ marking the panels with your postcode or other security markings
- ✔ security lighting
- ✔ making it difficult for any potential thieves to gain access to where your solar PV panels are sited.

Your building insurance should cover solar PV systems for loss or damage, but contact your insurer to check before your panels are installed. [More details about insuring solar panels.](#)

Roof-integrated panels, tiles and slates

On new buildings or when a house is being re-roofed, you may prefer a roof-integrated solar PV system. The type of roof fixing will depend on your choice of solar PV system. If solar tiles are being used they can be fixed to the batons like normal tiles or slates, although an additional baton and larger starter hooks in the first row may be required. As solar PV panels work best if they stay cool, some installers will counter-batten before installing roof-integrated solar PV as this allows some ventilation behind the panels. Roof-integrated panels can be supported on frames fixed directly to the rafters and integrated into the rest of the roof using a flashing kit to keep the roof waterproof.

Flat roofs

Solar PV panels on a flat roof will produce more electricity if they can be angled toward the sun rather than laid horizontally on the roof. Solar PV panels on a flat roof are often installed on an A-frame mounting system or on a specially designed plastic 'tray' at an angle of around 15° from the horizontal to improve their performance while limiting their visual impact and wind loading. This lower angle also reduces the risk of one row of panels shading another on the roof.

As these panels sit above the roof they do not fall within permitted development rights (unless you live in Scotland, where some installations on flat roofs fall within permitted development) meaning that you will need to apply for planning permission.

Rather than make holes in the roof (increasing the risk of leaks), most installers will use a fixing system which weighs down the panels using ballast such as paving slabs, stones or gravel (held in trays). In this way the solar PV panels are held in position without penetrating the roof.

An MCS-registered installer will check that the roof structure is strong enough to withstand the additional load of the solar PV panels and their mounting structure. If there is any doubt (and the risk is higher for flat roofs than many other roofs), you should get a structural survey. This may involve the temporary removal of a small part of the ceiling underneath to check the depth of the joists.

If a mounting system is not possible – due to concerns about either visual impact or wind loading – other possibilities are:

- ✔ a lightweight solar laminate (amorphous) solar PV system installed on the roof instead, glued or heat sealed in place
- ✔ a ground-mounted system.

Ground-mounted

Ground-mounted solar PV panels are fixed to an A-frame or other purpose-built framework in much the same way as flat roof-mounted solar PV panels. The main difference is how the frame is fixed to the ground as the characteristics of a roof and the ground are very different.

Ground-mounted solar PV panels can be fixed to the ground using concrete pile or raft foundations. To reduce the environmental impact of installing this type of system, some installers will use a rammed earth technique or ground screws.

Much will depend on the existing ground conditions, the type of framework and the weight of the panels. The best method for your installation is something that your installer is in the best position to guide you on after looking at the ground conditions on site. Whatever fixing method is used, you will need to dig a trench to bury the DC cable back to where the inverter is sited.

[Get more information about solar PV roof fixing systems at the Ecofirst website.](#)

Tracking systems

Solar PV tracking systems move the PV panels to track the sun, and are claimed to produce up to 30 per cent more electricity than a static array. The downside is the additional cost. For a smaller, domestic solar PV system this will usually outweigh the increase in income from producing more electricity, but it is something that you could discuss with your installer particularly if you are planning to have a large ground-mounted system installed.

Roof and wind loading

The installation of solar PV panels on the roof on a house needs to comply with Building Regulations including Part A on Structural Safety. If the loading to the roof is increased by 15 per cent or more, this is a material alteration and formal Building Regulation approval is required.

An installer who is a member of a Part A Competent Person Scheme (CPS) is qualified to assess whether the loading (i.e. weight) to the roof is likely to be increased by 15 per cent or more. If the installer you are using is not a member of a Part A CPS then you (or your installer) should speak to your local Building Control officer about this before any work is carried out.

