

Solar PV on flat roofs – Design guidance for BauderSOLAR systems

Roof mounted solar photovoltaic (PV) systems are becoming a vital solution in both our transition to a net zero economy and as a tool to help homes and businesses reduce ever increasing energy costs.

Flat roofs can provide a perfect location for solar PV systems as they are often large, uninterrupted spaces that are easy to access for installation and maintenance. However, as the industry grows, the risks associated with the installation of solar panels on flat roofs need to be understood and mitigated.

Flat roof systems will contain combustible elements. This could be the deck or insulation, but the roof membrane will almost certainly be combustible. It is evident that above roof mounted solar panels can change the fire performance of the roof finish, but there are many variables that will affect exactly what impact the panels could have should a fire occur.

Bauder are currently in discussions with major insurers asking for further clarity on the matter, and a standardised method of practice moving forward. The solar PV industry is currently pushing for the same as there is currently no UK standard fire test methodology for solar on flat roofs.

The following information is for mitigating the impacts of a roof top fire, and does not take into consideration measures to prevent a fire starting as a result of the solar array. For further information on fire prevention please see link to the RC62 guidance or Zurich risk engineering document in the further reading section at the end of this guide.

Design guidance

Bauder will only provide BauderSOLAR designs for schemes where one of the following is in place:

- A non-combustible deck, i.e. metal or concrete
- Non-combustible layer above the waterproofing (i.e. 50mm of stone ballast or 80mm BauderGREEN substrate)

Currently, in the absence of any guidance or test methods to evidence the fire performance of solar PV systems on flat roofs, we will also follow the following guidelines within our designs:

- Ensure there are fire breaks between the solar PV system and any rooflights, upstands, penetrations, or other M&E equipment. This should be 1.5m where possible with an absolute minimum of 1m.
- Where a roof overlay is taking place to an existing roof with a combustible deck, then a non-combustible recovery board can be used to reduce the risk of penetration of flame.
- Hard landscaping - Where the above options have not been met, install a ballast layer above the waterproofing around and under the array spreading to a minimum of 1m external to the perimeter of the solar PV array. Please see below examples of projects where hard landscaping has been used to satisfy insurers and/or building control.



Please note that these mitigation requirements are Bauder guidance only, and are not industry standards. Requirements from building control and insurers will change due to numerous variables such as insurer, type of building, type of deck, structural limitations etc.

Further guidance

Scottish Building Control Requirements

Background:

Scottish building control often call for a 4mm glass solar PV module. They are usually referring to the Building standards technical handbook 2019, section 2.8 - Spread from neighbouring buildings:

More than 6m but not more than 24m from boundary - the roof of a building, including any rooflights, but excluding any wall head fascia, flashing or trim, boxed gutters, soffit or barge boards, should have a low or a medium vulnerability if more than 6m but not more than 24m from the boundary. Common materials that normally attain the criterion include felts and certain plastic materials as described in Annex 2.F.

This is being interpreted that the PV panels are required to meet the above criteria, assuming that they are replacing the roof covering. This is relevant for 'in roof' solar systems found on pitched tiled roofs and **not** 'above roof mounted' systems.

Bauder Mounting Solution:

In a flat roof scenario, the module does not replace the waterproofing finish and is mounted above the membrane. As you can see in the below image the BauderSOLAR F XL mounting system is installed after the finished waterproofing is completed and does not make up part of the roof covering.



Potential Mitigations:

In many cases, building control will accept the above, that PV mounting systems on flat roofs do not form a part of, or replace the roof covering.

If it is not accepted by Building Control that the PV mounting system does not form part of the roof covering, a combination of one or more of the following options will mitigate risk and satisfy any concerns around the topic.

- Photovoltaic module selection - Specifying a panel which is Euroclass A rated or which has 2mm glass on both front and rear of the panel (4mm total). There is a cost uplift, but using this, little changes are needed to be made to the roof construction.
- Deck choice - a non-combustible concrete or metal deck will again help mitigate any risk.
- Hard landscaping - Where the above options have not been accepted, an alternative could be to install a ballast layer above the waterproofing around and under the array spreading to a minimum of 1m external to the perimeter of the solar PV array. As shown above.

NB: In scenarios where a non-combustible ballast layer (40/20 washed rounded stone) is installed beneath and around the array, a non-combustible insulant should not be required as the ballast will prevent both spread and penetration of flame.

BioSolar roofs

The combination of a biodiverse green roof and a solar PV system, often termed a BioSolar roof, is becoming extremely popular, particularly as biodiversity net gain is introduced.

BioSolar roofs provide a huge range of environmental benefits and the combination of a green roof and solar PV system can be mutually beneficial. However, there are certain criteria that should be adhered to, in order to ensure that fire safety is not compromised.

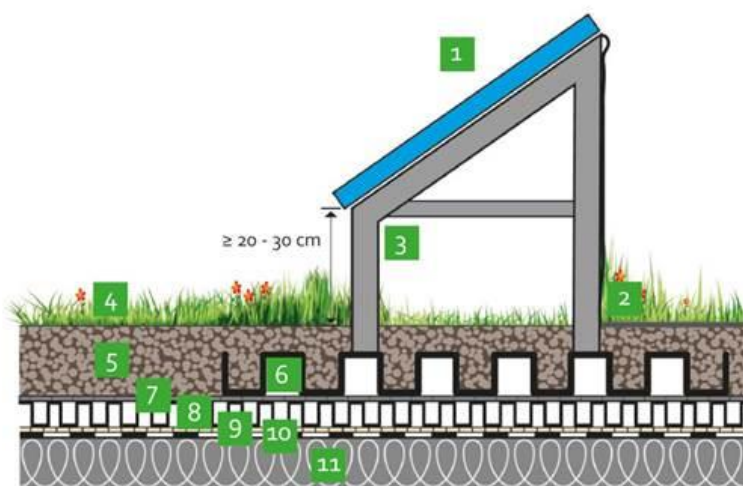
Section 4.5.2 of DCLG Fire Performance of Green Roofs and Walls states that compliance with the requirements of Regulation B4 to achieving B_{ROOF}(t4) to BS EN 13501-5 can be 'deemed to satisfy' when using a growing media of a minimum 80mm of settled depth with an organic content not exceeding 50% by volume. Bauder growing mediums have an organic content of less than 20% and are peat free.

Section 4.5.1 of DCLG Fire Performance of Green Roofs and Walls states that compliance with the requirements of Regulation B3 which aims to prevent the spread of fire into, or from a building on to the green roof, recommends a fire break of 500mm width and 75mm deep is installed wherever the green roof abuts a vertical element i.e., at perimeters and penetrations such as rooflights, soil pipes, etc. Additionally, on large roofs, a one-metre-wide fire break should be installed at 40m intervals across the roof.

The German Landscape Authority (FLL) provides the following guidance for BioSolar roofs:

'When planning photovoltaic systems, it must be ensured that the modules are not shaded by the vegetation. For this purpose, attention must be paid to a sufficient distance of the lower edge of the modules to the substrate, depending on the height of the vegetation. The minimum distance for a low growing extensive greening should be 20cm and may be higher, depending on planned vegetation.'

Example section:



- 1 – Solar module
- 2 – Electrical cables
- 3 – BioSolar mounting system
- 4 – Vegetation
- 5 – Growing medium
- 6 – Anchor board
- 7 – Filter fleece
- 8 – Drainage board (optional)
- 9 – Protection layer
- 10 – Waterproofing
- 11 – Insulation

Source: <https://www.gebaeudegruen.info/gruen/dachbegruenung/planungshinweise>

Maintenance

Maintenance is vital to the success and safety of any roof mounted solar array. The exact requirements will vary depending on the type of system but will include inspection and maintenance of the electrical elements, inspection to ensure the mounting system is functioning correctly, and in the case of BioSolar systems prevent vegetation growing over Fire Breaks and to remove wildflower dry thatch in the Autumn.

Further guidance on maintenance requirements can be found in the following links:

Flat roof systems - <https://www.bauder.co.uk/getdoc/86acd648-4cdb-4e7e-86b4-6d98ddc399f6/pv-arrays.pdf>

BioSolar systems - <https://www.bauder.co.uk/getdoc/3a1b469f-9247-46bd-b960-8f8c379bef8a/biosolar-pv.pdf>

SEUK guidance - <https://solarenergyuk.org/wp-content/uploads/2021/12/Solar-Energy-UK-Rooftop-OM-best-practice-Second-edition.pdf>

Further reading:

- https://www.pu-europe.eu/fileadmin/documents/Factsheets_public/Factsheet_24E_Fire_performance_of_thermal_insulation_products_in_end-use_conditions_Comparative_fire_tests_PIR_MW_under_PV_systems.pdf
- <https://www.thefpa.co.uk/news/fpa-publishes-joint-code-of-practice-for-fire-safety-with-photovoltaic-panel-installations>