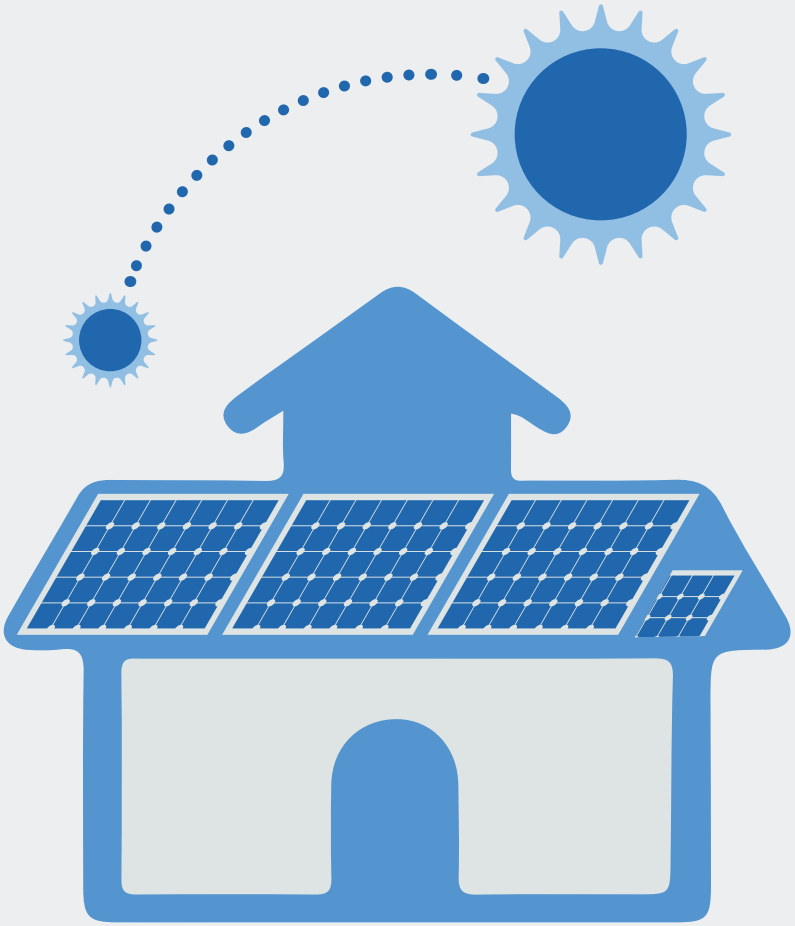
ZURICH

Managing the risks of roof-mounted solar panel systems on community buildings

Introduction

Photovoltaic (PV) panels – more often referred to as solar panels – are becoming a common sight on homes, commercial premises and community buildings throughout the United Kingdom.



According to Government figures, between 2016 and 2021, there were 3,000 new PV installations a month on average; in the six months up to July 2022, however, the monthly average was 10,000.

Source: https://www.gov.uk/government/statistics/solar-photovoltaics-deployment

Community buildings such as village halls often have large roofs which can make them a convenient location for roof-mounted solar panel systems. In 2022, there were numerous reports of village halls nationwide – from East Sussex to Northumberland – putting plans in place for roof-mounted solar panels, in a bid to save on energy bills and become more sustainable. As solar panels become a more regular feature on community buildings, however, it is important that the associated risks are understood and safely managed.

Zurich has seen a rise in fire claims involving solar panels in recent years, some of which have resulted in significant damage and substantial losses.

Pre-Installation and Design Stage

Operation & Maintenance

About this guide

The guidance in this document addresses the design and maintenance of roof-mounted PV systems – whether retrofitted to an existing building or forming part of a new build project – and highlights some of the key risk and safety considerations. This guidance is based on Zurich's Roof-Mounted Photovoltaic Panels Risk Insight, a longer guide which covers some of the technical aspects of PV panel safety in more detail.

This guide is specifically aimed at small solar panel installations for community buildings. Additional controls and guidance may be needed for larger installations.

Pre-installation and design stage

If you are planning to install solar panels on the roof of your community building, it is important that you understand the risks involved. In the event that a solar panel fire happens, it will make a significant difference whether your solar panels are installed on a combustible or non-combustible roof.

Roof Construction

The preference is to only install solar panels on entirely non-combustible roofs . These would include:

- Flat roofs lined with a non-combustible material such as 50mm pebble ballast or concrete pavers
- Flat concrete roofs are non-combustible but if overlaid with combustible insulation they made need protection with pebble ballast/concrete subject to a structural engineer's assessment
- Concrete or clay tile pitched roofs have a degree of fire resistance although timber roof frames are combustible

If you have a combustible flat roof then ask the solar panel installer, with the support of a structural engineer, whether a non-combustible layer can be provided between the solar panels and roof layer.

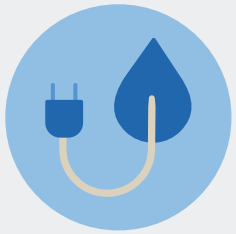
Structural engineers will also need to consider the design around the wind/storm and snow/ice loading.

Location of Inverters

All solar panels will have electrical equipment including an inverter that converts the DC current generated by the solar panels into useable AC current.

Such equipment needs to be located in a non-combustible area that is also free from any combustible storage.

Currently regulations allow such equipment to be installed in combustible roof voids. Adding electrical equipment, which represents a source of ignition, within a combustible roof void is considered to be poor practice and should be avoided.



Energy Storage Systems (ESS)

The amount of electrical power a solar PV installation generates will tend to vary depending on the weather and the season. Rather than exporting excess power to the grid, Energy Storage Systems (ESS) such as battery storage systems, can retain excess power for use in times of lower PV output.

These battery systems, which are typically Lithium-ion technology, carry a degree of fire/explosion risk which needs to be safely managed. One such hazard is thermal runaway, where heat is transferred through the battery cells causing further fire spread. Disconnection from the power source does not stop the reaction and therefore these batteries need to be located in fire rated compartments that are completely clear of combustible materials.

Contractors

It's important that any contractors involved with PV system design and installation are accredited to a national trade body such as the UK MCS Certification Scheme Requirements (MCS Contractor Certification Scheme) and the UK BS 7671 IET Wiring Regulations (18th edition or later) with experience of both AC and DC systems. Our Roof-Mounted Photovoltaic Panels Risk Insight covers other important contractor considerations, including electrical installations, cabling and fault detection.

PV panel location

The effect of shading from sunlight also needs to be carefully assessed. Anything that reduces the PV panel exposure to sunlight will reduce the overall output of the system. In extreme cases, it may result in current backflow, from panels exposed to sunlight to panels in shaded areas. This can lead to overheating and fire. The best solution is to ensure panels are installed where they will not be subjected to shading or partial shading, including from trees and other surrounding vegetation. If leaves and other debris fall onto your panels this will require regular cleaning. Therefore the ease of accessibility of the panels needs to be carefully considered in order to avoid unexpected maintenance costs.

Roof access

It's important that there is safe access to the roof for inspection and maintenance purposes. If safe access has not been provided this could substantially increase the maintenance costs.

Please ensure your designer has considered these aspects and provides a clear plan regarding access and maintenance and the costs involved from the outset.

Isolation potential

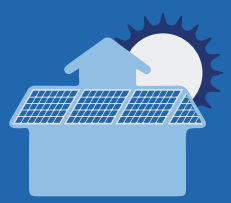
One of the safety challenges of PV systems is that they are considered constantly 'live'. It's important to provide a way to automatically isolate the PV panels. There are a number of options to isolate the panels, including a dedicated remote isolation switch, an integrated isolator switch or isolation via your fire alarm system. Your solar panel designer will be able to provide guidance on the most appropriate form of isolation for your system.

Handover process

Once the installation is complete, a comprehensive commissioning process should be in place before handover, including a quality inspection and test of the system, and certification of all electrical work in compliance with the relevant local/UK standards.

It's also important to ensure that as a building owner or occupier, your contractor has clearly explained to you the operational risks and safety features of your PV system. The handover should include detailed documentation relating to inspection and maintenance requirements.

Operation & Maintenance



Once roof-mounted solar panel systems are in use, there are a number of operational and maintenance issues to consider.

Monitoring the system

Having a system to monitor energy production can provide early signs of any issues with the system. Make sure local staff responsible for the building operation understand the action to take and who to contact in the event of any suspected issues.

Electrical Inspections

Electrical maintenance should be performed by competent electrical engineers – such as those recognised in the UK by the NICEIC, the Electrical Contractors Association (ECA) or Select in Scotland – who are familiar with the form of installation and the appropriate access equipment.

Fixed electrical inspection and testing should only be conducted by qualified electrical contractors who are competent in both AC and DC installations.

Panel cleaning

PV panels will become dirty and contaminated over time, leading to operational inefficiencies and a potential increase in operational temperatures, which can lead to long-term deterioration and failure. Periodic cleaning of PV panel surfaces (the frequency should be stipulated by the installer) will help maintain efficiency of the panel system. Again, it is important to ensure there is sufficient space on the roof to allow servicing and cleaning engineers to access all PV system equipment, including panels, inverters and cables.

Annual Inspection

Every year a full visual inspection of all the system components will be required by a competent person. This inspection should be recorded and photographic evidence be kept.

The annual inspection would include:

- Panel condition and any signs of damage or discolouration
- Check for any build-up of vegetation, bird nests or debris
- Wiring and junction boxes are in good condition with no signs of water ingress
- The fixing system is in good condition
- Visual inspection of electrical components
- Ensuring isolators and other equipment is operating correctly

Your inspection programme should be in accordance with manufacturer's guidelines and industry good practice. Additional information and checklists can be found in the Further Reading section at the end of this document.

Please note that additional visual and physical inspections should be undertaken following extreme weather events.

Solar panel maintenance companies may also recommend thermographic inspections as a means to detect defects that could otherwise lead to a fire.

Further information and reading

To find out more about the issues identified in this guide, read our comprehensive Roof-Mounted Photovoltaic Panels Risk Insight.

Further reading

Solar Energy UK Industry best practice manual:

https://solarenergyuk.org/resource/rooftop-om-guidelines/

Zurich Risk Insight (roof mounted photovoltaic panels and systems):

https://www.zurich.co.uk/news-and-insight/risk-insight-roof-mounted-solar-panels

MCS Solar PV Standard:

https://mcscertified.com/wp-content/uploads/2019/06/MIS-3002_Solar-PV-Systems-V4.0.pdf

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