QBE

PV Solar Panel System Installations

Risk Management Guidance

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Introduction

In alignment with the government's ongoing commitment to transitioning toward sustainable and renewable energy sources, QBE has observed a notable increase in client enquiries related to the deployment of photovoltaic (PV) solar panel systems. These enquiries typically concern technical support, regulatory guidance, and insurance coverage.

This guidance document has been developed to provide risk management advice associated with the installation and operation of PV solar panel systems. It identifies key insurance considerations; safety controls and operational risks associated with solar energy installations. Furthermore, it outlines industry best practices aimed at mitigating these risks and ensuring the safe, efficient, and compliant use of solar technologies.

Property Damage:

Solar panels can be damaged by severe weather events, such as hail, storms, or high winds. Also, inadvertent material damage to existing structures during the installation process. Both can lead to claims for property damage.

Liability Risks:

If solar installations are not properly secured or maintained, they can pose a risk of injury to others. For instance, falling debris or accidents during installation can lead to liability claims. Liability risks are wide reaching, ranging from working at height, injuries to third parties, through to electrical safety. Key aspects are discussed further in the document.

Theft and Vandalism:

Solar panels can be targets for theft or vandalism.

Fire Hazards:

Electrical components of solar systems can pose fire risks if not installed correctly, areas of potential source could be poorly managed hot works, substandard cabling and connections and battery storage.

Furthermore, the material of the roof could pose a fire risk, especially if timber or combustible cladding or insulation are present.

Installation Workmanship:

Poor installation practices can lead to malfunctioning systems, resulting in financial losses for asset owners. These can extend from programme delays through to cable glanding and electrical network interface.

Regulatory or Industry Changes:

Changes in regulations or industry guidance regarding solar energy can affect insurance coverage and risk assessment appropriateness.

Natural Disasters:

Areas prone to natural disasters such as earthquakes, floods, heavy hail, or hurricanes may face unique challenges and higher insurance premiums.

To mitigate these risks, it is essential for asset owners to undertake effective due diligence, engage competent and experienced solar installers, regularly maintain their asset management systems, and consult with insurance carriers to ensure they have adequate coverage tailored to their specific solar installation.

Health and Safety Hazards

Electrical Hazards:

Working with electricity poses risks such as electrocution, fire and or explosion. Robust processes must be followed when handling electrical components.

These include:

- Isolations (including process for testing for dead)
- Permit to Works, from both asset owner and contractor
- Frequent monitoring to ensure behavioural and procedural compliance
- Work to be undertaken by competent and experienced personnel

Contractor Competence:

Installers need to be adequately trained, with effective safety controls and installation procedures to minimize risks. Typically, installers would be fully qualified electrical engineers with knowledge of current standards (18th Edition IET Wiring Regulations), who then complete additional manufacturers training to install the panels.

Where deemed appropriate, request details of previous projects where similar installations were completed

Select a contractor who will provide their own installation team of Engineers and Technicians where every person is certified for PV solar panel installation work.

Make sure the lead-contractor employs their own qualified supervising project managers and engineers.

If sub-contractors are employed, make sure every individual deployed on the installation is certified for PV solar panel installation work.

Work at Height:

If a solar installation is to be sited on the roof of a building, then one of the most obvious and most serious of risks is working at height during installation and subsequent inspection and maintenance.

Most solar panel installations require the erecting of a suitable fixed scaffolding system by a competent person.

Scaffold design as per TG20: 21 developed by National Access & Scaffolding Confederation (NASC).

If a bespoke design is required, ensure the engagement of a component Temporary Works Designer. Structural loading, wind loading or free-standing scaffolds are examples that require a bespoke design.

Ensure a routine inspection programme is in place to ensure integrity of structure. Scaff Tags are an effective mechanism for providing confirmation.

It is also required that risk assessments identify controls to prevent unauthorised scaffold access to prohibit trespasser access.

Ongoing maintenance and inspection are critical for the safety and efficiency of solar installations, which may require access to solar panel that are at height. Procuring of temporary access equipment or installing permanent safety controls such as safety lines is essential. These measures not only ensure the safety of workers but also assist maintaining the integrity of the installation over time.

Regular statutory inspections and maintenance of these controls are necessary to comply with legislation and support accident prevention. It is also important to keep detailed records.

Fragile Roofs:

The primary hazard being the structure that PV panels are to be mounted on, i.e. fragile roofs. It is imperative that all asset information is reviewed (Operating & Maintenance Files, Health and Safety File and Asbestos Register), and a structural roof inspection is undertaken prior to installation to identify any potential issues. Taking into consideration items such as:

- structural loading capability
- condition

- material
- pitch

All of which will support the production of a suitable and sufficient risk assessment, identifying effective controls and detailed safe system of work.

If it is identified that the installation will be on an asbestos cement roof additional controls will be required to prevent both personal and uncontrolled dust exposure.

- Non licensed task training for installers
- Waste (including PPE), to be disposed of as hazardous waste

HSE Asbestos Essentials can provide further information on controls and competency.
https://www.hse.gov.uk/asbestos/essentials/

Mechanical and Manual Lifting:

Solar panels can be heavy. Improper lifting and handling techniques can lead to musculoskeletal injuries or panel/asset damage. Using tested and certified lifting equipment can reduce the risks associated with moving of panels.

Where mechanical lifting is being used:

- Where practicable, identify component weights
- Lift Plans developed (by competent person) and in place for lifts by mechanical appliances
- Appliances to be operated on flat, level ground, which must be reviewed as part of the Lift Plan
- All lifting appliances and equipment to have in date statutory inspections and available certification
- Pre-use inspections undertaken to identify visible damage
- Competent persons to plan and monitor lifting operations
- Established demarcation zone around the area of the lift

Where the risk assessment process has determined that a mechanical lift is not practicable, planning of team lifts by operatives may be undertaken. If it is felt that manual handling poses further risks, consultation with the Designer and manufacturer must be undertaken to identify safer alternatives.

Weather Conditions:

Extreme weather can pose risks, such as slippery surfaces from rain or ice, high winds, or extreme heat. Installing panels should be planned based on weather forecasts.

Solar panels should not be hoist lifted or hand-carried in high winds and great care should be taken by personnel when moving around a roof in wet or freezing weather conditions. In extreme hot weather, the safety of personnel will need to be closely monitored to avoid dehydration and sunstroke.

No matter how well an installation project is planned, there will be times when work will need to be suspended in the face of inclement weather. This also applies to scheduled activities involving cleaners, inspectors and maintenance contractors when the PV solar panel system is operational.

Site Hazards:

The installation site may have wider operating or environmental hazards that may influence the installation. These may include:

- uneven ground
- nearby traffic routes
- high footfall
- other construction activities
- overhead services
- adjacent structures

Conducting a site risk assessment during the pre-construction phase can help identify required controls to mitigate these risks.

Emergency Preparedness:

Effective planning is essential to minimize the negative impacts of incidents related to solar installations. The following list outlines key considerations for emergency preparedness.

Awareness & Training:

Ensure workers know evacuation procedures, escape routes and rescue plans for roofs and plant rooms.

Roof Access & Egress:

Provide safe access and temporary emergency escape routes during installation, considering equipment congestion and travel restrictions.

Plant Room Safety:

Ideally, have an emergency escape route at the rear of plant rooms. If only one entrance/exit, enhance supervision during work.

Fire Extinguishers:

Provide suitable manual fire extinguishers and train operators/contractors in their use.

Electrical Fire Safety:

Isolate power when dealing with electrical fires to reduce the risk of electrocution and fire spread.

Fireman's Switch:

Use Fireman's Switch to trigger AC/DC shutdown of solar panel systems during a fire.

Emergency Services:

Call Emergency Services promptly. Prefer professional services for search, rescue and firefighting.

Lithium-Ion Battery Safety:

Train operators on handling fires involving lithium-ion batteries. Avoid breathing harmful gases and let professionals handle such fires.

Recommended Extinguishers:

Use Trinity Multi-Purpose Fluid (MPF) 6 Litre extinguishers for lithium-ion battery fires.

When the PV solar panels are operational:

Correct signage should be installed to indicate the presence of PV solar panels such as 'Double Power Supply: PV and Grid', also signage for the presence of AC and DC power.

Pre-fire planning should be done with the Fire Brigade and site management. This should consider safe access to the roof and around the roof between the PV panels given the layout of the PV panel arrays (the access routes it will be different from before the panels were installed).

The emergency hazard site plan should be marked up to show the presence of the PV solar panel system and the location of the Fireman's switch(es).

Property Protection Hazards

Roof construction:

The external surface of a roof must not be relied upon alone to be judged as 'non-combustible' by the designer/installer. It is essential that the insulation material beneath the outer surface is evaluated to determine whether the roof should in fact be classed as 'combustible'. Insurers of the building should be consulted to determine the classification of the roof.

Non-combustible roofs can be fitted with single-faced PV panels with plastic and backed panels with PVF liners. Non-Combustible roofs are uninsulated metal panels or mineral wool insulated metal panel roofs, whether composite panels or built-up-roofs.

LPCB/FM Approved foam insulated composite panel roofs can be fitted with single-faced PV panels with plastic backed panels with PVF liners. LPCB/FM Approved roofing panels have passed LPCB and/or FM large scale fire tests and are typically insulated with PIR (fire-rated polyisocyanurate) or IPN Quadcore.

Roofs constructed using EPS (polystyrene) insulated panels or wood/timber boards must not have PV solar panels fitted to them, no matter which type of EPS insulation or boarding is used and irrespective of what other mitigation measures are applied.

If the roof is combustible such as bitumen laid roofing felt over insulated steel deck roofs or fire retardant coated CLT roof assemblies or has combustible insulation such as PUR (non-fire-rated polyurethane), or other Non-Approved Foam insulated panels, the PV solar panels MUST be dual-faced or glass-backed (glass on both faces). Also, all cabling must be armoured cable or installed in closed metal conduit; also, roof-mounted equipment/switches/power optimisers/micro-inverters must be installed on metal plates to separate them from the combustible roof.

Concrete roofs often have EPS/PUR insulation laid on top and fully overlaid with stones or paving slabs. For this roof construction arrangement dual-faced or glass backed PV panels are required.

Fireman's Switches:

A Fireman's AC disconnect switch must be installed to enable remote manual isolation of AC power from the PV solar panel system irrespective of the string array voltage.

The Fireman's AC disconnect switch must be located in an easily accessible location outdoors or inside the building with access through no more than one unlockable door and be immediately accessible through that door. It should not be located in the power supply plant room with the DC inverters as this is often the location of a fire on a PV solar panel system.

The building fire alarm should be linked to the Fireman's AC disconnect switch to automatically trigger isolation of power from the PV solar panel system.

Where power optimisers are installed or DC microinverters are fitted adjacent to or below the PV solar panels on the roof, a Fireman's DC disconnect switch should be installed as well or instead. This enables 'edge protection mode' to be activated which renders the DC circuitry between the DC inverters and the PV panels electrocution safe. The Fireman's DC disconnect switch must be located following the same guidance given above for a Fireman's AC disconnect switch.

Arc Fault Detection:

The DC circuitry must be protected with arc fault detection breakers that raise a fault alarm on the system control panel and require manual reset.

Fire Detection:

Roof level fire detection should be included in the system design, arranged to raise a fire alarm if activated. This can be achieved using linear wire heat detection cable beneath the PV solar panels or using Thermarestor proximity heat detection on the electrical fittings beneath the PV solar panels and on the electrical connection blocks in the DC inverters.

Existing Engineered Fire Breaks:

Solar panel arrays crossing engineered fire breaks within a building that are being relied upon must have 6m gaps above the fire breaks. This is to reduce the chance of a fire involving the solar panels on the roof jumping fire breaks below. If roof-level parapets are present projecting at least 0.6m above the roofline, the gap should be 1.5m from of the parapet on each side.

Battery Energy Storage Systems (BESS):

If battery energy storage systems (BESS) are planned for the PV solar panel installation these must be located outside the main building footprint.

Fire-rated enclosures (1-hour+) for the BESS can be located against a solid brick wall in the yard or inside a 2-hour+ fire rated plant room attached the external wall of the main building.

Non-fire-rated, non-combustible enclosures must be located outdoors at least 1m from the building, important infrastructure, yard storage and parked cars/trucks. Combustible (GRP, plastic, wood) enclosures must be outdoors at least 3m clear of anything important.

Inspections:

PV installations shall be serviced and maintained in accordance with the installer's instructions and to BS EN IEC 6244 6-2 (2020) and includes requirements for visual inspection, electrical testing and performance testing. Ongoing mainte nance and inspection should be done via annual inspections, testing and cleaning by a MCS (Micro-Generation Certific ation Scheme) approved contractor.

Drone infra-red/visual surveys can be used to identify hot-spots, or debris collection or areas of obscuration. Provided t he affected solar panel strings are de-powered when defects are identified, the use of drone inspections allows the ann ual maintenance/cleaning inspections to be reduced to 3-yearly.

Inspections should include:

- removal of debris, leaf litter, bird's nests etc. from beneath the PV panels
- checking for evidence of damage to the cabling, fittings or connectors
- checking for (and planning repairs for) impact or hail damage or areas of surface obscuration by dirt, moss growth, bird droppings or unexpected shadowing.

Conclusion

To mitigate these hazards, it is important to conduct a thorough risk assessment of both the existing assets and the installation process, ensuring competence of installers, suitability of installation infrastructure, compliance with applicable safety legislation and industry practice throughout the installation process.

Furthermore, it is imperative that risk assessments and safe systems of work are clearly communicated, acknowledged and most importantly, monitored for control measure implementation and effectiveness.

The construction of the building must be properly understood so that the choice of PV solar panel, design and layout of the system can be made as fire-safe as possible with the appropriate emergency response measures built-in.

Resources

The below links provide access to the QBE Working at Height Toolkit, providing further information on the key aspects to effectively support safe working at height.

Topic	Link
Work at Height – Fall Protection	https://qbeeurope.com/document-library/risk-solutions/risk-essential/risk-essentials-fall-protection/?token=883282
Work at Height - Fall Arrest	https://qbeeurope.com/document-library/risk-solutions/risk-essential/risk-essentials-fall-arrest/?token=322186
Work at Height - Fall Restraint	https://qbeeurope.com/document-library/risk-solutions/risk-essential/risk-essentials-fall-restraint/?token=996448
Work at Height - Ladders	https://qbeeurope.com/document-library/risk-solutions/risk-essential/risk-essentials-fall-restraint/?token=996448
Work at Height- Fragile Roofs and Surfaces	https://qbeeurope.com/document-library/risk-solutions/risk-essential/risk-essentials-fragile-roofs-and-surfaces/?token=899148
Work at Height - Falling Object Protection	https://qbeeurope.com/document-library/risk-solutions/risk-essential/risk-essentials-falling-object-protection/?token=332365
Work at Height - Scaffolding	https://qbeeurope.com/document-library/risk-solutions/risk-essential/risk-essentials-scaffolding/?token=035532
Work at Height Policy Template	https://qbeeurope.com/document-library/risk-solutions/risk-essential/work-at-height-policy/?token=986723
Work at Height Hierarchy Risk Assessment Template	https://qbeeurope.com/document-library/risk-solutions/risk-essential/work-at-height-hierarchy-risk-assessment/?token=860008
Work at Height Equipment Inspection Record	https://qbeeurope.com/document-library/risk-solutions/risk-essential/work-at-height-equipment-inspection-record/?token=876427
Work at Height Fall Protection Equipment Inspection Checklist	https://qbeeurope.com/document-library/risk-solutions/risk-essential/work-at-height-fall-protection-equipment-inspection-checklist/?token=174367
Work at Height Audit Template	https://qbeeurope.com/document-library/risk-solutions/risk-essential/work-at-height-audit-template/?token=354249

Work at Height Toolbox Talk for Managers	https://qbeeurope.com/document-library/risk-solutions/risk-essential/work-at-height-toolbox-talk-for-managers/?token=623564
Work at Height Toolbox Talk for Employees	https://qbeeurope.com/document-library/risk-solutions/risk-essential/work-at-height-toolbox-talk-for-employees/?token=079854

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