

## PV Panels

Photovoltaic (PV) Solar Panels are increasing in popularity as a viable alternative source of energy for businesses and as a way of demonstrating commitment to improving the environment. With their installation a number of risks are introduced such as fire, natural hazards (e.g windstorm), theft and electrical (e.g. power surges).

As with any electrical equipment PV Panels are themselves a fire inception hazard and due to the perceived risk of Direct Current may present life safety issues for Fire Fighters.

Further technical developments will undoubtedly result in many more installations and improved efficiency may result in higher power consumption with an associated increase in fire hazards. Preventing fires from occurring through quality installation standards and protective devices is key.



## The Hazards

In contrast to the power used by conventional mains electrical equipment, the power that PV systems generate is DC (direct current) and the conduit between the panels and inverter cannot be switched off. If there is daylight falling on a PV panel it will be producing a DC voltage. It should also be considered that PV panels can produce current from other light sources such as flood lights.

DC is more hazardous (volt for volt) than normal AC (alternating current) electrical installations where the voltage and current oscillate. This can affect the muscles of the human body differently; DC current will continuously contract the affected muscles making it difficult to break contact with live components; AC current provides an opportunity for release as the current reverses its direction. Also, during the course of a fire, DC cable insulation might melt and cause and sustain a DC flash arc which can reach temperatures of over 3000 deg C. Any form of disconnection can cause this and the condition can melt metal and when in the presence of combustible materials can be a source of ignition. In fact DC arcing is found to be the main reason for large rooftop fires on commercial buildings.

PV panels can also be manufactured from plastics and when coupled with plastic mounting structures and cabling can significantly add to the roof's fire loading.

## What can you do in your facility?

- a. A DC disconnect between PV panel and inverter should be installed allowing safe maintenance to inverters. In addition, rooftop shut-off valves (or "fire-men's switches") close to the panels which isolate the main DC conduits with live currents and voltages should be installed. The switches should have remote actuators installed in a position where the Fire Brigade can get to safely. This can also be connected to the fire alarm system for automatic activation in addition to manual isolation.
- b. There needs to be sufficient visible labelling that PV panels are on the roof, ideally in an area where the fire brigade would conjugate. In addition at the switchboard a sign "Double power supply: PV and Grid" should be installed.
- c. Suitable and regular pre-fire planning needs to be conducted with the Fire Brigade. Items to consider include roof accessways which may have changed due to PV panel layout, the added weight of the installation leading to earlier roof collapse, potentially toxic fumes and falling objects such as the panels themselves.
- d. The emergency response plan and fire risk assessment needs updating accordingly. Electrical equipment and access to the roof and the module should be marked on the fire and emergency site plan.
- e. Cable routing should not compromise fire compartments of the building. If unavoidable then they should be sealed in accordance with respective standards. In addition, DC cabled should not be routed through the interior of a building. When there is no alternative suitable conduit should be used.
- f. Unless completely unavoidable, hot work such as welding and flame cutting should not take place in the vicinity of PV panels and only permitted with a suitable permit system.
- g. Where possible, panels and wiring should be positioned where they are not likely to be damaged by rodents, such as laying wiring in closed ducts.
- h. Depending on the value of the panels, some form of physical protection that prevents panel removal including the use of security fasteners and/or system monitoring tools and alarms.
- i. Inverters should not be mounted directly on combustible walls or combustible sandwich panels.
- j. Leaves and litter should not be allowed to collect around or beneath PV panels.

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