

Rooftop Solar Panel System

OVERVIEW OF ISSUE

Solar power is cited by environmental organizations as one of the most sustainable and clean energy sources in Canada. Solar photovoltaic (PV) systems, including those installed on rooftops, are vigorously promoted by the government.

There has been an increasing trend of businesses, residential buildings, industrial facilities and institutions, including healthcare facilities, installing these systems.

Solar PV systems pose considerable concern for fire fighter safety and in property loss prevention. Proper coordination and consultation with all stakeholders – the fire department, authority having jurisdiction (e.g. city engineer), roof/building designers/engineers, consultants, facilities/maintenance team and insurers – should be made to address foreseeable risks associated with rooftop solar PV installations.

KEY POINTS

- All stakeholders should be involved in the design phase before installation to address various foreseeable risks associated with rooftop solar photovoltaic system in healthcare facilities.

THINGS TO CONSIDER

Structural

- Design of the rooftop solar PV system should be completed by a qualified professional engineer and installed by a certified solar PV contractor/installer with experience, preferably in the healthcare industry.
- Comply with the building code having jurisdiction regarding solar PV. Consider additional loads on the existing roof, lightning exposure, surge protection, snow loading/drift, wind, rainfall/drainage, hail and earthquake (if exposed) in the design.
- Involve the fire department in the project design and coordination.
- Firefighters' concerns should be addressed in the system design (please see References section for Ontario Ministry of Labour's Guidance, as an example).

Fire

- Evaluate whether and how the installation of the solar PV system affects the fire performance characteristics of the overall roof system.
- Install noncombustible insulation (e.g. mineral wool) within roof expansion joints when solar PV installations are installed on new or existing roof covers.
- For new roofing system projects, consider using an approved solar PV system and approved roof assembly (i.e. installing an FM approved roof system in conjunction with Approval Standard 4478). Use noncombustible insulation or cover boards directly below the roof cover. This includes gypsum cover boards and mineral wool or expanded glass insulation.
- Do not use solar PV panel systems that contain foam plastic (e.g. extruded foam polystyrene) unless specifically approved as part of the assembly.

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- Where rooftop solar PV systems cover the entire roof, ensure alternative routes for smoke ventilation in case of fire.
- Provide a remote disconnect for the DC (direct-current) power combiner box. Provide interlocks to trip the DC feed to the inverter and initiate an alarm. Investigate the alarm if the interlock trip was caused by a ground fault (via residual current DC monitoring or a ground circuit DC current sensing relay).
- Other best practice guidelines include:
 - Check all equipment for damage or required maintenance after severe wind or snow storms.
 - Perform solar PV array insulation resistance tests every three years.
 - Perform a thermographic survey for all electrical components (e.g. inverters, wire connections, and modules) annually.
 - Visually inspect inverters regularly.
 - Test inverters annually to ensure correct operation in accordance with the manufacturer's specifications.
 - Inspect the sealing of roof penetrations for water-tightness annually and repair or replace as needed.
 - Adjust the inspection and testing frequencies depending on the particular type of equipment and its duty, failure history, criticality, and condition using recognized codes, standards and best practices.
 - Inspect the solar PV assemblies at least annually to ensure mechanical connections between panels and supports have not loosened or become corroded, and that concrete paver blocks have not deteriorated. Tighten connections and replace corroded or deteriorated materials as needed.

Trips and Falls

- Provide orientation and training (i.e. fall safety program) to personnel and contractor staffs accessing the roof for increased risk of trip and fall.
- Keep "tie off" points (anchor points for attaching lifelines, lanyards or deceleration devices) accessible for contractors and/or maintenance personnel.

Falling Snow and Ice Risks

- A solar PV system on the roof can potentially shed snow. This sudden release of snow can be hazardous to pedestrians or vehicles below. Precautions should be put in place and appropriate building codes should be consulted and complied with.

Operation and Maintenance

- Operate and maintain the solar PV system in accordance with the manufacturer's recommendations and specifications.



REFERENCES

- Canadian Standards Association Group. (2013). Solar photovoltaic rooftop-installation best practices guideline.
- Electrical Safety Authority. (2013). Renewable generation safety.
- FM Global. (2014). Roof mounted solar photovoltaic panels. [Data Sheet].
- Ontario Fire Service Section 21 Advisory Committee. (2011). Solar photovoltaic systems. [Fire Fighters Guidance Note].
- Zurich American Insurance Company. (2014). Photovoltaic systems.