Bulletin 64-6-0
PV rapid shutdown
Rules 64-200, 64-218

Issued May 2016

Scope

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(1) Background

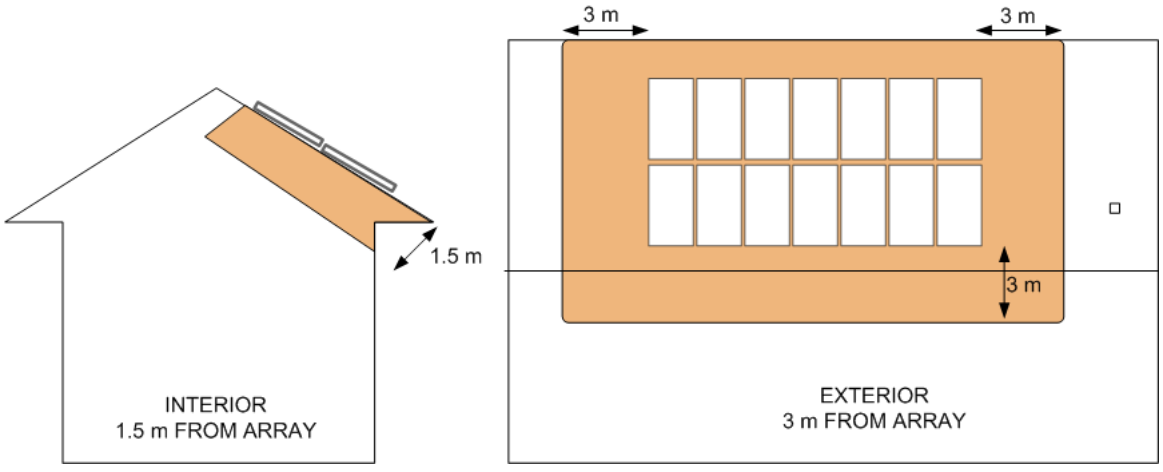
Fire service representatives are concerned about the inherent shock hazard that most PV power systems present to first responders. To address their concerns, new Rule 64-218 has been added to the 2015 Ontario Electrical Safety Code (OESC), to provide requirements for the rapid shutdown process for PV systems installed on buildings or structures. For ground-mounted or similar PV systems, where none of PV system components or circuits is in contact with a building, the rapid-shutdown requirements do not apply.

Based on the intent of Rule 64-218, rapid shutdown process can be defined as a process that:
- de-energizes PV source or output conductors that are more than 1.5 m (5 ft) in length inside a building, or more than 3 m (10 ft) from a PV array/module, as shown on Diagram B1; and
- de-energized conductors to not more than 30 V and 240 VA within 10 s of initiation.

If a combiner is close (not more than 3 m) to a PV array/module, Rule 64-218 does not require a PV module level shutdown. PV conductors within a PV array and up to a combiner box located within 3 m are permitted to remain energized.

It is important to understand that Rule 64-218 does not provide **“how to”** design the rapid shutdown process. The Rule specifies the objective and the end result of the rapid shutdown process includes:
- circuits required to be de-energized, as shown on Diagram B1;
- acceptable voltage; and
- time to achieve that voltage.

Diagram B1 – PV circuits that are required to be de-energized (outside of the marked area)



Based on Rule 64-218, the rapid-shutdown process applies to a complete photovoltaic system, installed on a building, which includes; PV source and output conductors, inverter input and output and batteries and charge controller input and output.

(2) PV rapid shutdown initiator

Based on the clarifications provided in the Appendix B Note to Rule 64-218, there shall be a device included in the PV rapid shutdown process that initiates the process. Considering that the intent of the Rule is that emergency responders can shut down the PV system, should an emergency situation occur, the rapid shutdown initiator is required to be a manual device. When a manually activated rapid shutdown device is provided, there is nothing that prevents other systems, such as an ancillary device from a fire alarm system, to also be able to shut down the system.

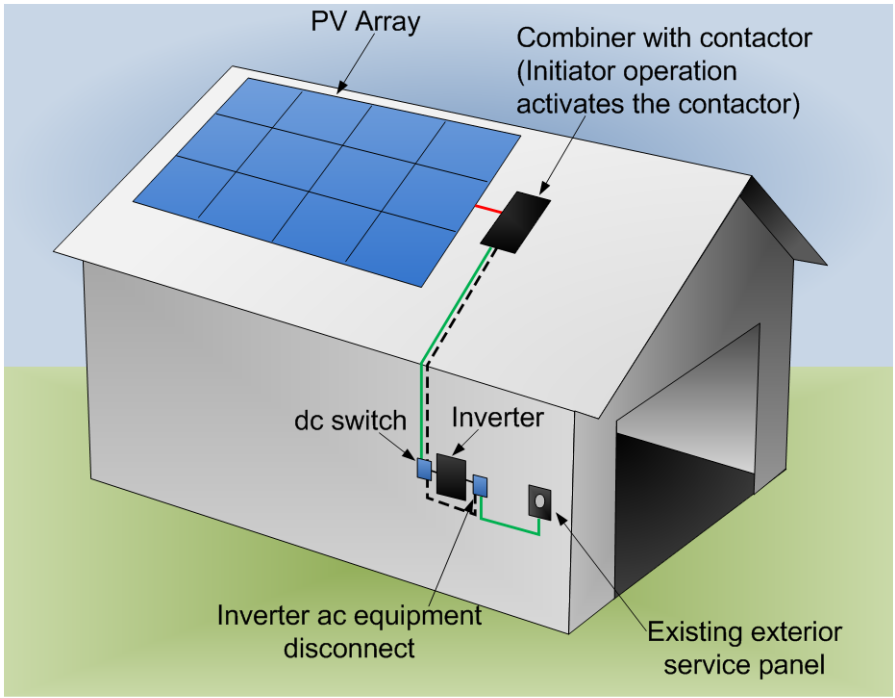
Although Appendix B Note to Rule 64-218 explains that the intent of the rule is to require a disconnecting means capable of making and interrupting its full load, the initiator may or may not be required to be a load breaking device, based on the design. If the initiator is part of a control circuit that activates a rapid shutdown and is not interrupting any load, it is not required to be a load breaking disconnecting means. Only when the initiator activates the rapid shut down by opening a PV source or output circuit is it required to be a load breaking disconnecting means.

Rule 64-218 does not specify that a rapid shutdown device is required to be an emergency shut-off switch used for only that purpose. Based on a rapid shutdown process design, PV ac or dc disconnecting means may also be used as a rapid shutdown initiator, as shown in Diagram B2. The examples of devices that may be used as an initiator are:

- Utility disconnect switch
- “DG” disconnect switch
- Rapid-shutdown switch

If a rapid shutdown initiator disconnects dc power only, in order to provide complete PV System disconnection, the ac disconnect required by Rule 84-022, may require operation to disconnect the ac conductors.

Diagram B2 – “DG” disconnect switch or Utility disconnect switch may be used as an initiator



Rule 64-218 does not specify the location for rapid shutdown initiator. Keeping in mind that the initiator is to be used by emergency responders, the initiator shall be readily accessible. The most suitable location should be typically near the supply authority disconnect required by Rule 84-022, or equivalent for standalone systems.

(3) Marking requirements

Based on the new Rules 64-200(2) and (3), a marking shall be provided at the disconnecting means for the PV output circuit (DG source disconnect) to identify that the PV system is equipped with rapid shutdown. The marking shall be capital letters with a minimum height of 9.5 mm, in white on a red background:

Similar to PV system marking requirements, the rapid shutdown initiator is required to be labeled in a conspicuous, legible, and permanent manner, as required by Rule 2-100. Since the initiator is to be used by emergency responders, the initiator shall be appropriately identified. The marking requirements specified in Rule 64-200(3) shall apply. So, a rapid shut down switch or an ac or dc switch that serves as a rapid shutdown initiator is required to be marked as follows (or equivalent):

Note:
If the PV Rapid Shutdown disconnect is the DG Source Disconnect, only 1 label is required.

(4) Micro-inverters and roof mounted “string” inverters

PV installations with micro-inverters and ac modules may inherently comply with rapid-shutdown requirements. Loss of ac power immediately de-energizes all PV system circuits outside the array. Only circuits internal to modules and between modules and micro-inverters or ac modules remain energized.

Another case would be where a utility-interactive inverter (that operates only in grid-dependant mode) with an integral combiner box, sometimes referenced as a “string” inverter, is located within 3 m of a PV array/module. Loss of ac power will immediately de-energize PV system conductors outside the 3 m envelope.

Marking, in accordance with Rule 64-200(2) and (3), to identify that the PV system is equipped with rapid shutdown and identification of the Utility disconnect switch, when used as the rapid shutdown initiator, is required as discussed above in Topic (3).