

In the 2020 National Electrical Code (NEC), the concept of "Rapid Shutdown" within the array boundary was expanded to include "PV Hazard Control Systems (PVHCS)" as a method to comply with rapid shutdown requirements, essentially allowing for more flexibility in system design while still ensuring safety for firefighters during potential emergencies.

## KEY POINTS TO REMEMBER:

**UL 3741 Standard:** PVHCS is directly linked to the UL 3741 standard, which outlines specific requirements for systems designed to mitigate shock hazards for firefighters when working on a solar array.

**Compliance with NEC 690.12:** By utilizing a UL 3741 listed PVHCS, solar installers can meet the rapid shutdown requirements outlined in NEC section 690.12.

**Benefits of PVHCS:** This approach can sometimes offer cost advantages compared to traditional module-level rapid shutdown devices, as it allows for system designs that may not require electronics on each individual solar panel.

## ACHIEVING NEC 690.12(B) COMPLIANCE:

**RESIDENTIAL CASE 1: UL3741 LISTED SYSTEM SINGLE ARRAY**

Case 1: Single arrays comply with NEC 690.12(b)(2)(i)

- Outside Array Boundary:  $\leq 30V$  within 30 seconds.
- Inside Array Boundary:  $\leq 600V$  Residential, 1000V Commercial.

Case 1: Maintain NEC compliance for single arrays. Single arrays require the use of a SID as shown in the figure above to control the conductors outside of the array boundary.

IMPORTANT: Review electrical page(s) for specific approved SID(s) and install methods.

**RESIDENTIAL CASE 2: UL3741 LISTED SYSTEM CONTIGUOUS SUB-ARRAY**

Case 2: Sub-Array(s) within the same Array Boundary ( $\leq 2ft$ ) are considered contiguous and comply with NEC 690.12(b)(2)(i)

- Outside Array Boundary:  $\leq 30V$  within 30 Seconds
- Inside Array Boundary:  $\leq 600V$  Residential, 1000V Commercial.

Case 2: Maintaining NEC Compliance with sub-array(s) within array boundary. Multiple arrays with maximum 2 ft. spacing between array and sub-array result in a contiguous single array boundary and will require the use of a SID as shown above to control conductors outside of the array boundary.

IMPORTANT: Review electrical page(s) for specific approved SID(s) and install methods.

**RESIDENTIAL CASE 3: UL3741 LISTED SYSTEM MULTIPLE ARRAYS**

Case 3: Multiple arrays with multiple strings comply with NEC 690.12(b)(2)(i)

- Outside Array Boundary:  $\leq 30V$  within 30 seconds.
- Inside Array Boundary:  $\leq 600V$  Residential, 1000V Commercial.

Case 3: Maintain NEC compliance with multiple arrays. In multiple arrays with multiple strings, each string will require a SID. When a string is split across non-contiguous ( $>2ft$ ) sub-arrays, a SID must be installed on both ends of the connection between sub-arrays as shown above to control conductors outside of the array boundary.

IMPORTANT: Review electrical page(s) for specific approved SID(s) and install methods.

For compliance with NEC 690.12(B) Case 1, the PV array should be designed as a single, continuous unit to stay within the 1-foot array boundary. Installations where sub-arrays can be included within a 1-ft array boundary, or 2-ft total, can be considered a contiguous array should comply with NEC 690.12(B) Case 2. Finally multiple arrays, and more than a 2-ft gap between them, conductors must be controlled outside the array boundary and should comply with NEC 690.12(B) Case 3.