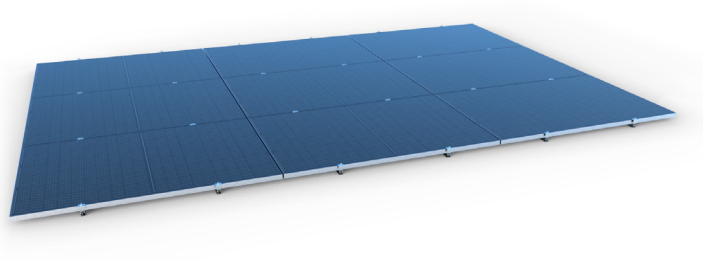
POWER RAIL™ UL 3741

PV HAZARD CONTROL

INSTALLATION ADDENDUM



⚠ IMPORTANT SAFETY INFORMATION

READ AND COMPLETELY UNDERSTAND ALL INSTRUCTIONS BEFORE INSTALLING PRODUCT. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY OR DEATH.

This product is intended for use by trained technicians only. This product should not be used by anyone who is not familiar with and not trained to use it. When working in the area of energized lines, extra care should be taken to prevent accidental electrical contact. Be sure to wear proper safety equipment per your company protocol. These instructions are not intended to supersede any company construction or safety standards. These instructions are offered only to illustrate safe installation for the individual. PLP products are intended for the specified application only. Do not modify this product under any circumstances. Do not reuse or reinstall any PLP product unless that capability is expressly indicated in the product's Installation Instructions. For proper performance and personal safety, be sure to select the proper PLP product before installation. PLP products are precision devices. To ensure proper performance, they should be stored in cartons under cover and handled carefully.

It is the installer's responsibility to:

- Ensure safe installation of all electrical aspects of the array. All electrical installation and procedures should be conducted by a licensed and bonded electrician or solar contractor. Routine maintenance of a module or panel should not involve breaking or disturbing the bonding path of the system. All work must comply with national, state, and local installation procedures, product, and safety standards.
- Comply with all applicable local or national building and fire codes, including any that may supersede this manual.
- Ensure all products are appropriate for the installation, environment, and array under the site's loading conditions.
- Use only POWER RAIL parts or parts recommended by PLP; substituting parts may avoid any applicable warranty.
- Ensure provided information is accurate. Issues resulting from inaccurate information are the installer's responsibility.
- Ensure bare copper grounding wire does not contact aluminum and zinc-plated steel components, to prevent risk of galvanic corrosion.
- If loose components or loose fasteners are found during periodic inspection, re-tighten immediately. Any components showing signs of corrosion or damage that compromise safety shall be replaced immediately.
- Provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems or in accordance with CSA C22.1.
- Disconnect AC power before servicing or removing modules, AC modules, microinverters, and power optimizers.
- Review module manufacturer's documentation for compatibility and compliance with warranty terms and conditions.

CAUTION

Module removal may disrupt the bonding path and could introduce the risk of electric shock. If during servicing a module is required to be removed, a bonding jumper shall be installed between the adjacent modules from where the module was removed to maintain the bond path.

RATINGS

UL 2703 Listed
UL 3741 Listed

US
#264073

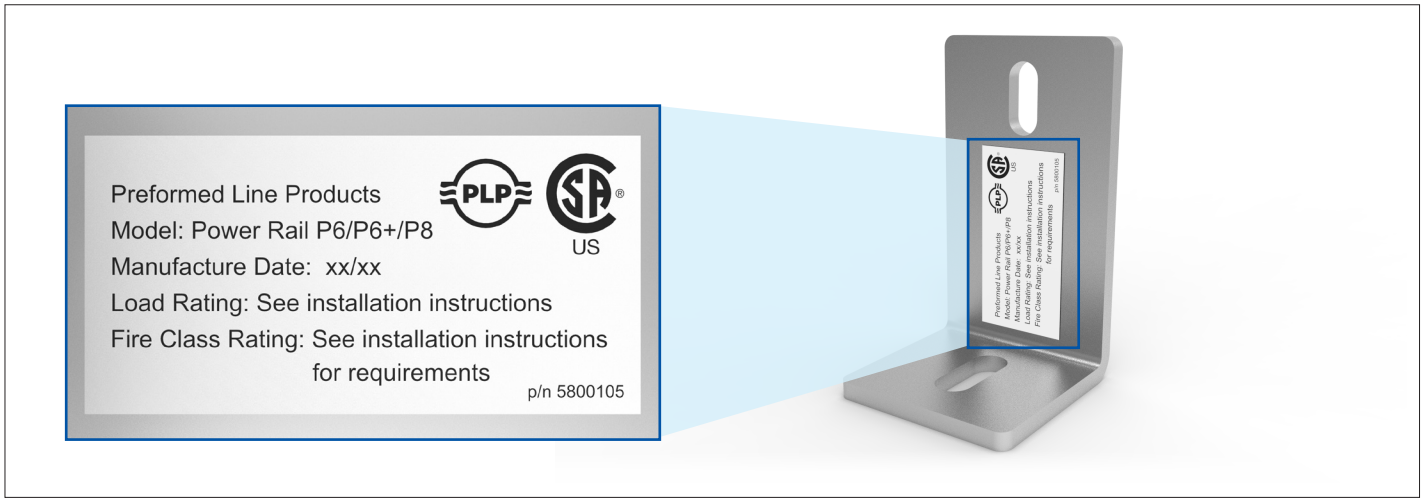
CONFORMS TO STD ANSI/UL 3741 STANDARD FOR SAFETY PHOTOVOLTAIC HAZARD CONTROL SYSTEM
- Max PVHCS System Voltage: 1000 V

List of approved PV Hazard Control Equipment or Components evaluated at 1000 V Max System Voltage:

- All Modules listed in Module Compatibility Section with max module size 30.5ft^2
- POWER RAIL™ P6
- POWER RAIL P8
- POWER RAIL P14
- P6 Splice Plate
- P8 Splice Plate
- P14 Splice Plate
- P14 L-Mounting Foot
- 2.5" Tall L-Mounting Foot
- 3.5" Tall L-Mounting Foot
- 5" Tall L-Mounting Foot
- 6" Tall L-Mounting Foot
- 5° Tilted Front Foot
- 5° Tilted Back Foot
- 10° Tilted Front Foot
- 10° Tilted Back Foot
- Pivot Easy Mounting Foot Kits
- 7" Cast Super Power Post
- 8" Cast Super Power Post
- 9" Cast Super Power Post
- 10" Cast Super Power Post
- 4" Power Post
- 6" Power Post
- 4" Easy Power Post
- 6" Easy Power Post
- RAD™ AMP™ Mid Clamp
- RAD Grounded End Clamp
- RAD Grounded Lug
- Turn Bolt Key

MARKINGS

Product markings are located on the POWER RAIL L-feet.



INTRODUCTION: UNDERSTANDING UL 3741 AND NEC 690.12

2020 NEC 690.12 Rapid Shutdown of PV Systems on Buildings

NEC 690.12 requires that all PV arrays installed on or in buildings shall include the following rapid shutdown functions to reduce shock hazard for Fire Fighters (FF) in accordance with 690.12(A) through (D):

(A) Controlled Conductors

(1) PV system DC circuits

(2) Inverter output circuits originating from inverters located within array boundary

(B) Controlled Limits

(1) Outside Array Boundary: ≤30V within 30 seconds

(2) Inside Array Boundary:

(1) Listed PV Hazard Control System (UL 3741)

(2) ≤80V within 30 seconds after rapid shutdown initiation

(3) PV array without exposed wiring methods or conductive parts

(C) Initiation Devices

• Initiation device(s) shall initiate the rapid shutdown function of the PV system

(D) Equipment

• Equipment that performs rapid shutdown functions other than initiation devices, such as listed disconnect switches, circuit breakers, or control switches

NEC 690.2 defines the array as a mechanically and electrically integrated grouping of modules with support structure, including any attached system components such as inverter(s) or dc-to-dc converter(s) and attached associated wiring. This indicates the POWER RAIL™ Racking and collocated inverters are part of the array

NEC 690.12(B) defines the array boundary as 1 ft from array in all directions. This indicates that the array boundary can extend 1 ft from the edge of the POWER RAIL racking, inverter or module.

2020 NEC 690.12(B)(2) CONTROLLING CONDUCTORS WITHIN THE ARRAY BOUNDARY

The POWER RAIL Photovoltaic Hazard Control System (PVHCS) is a UL 3741 Listed system that complies with NEC 690.12(B)(2)(1), when installed by qualified installers per the installation procedures outlined in the POWER RAIL Installation Manual and the POWER RAIL UL 3741 Installation Addendum. Please refer to subsequent sections of the addendum for various examples of system designs that comply with 690.12(B)(2).

INSTALLATION METHODS PER UL 3741 AND NEC 690.12

The simplest installation method to comply with NEC 690.12(B) is to utilize the POWER RAIL UL 3741 system with a contiguous array (no separate sub-arrays) with one or more collocated inverters, as all inverter DC input circuits are within the 1 ft array boundary (Case 1). Installations where sub-arrays are required and cannot be included within the 1 ft array boundary can comply by using a single or combining one or more of the three options below (Cases 2 - 4).

The following case studies have been provided by PLP to show examples of installation options that comply with NEC 690.12(B). Compliance is not limited to these examples.

Case 1: UL 3741 Listed System
Case 2: UL 3741 Listed System with Contiguous Sub-Array
Case 3: UL 3741 Listed System with Non-Contiguous Sub-Array
Case 4: UL 3741 Listed System with MLPE Sub-Array

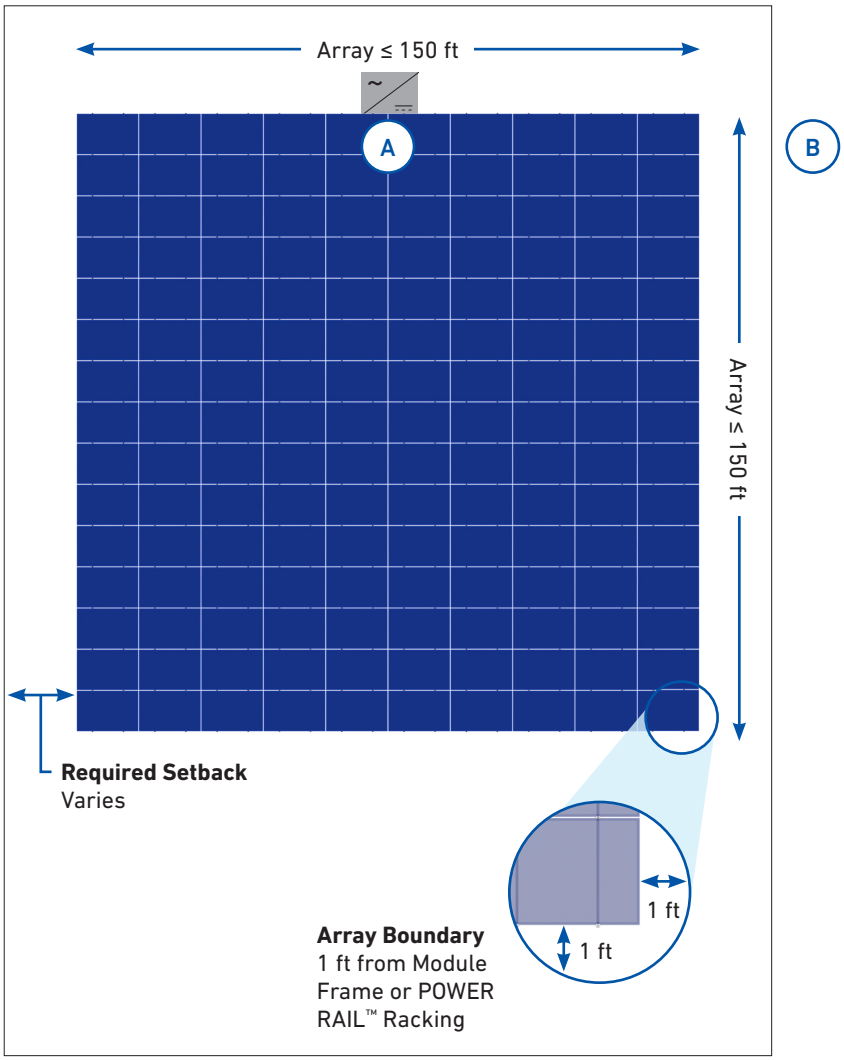
CASE 1: UL 3741 LISTED SYSTEM

Outside Array Boundary: ≤ 30 kV within 30 seconds
Inside Array Boundary: ≤ 1,000 kV

Case 1: Array(s) Comply with NEC 690.12(B)(2)(1)

A All inverter input circuits (DC) are contained within the PV array boundary and do not require additional measures to reduce string voltages per 690.12(B)(2)(1) after installation (Inverter DC disconnect, AC breaker or AC disconnect).

B Inverter output circuits (AC) are outside of the array boundary and meet the 690.12(B)(1) requirement after initiation (AC breaker or AC disconnect).

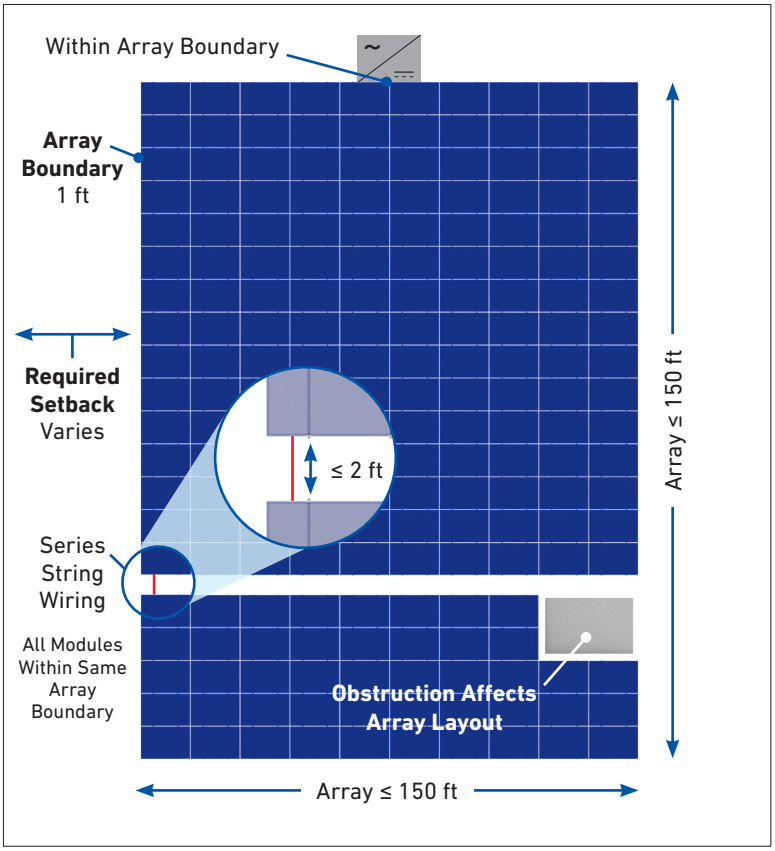


CASE 2: UL 3741 LISTED SYSTEM WITH CONTIGUOUS SUB-ARRAY

Outside Array Boundary: ≤ 30 kV within 30 seconds
Inside Array Boundary: ≤ 1,000 kV

Case 2: Maintaining NEC Compliance with Sub-Arrays within Array Boundary

Maximum 2 ft spacing between all array components resulting in a single array boundary.

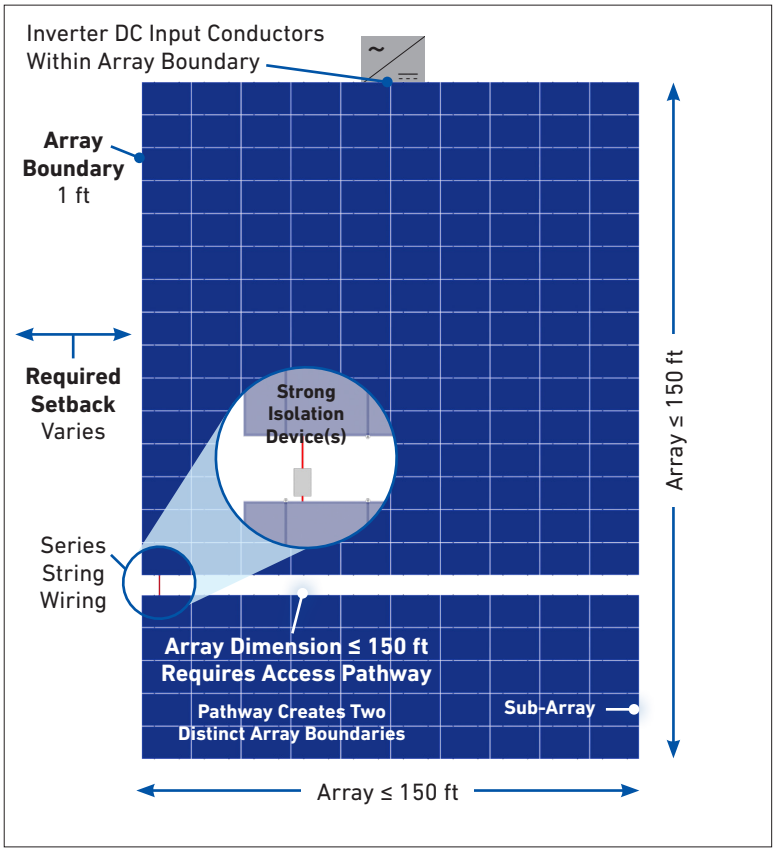


CASE 3: UL 3741 LISTED SYSTEM WITH NON-CONTIGUOUS SUB-ARRAY

Outside Array Boundary: ≤ 30 kV within 30 seconds
Inside Array Boundary: ≤ 1,000 kV

Case 3: (String Isolation Device) Conductors Outside of Array Boundary are Controlled via String Isolation Device(s)

Complete string must be connected to a single isolation device. If used for a partial string, isolation devices are required on both sides of the pathway since voltage will be present on both sides.



CASE 4: UL 3741 LISTED SYSTEM WITH MLPE SUB-ARRAY

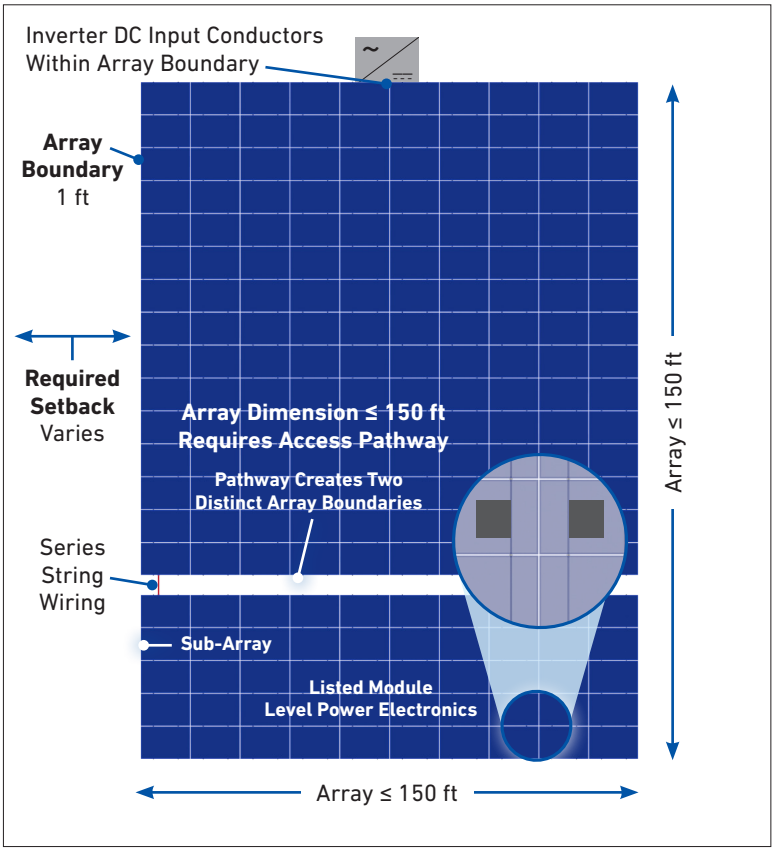
Outside Array Boundary: ≤ 30 kV within 30 seconds
Inside Array Boundary: ≤ 1,000 kV
Inside Sub-Array Boundary: ≤ 80 kV within 30 seconds

Case 4: (Using MLPE) Sub-Array Circuits are Controlled to Meet 690.12(B)(2)(2)

CAUTION

When using MLPE devices, review installation instructions for both the MLPE device and inverter to verify that both devices comply with UL 1741 Rapid Shutdown requirements.

Utilize Module-Level Power Electronics on lower-sub-array. All modules on the same inverter input must be connected to an MLPE. Upper array utilizes UL 3741 listing without MLPEs for compliance.

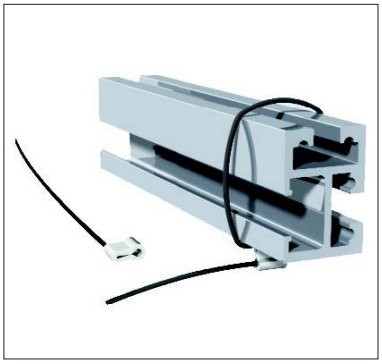


UL 3741 ENHANCED WIRE PROTECTION

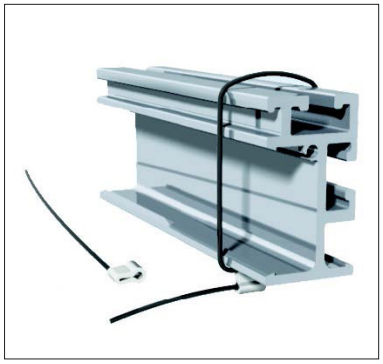
CAUTION

Installers shall refer to PLP Wire Management Solutions for guidelines on use of wire management solutions with PLP products.

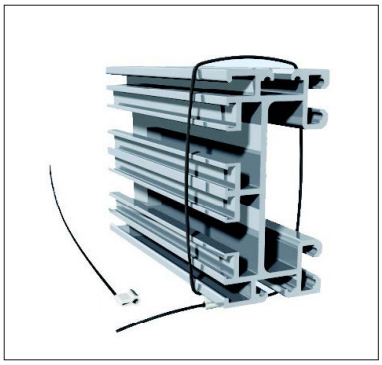
All wires shall be routed such that they are not exposed to potential FF interactions. Routing wires in POWER RAIL™ channels and under modules, or through approved listed raceway for wires crossing over a pathway, will ensure avoiding exposure to FF interactions.



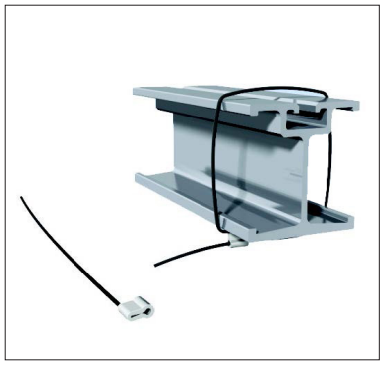
SunBundler - P6 Rail



SunBundler - P8 Rail



SunBundler - P14 Rail



SunBundler - UD Rail

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