Question 1: What is UL 2703?

Answer: UL 2703 is the Safety Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels. The first edition was published January 28, 2015. This standard is an ANSI-consensus standard, developed by a Standards Technical Panel representing all stakeholders - authorities having jurisdiction, manufacturers, designers, installers, and testing laboratories. This standard supersedes the Outline of Investigation, Subject 2703. Go to www.ul.com/standards for more information on submitting proposals and obtaining a copy of the standard. For products covered by this standard see question 4.

Question 2: What is the purpose and scope of UL 2703?

Answer: UL 2703 covers rack mounting systems and clamping devices for flat-plate photovoltaic modules and panels that comply with the Standard for Flat-Plate Photovoltaic Modules and Panels, UL 1703, intended for installation on or integral with buildings, or to be freestanding (i.e., not attached to buildings), in accordance with the National Electrical Code, ANSI/NFPA 70 and Model Building Codes. These products are for all applications - residential, commercial, and utility.

Question 3: What are the related code requirements as applicable to products listed to UL 2703?

Answer: The following codes apply:

- National Electrical Code (NEC) and California Electrical Code (CEC)
- International Building Code (IBC) and California Building Code (CBC)
- International Residential Code (IRC)
- California Residential Code (CRC)

Grounding and Bonding:

- NEC & CEC - Part V of Article 690 and Article 250
- IRC - Section R324
- CRC - Section R331
Mechanical Load:
- IBC & CBC - Section 1609
- IRC - Section R324
- CRC - Section R331

Fire:
- IBC & CBC - Section 1505.9
- IRC - Sections R902.4 and R324
- CRC - Sections R902.4 and R331

(Refer to Question 7 to further understand these attributes)

Question 4: What is a rack mounted PV system? What are the typical components of the racking system? (e.g. clamping device, rail, L-foot, etc.)

Answer: A rack mounted PV system is comprised of PV module(s) and a racking system that structurally supports and secures the PV module(s) to the ground or the roof. Not all components referenced are in every rack mounting system. Refer to the manufacturer's instructions for what constitutes each rack mounting system.

- **Rack (Racking):** the structural system that supports and connects the PV modules to the roof, ground, or other mounting structure. Rack may be made of metal or non-metallic materials.

- **Rail:** Structural “bar” which supports the PV modules between structural attachment points to the roof or ground mounting structure.

- **Rail-Free Racking (Rail-Less Racking):** Racking system that lacks continuous rails. Rail Free racking systems connect PV module frame rails together as part of the racking system structure.

- **Clamping/Retention Device:** A mechanical means to secure a PV module to the rack mounting system which does not rely upon the mounting holes in the PV module’s frame. These clamping devices are typically, but not limited to, top-down clamps. The clamping device may also function as a bonding device where specified in the installation instructions.

- **Ground Lug:** Device which connects to the rack mounted PV system that provides a secure reliable electrical grounding method to ensure the exposed metal surfaces that are part of the system fault current grounding path to the main system ground.

- **Bonding Device:** A device for bonding and may include a function to pierce non-conductive coatings such as but not limited to; anodization, paint, vitreous enamel, and may be a separate piercing device or integral to the component to perform the bonding function.
• **Exposed Metal Accessory:** Accessible conductive components such as flashings, skirts, roof attachments, ballast trays and wind deflectors.

• **Roof attachments** include (but are not limited to) the following devices:
  - L-foot (plural: L-Feet): component which connects and structurally supports rails to roof attachments, ground mount attachments, or other structures.
  - Standoffs: Post which attaches to roof using a base which is secured to roof deck.
  - Tile hooks: Component which secures the rack to the roof structure under tile without penetrating through the top of the tile.

• **Ground mount attachments** include (but are not limited to) the following devices:
  - Ground screws
  - Driven pilings
  - Poured Concrete footings

**Question 5: What parts of the racking system do not need to be bonded/grounded?**

**Answer:**
- Exposed metal accessories are not required to be electrically bonded when the following are all true:
  - The fault current ground path components of the system are clearly marked by manufacturers.
  - The installation instructions clearly identify the system’s fault current ground path components and their methods of assembly.
  - The accessible conductive component is not likely to be energized other than through direct or indirect contact with other accessible conductive components that are likely to be energized under normal operations or single fault conditions.
  - A suitable wire positioning device that complies with the Standard for Positioning Devices, 1565, or the Standard for Cable Management Systems - Cable Ties for Electrical Installations, 62275, is used to secure current carrying conductors.

- Exposed Metal Accessories are defined as accessible conductive components that are not a part of the fault current ground path such as flashings, skirts, roof attachments, ballast trays and wind deflectors.

- **ROOF AND GROUND ATTACHMENTS ARE NOT PART OF UL 2703 AND ARE NOT CONSIDERED IN UL 2703.**

**Question 6: What are the benefits to solar installers and AHJs of using a UL 2703-listed rack mounting system?**
**Answer:** UL 2703 provides installers, building officials and inspectors with a method for evaluating the bonding/grounding, mechanical loading, and fire performance characteristics of a PV racking system and demonstrating compliance with code requirements. Using a UL 2703 listed system reduces the necessity for repetition of evaluation by different plan checkers and inspectors resulting in the reduction of the time required for plan check and inspection.

**Question 7: What are the attributes covered by UL 2703?**

**Answer:** There are three attributes:

- Bonding/grounding electrically connects all accessible potentially conductive parts and provides a ground return path.
- Fire classification (Class A, B, or C) determines the resistance to external fire exposure when the rack mounting system is installed in combination with specific PV modules and according to the PV mounting system installation instructions.
- Mechanical loading determines the minimum design load rating in the directions of downward pressures, upward pressure, and down-slope load.

**Question 8: How do you know what attributes have been evaluated for a specific racking and mounting system?**

**Answer:** The certification information posted by the third party certification organization.

**Question 9: Are all rack mounting systems required to be evaluated to all attributes?**

**Answer:** No. If the system is not being used to bond the attached modules, then a listing to the bonding/grounding attribute is not required. Fire classification is not required on all structures. Mechanical loading may be determined by the registered design professional (such as a registered structural engineer or licensed contractor) for the specific installation. However, each system needs to be evaluated for the attribute(s) required for a specific installation.

**Question 10: What is the difference between listed, classified, certified, and recognized rack mounting components and systems?**

**Answer:** Listed, classified, or certified products have been tested and evaluated to appropriate designated standards, or have been tested and found suitable for a specified purpose, by third party certification organizations that are acceptable to the AHJ. Each third party certification organization uses these three terms to clarify the scope of their certification. Refer to the third party certification for these terms. Recognized components are incomplete in construction features or restricted in performance capabilities, and are intended for use as components of complete equipment submitted for investigation by a third party certification organization rather than for direct separate installation in the field. The means for identifying listed products may vary for each third party certification organization. Refer to the answer to Question 11 for more information.
Question 11: Where do I find certification information on a particular racking and mounting system?

**Answer:** The following third party certification agencies currently provide certifications to UL 2703:

- QAI Laboratories - [www.qai.org](http://www.qai.org)
- Underwriters Laboratories (UL) - [www.ul.com/database](http://www.ul.com/database) - UL Category Code “QIMS”

*Check with the local jurisdiction as to which third party certification organizations are acceptable to the jurisdiction.*

Question 12: How can AHJs and installers verify what PV modules have been evaluated with a specific UL 2703-listed mounting system? How can the various parts that constitute the system be verified?

**Answer:** Go to the certification information posted by the third party certification organization. See Question 11 for where the information is posted. Also refer to installation instructions provided as part of the listing.

Question 13: What are the key factors an AHJ should look for to ensure a code compliant installation?

**Answer:** The AHJ must be aware of the following key factors:

- Rack system manufacturer and model
- The components of the specific rack system
- Specific UL 2703 listing attributes
  - Fire classification in combination with the installed modules
  - Bonding/grounding in combination with the installed modules
  - Mechanical loading
- Rack system installation instructions

*The above information is necessary for an AHJ to correctly evaluate and approve a specific installation in compliance with the minimum code requirements.*
Question 14: What is Fire Classification and how is it achieved?

Answer: Fire Classification is the method used to determine the resistance to light (Class C), moderate (Class B), and severe (Class A) external fire exposure for roofing assemblies in accordance with Section 1505 of the International Building Code. Each rack mounting system is tested with specific types of photovoltaic modules (Types 1 through 15) in accordance with UL 2703 established the Fire Classification (Class A, B, or C) of the rooftop mounted photovoltaic system. Rack mounting systems not evaluated for a Fire Classification are marked “Not Fire Rated”. For more information, see www.solarabcs.org and the California State Fire Marshal’s Informational Bulletins (http://osfm.fire.ca.gov/informationbulletin/pdf/2014/IB14002addendumPVFireClassificationDelay.pdf). Refer to the certification information to verify the Fire Classification for each rack mounting system. Rack mounting systems marked “Not Fire Rated” have not been evaluated for Fire Classification.

Question 15: What is the content of installation instructions and what is its importance?

Answer: Installation instructions provide a detailed description of how the rack mounting system is to be installed to address the attributes evaluated for the system. Specific configurations and assembling specific components of the system are necessary to achieve bonding and grounding, fire performance, and mechanical loading. Where the system has been evaluated for the mechanical loading attribute, the instructions include the load ratings. The instructions are evaluated as part of the certification of the system to UL 2703, and are considered part of the certification. Section 110.3(B) of the NEC, Section 1510.7.3 of the IBC, and R908.1.4 of the IRC require the installation to be done in accordance with the manufacturer’s installation instructions.

Question 16: What are the markings, where are they located and what do they mean?

Answer: The rack mounting system is required to be marked with the manufacturer’s identification and the model number. A rack mounting system evaluated for the fire performance attribute is marked “System Fire Class Rating: See Installation Instructions for Installation Requirements to Achieve a Specified System Fire Class Rating with this Product”. If the system has not been evaluated for the fire performance attribute (i.e. ground mount), the system is marked “Not Fire Rated”.

Question 17: What resources are available to educate solar installers, manufacturers and AHJs on UL 2703?

Answer: The following additional educational resources are available:

- International Association of Electrical Inspectors (IAEI) - www.iaei.org
For the most recent version of the document, please refer to the SEAC website at www.SEACgroup.org
SEACIB1/201606-v1

(published by Underwriters Laboratories)

- UL 1703 Fire Code Compliance Database - applies to Fire Classification for 1703 and UL 2703, which are identical http://calseia.org/ul-1703-compliance-database/

**Note:** *UL 2703 has been going through some significant developments, SEAC will update this document as these developments occur.*

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