



FIRE CLASSIFICATION RATING TESTING OF STAND-OFF MOUNTED PHOTOVOLTAIC MODULES AND SYSTEMS

Prepared by

Larry Sherwood

Solar America Board for
Codes and Standards

Bob Backstrom

Dwayne Sloan

Christopher Flueckiger

Underwriters Laboratories

Bill Brooks

Brooks Engineering

Andrew Rosenthal

New Mexico State University

FIRE CLASSIFICATION RATING TESTING OF STAND-OFF MOUNTED PHOTOVOLTAIC MODULES AND SYSTEMS

Report Overview

In the last few years, fire and code officials along with members of the roofing industry have expressed concerns that installation of photovoltaic (PV) modules in stand-off configuration over typical roof coverings may impact the fire resistance of the roof coverings. With funding from the U.S. Department of Energy, Underwriters Laboratories (UL), and the Solar America Board for Codes and Standards (Solar ABCs) developed a test plan to investigate the fire resistance properties of this configuration.

Early research results demonstrated that the fire class rating of the PV module alone (determined according to American National Standards Institute [ANSI]/UL 1703-2012) may not accurately predict the fire resistance properties of the system composed of PV array, mounting structure, and roof covering.

Based on these results, stakeholders recognized the need to develop a new fire classification test for the PV module, mounting hardware, and roof assembly as one system. Over the last two years, the underlying principles of the new test have been refined and a new PV system flammability test regime was developed. In July 2013, the UL 1703 Standards Technical Panel (STP) adopted the new fire classification test into the standard.

Why the Report is Important

The new fire classification test represents a significant change from the previous PV module-only fire classification test procedure. In the new procedure, the performance of the PV array and roof covering forms the basis for the overall fire classification rating. As a result, the new fire classification test provides a more useful rating than the previous PV module-only rating test.

Issues

The new fire classification rating tests in ANSI/UL 1703-2013 involve the combination of the module or panel, the mounting system, and the roof covering to arrive at a single flammability rating. Because each of these three components has many products in the marketplace, testing every possible combination of the three components would mean thousands of required tests—an impractical solution.

Therefore, special care was exercised to develop a standard based upon 'typing' of common module and roof types combined with a limited suite of tests that minimizes the number of required tests. In addition, Solar ABCs, UL, industry, and stakeholders continue to explore and validate industry-wide solutions—system tests that further reduce the required testing—that may satisfy the new, revised ANSI/UL 1703-2013 fire classification requirements.

Summary and Key Findings

The new fire classification procedure requires the following tests be performed in order to derive a fire classification rating for the PV/roof system:

- spread of flame test on the top surface of module or panel,
- spread of flame test at roof and module or panel interface over representative steep or low sloped roof,
- burning brand test on module surface over representative steep sloped roof, and
- burning brand test between the module or panel and representative steep sloped roof.



Some of the major findings of the research program have been:

- For burning brand tests in which the brand is placed between the PV module and the roof surface, a Class B brand is the closest representation of actual materials likely to collect in this area.
- The critical flux values for ignition of low slope and steep slope roofing products and for crystalline silicon PV modules were found to be consistent for products in the same category (validating module ‘typing’ as a means to reduce testing requirements).
- The first to ignite (roof covering), second to ignite (PV) concept was demonstrated as a viable method for assessing the flammability performance of a system composed of PV, roof covering, and mounting hardware.

In July 2013, following stakeholder meetings and periods for public comment, the UL STP voted unanimously to approve the new fire classification test procedure. The STP acknowledged that further clarifications and refinements were still needed, including:

- defining additional PV module types in order to address new and old products not currently covered by the existing three types, and
- adding flexibility for the standard baseline roof types that meet the four-foot to six-foot fire performance criteria.

Lastly, additional research is ongoing in two areas—industry solutions (system tests that will help reduce the number of component tests otherwise required to determine system ratings) and completion of a new, calibrated burner flame source that will reduce variability and increase repeatability of tests using commercially available roof coverings.

For more information please contact

Mr. Larry Sherwood, 303-413-8028,
larry@sherwoodassociates.com.

Download the full report:

www.solarabcs.org/firerating

About Solar America Board for Codes and Standards

The Solar America Board for Codes and Standards (Solar ABCs) is a collaborative effort among experts to formally gather and prioritize input from the broad spectrum of solar photovoltaic stakeholders including policy makers, manufacturers, installers, and consumers resulting in coordinated recommendations to codes and standards making bodies for existing and new solar technologies. The U.S. Department of Energy funds Solar ABCs as part of its commitment to facilitate widespread adoption of safe, reliable, and cost-effective solar technologies.

For more information, visit the Solar ABCs website:
www.solarabcs.org

**Solar America Board
for Codes and Standards**

www.solarabcs.org