Solar America Board for Codes and Standards

Fire Testing That Helped Develop the Current Proposal for Fire Rating of PV Modules

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Issue

- What is the impact of a PV array on the fire classification of a rated roof?
- Building code and fire officials looking for answers and regulations to enforce

Roof Fire Safety

- Reduce fire movement across the roof of a building
- Prevent fire penetration into the building


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Roof Fire Class Rating

- International Building Code requires that roofs have a fire classification rating (Class A, Class B, Class C)
- Different buildings have different fire classification rating requirements
- States or local jurisdictions may enforce stricter requirements than the IBC

Solar ABCs Research Project

Investigate whether and how the presence of standoff-mounted PV arrays may affect the fire class rating of common roof covering materials.

Phases of Project

- Phase 1: Develop an understanding of the Spread of Flame test flame.
- Phase 2: Test PV modules over roofs and document the results. (Bulk of testing)

Phases of Project (cont.)

- Phase 2a: Determine if mitigation methods can cause PV modules to survive the test.
- Phase 2b: Test PV modules at angles, directly on roof, and understand heat load of burning brands.

Phases of Project (cont.)

- Phase 3: Characterization of PV Materials—Critical Radiant Flux
- Phase 4: Test the 3 SEIA 2015 IBC proposals to see if they address fire rating.
- Phase 5: Test concept of first to ignite, second to ignite concept—module/roof perimeter interface.

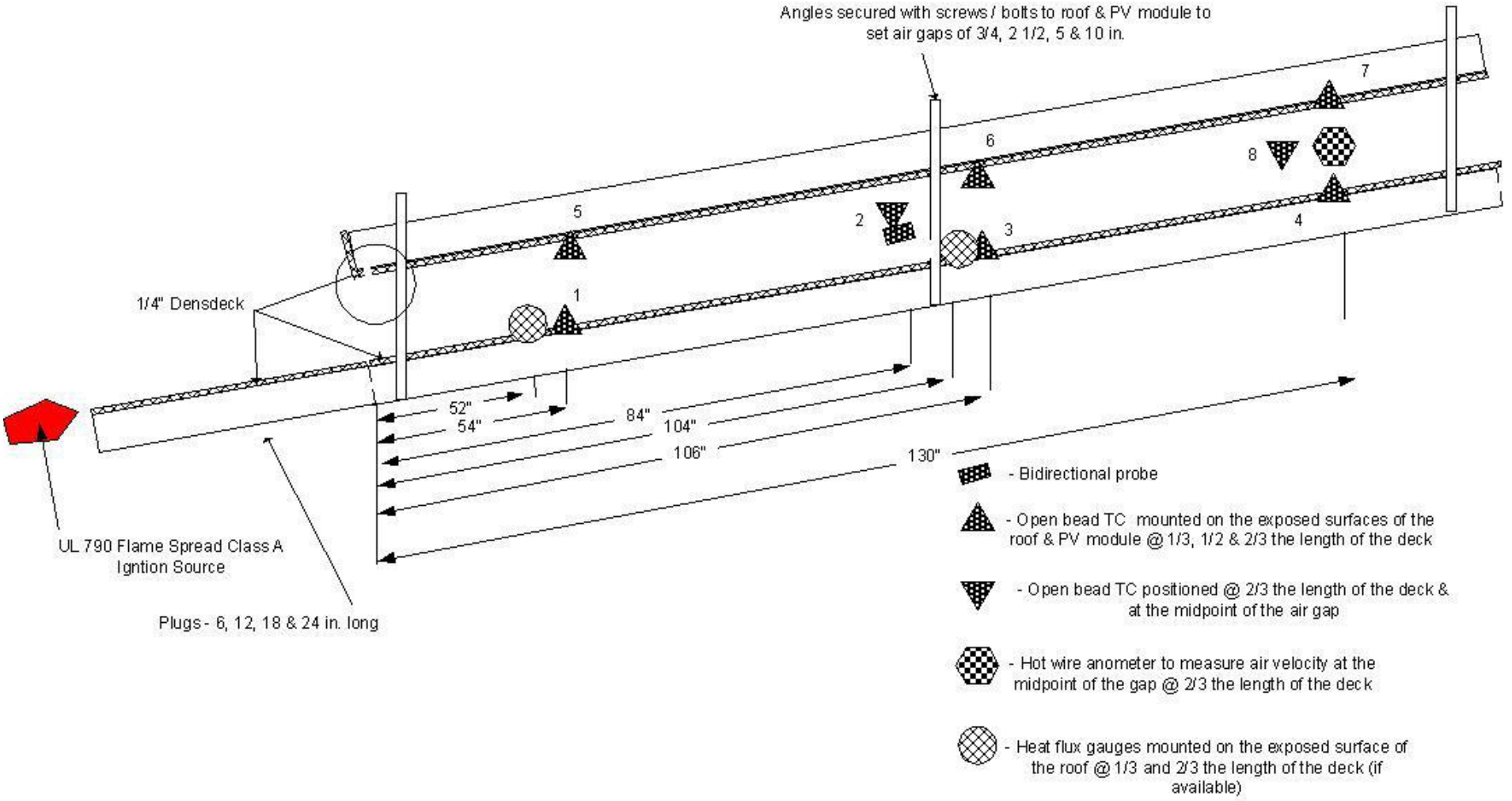
Phase 1: Develop an understanding of the Spread of Flame test flame.

- Use non-combustible materials to understand heat flux and temperature that fire presents to the materials tested.
- Establish baseline data of fire exposure on roof deck samples without PV according to UL 790

Phase 1: Develop an understanding of the Spread of Flame test flame.

- Understand the effect of PV module stand-off height above the roof and leading edge distance
- Determine if rail orientation impacts PV module fire performance

Instrumentation



Test Fixture for Non-Combustible Tests

Results

- 5” Gap is Worst Case (10” best, 2.5” next)
- 5” is most consistent with installation methods—best cooling relative to aesthetics
- Much greater challenge to both PV and roof by conducting test with PV at leading edge.
- 12” and 24” setback decreased intensity of flame—still higher than roof alone.

Results

Class C PV & Shingled Roof @ 5” Gap
Horizontal Rails

Not compliant (Class A, B or C)

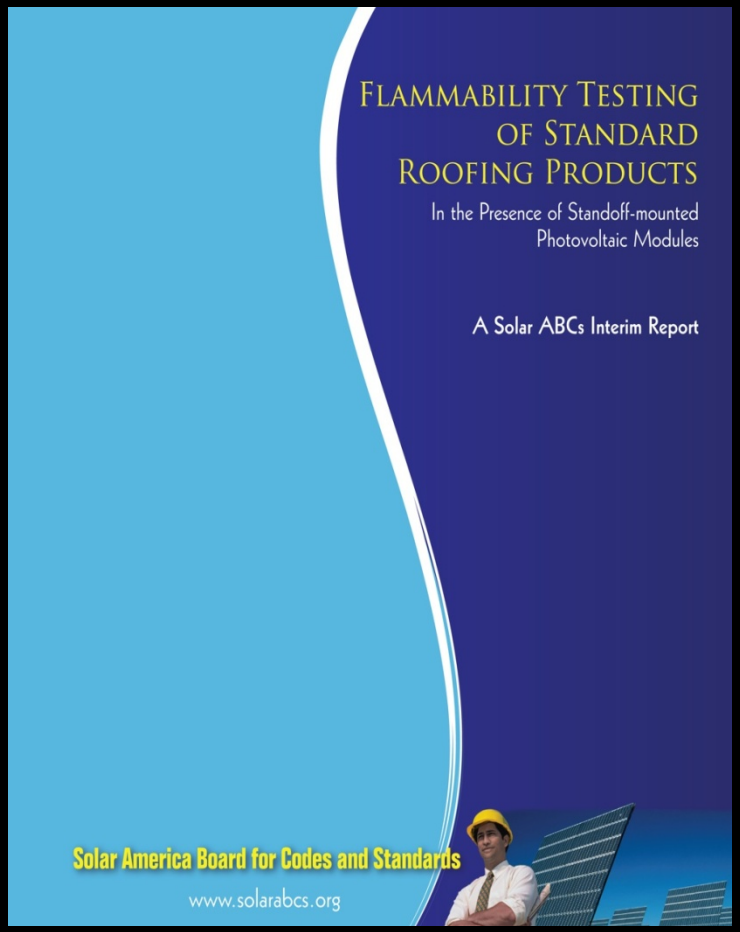
Class C PV & Shingled Roof @ 5” Gap
Vertical Rails

Not compliant (Class A, B or C)

Results

The fire classification rating of the PV module is NOT a good predictor of the fire class rating of the PV module and roof as a system.

Interim Report (April 2010)



Further Tests

- Mitigation strategies
- Low slope roofs
- Characterize materials
- Test SEIA proposed exceptions