

Solar PV Safety for the Fire Service

Presented by

Matt Paiss, PV Safety Instructor, NGLB Training Group

and

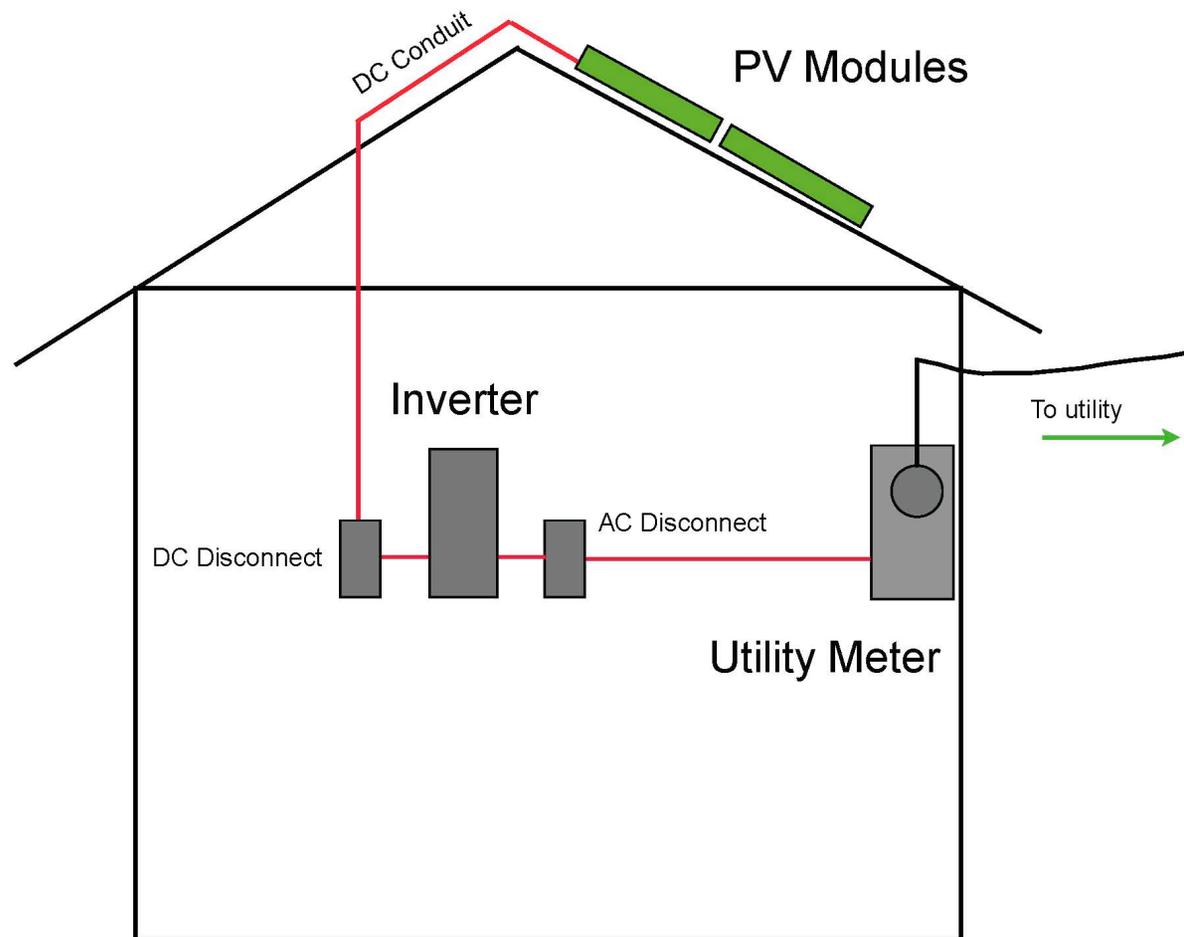
Bill Brooks, Brooks Engineering
Panel Lead: Code Official Panel, Solar ABC's



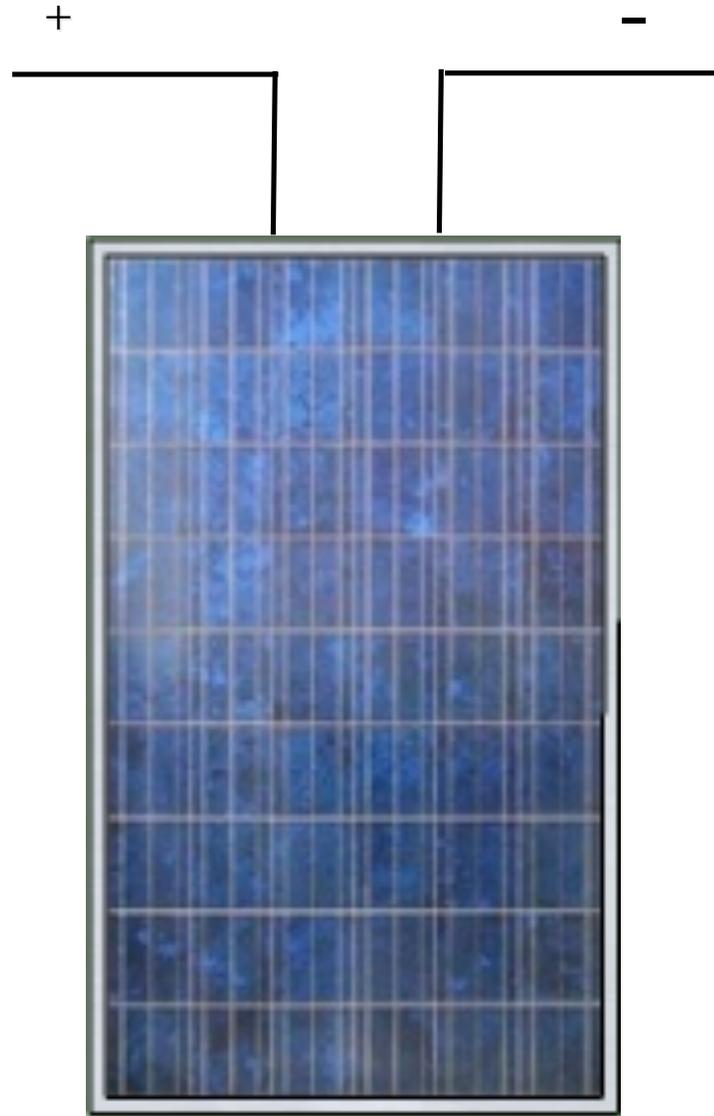
Overview of Presentation

- Terminology of PV Systems.
- Brief history of the Fire Service experience with PV system installations
- Review of California Solar Photovoltaic Installation Guideline
- What Firefighters Need to Know About Working Around PV Systems
- Training Availability

Simple Grid-Tied PV System



Module



40 VDC
8 Amps



Inverters - Residential



Photo courtesy of Independent Energy Systems



History of Fire Service Experience

- 10 years ago, fire officials in Northern California suggested a variety of very stringent regulations for PV systems. Largely ignored and the issues went away (for a period of time)
- CalSEIA (California Solar Industries Association) and SMUD (Sacramento Municipal Utilities District) developed training materials for fire fighters in 2006, which raised awareness among fire districts.
- LA Fire Department began strictly enforcing a document that was developed in 1999. They also added new requirements to the document.



The LA PV Installation Guidelines

- The LA Guidelines began to be more strictly enforced in the spring of 2007 after the fire department updated the document.
- Previous guidelines were only used for commercial PV systems—now being applied to residential.
- Main concerns related to language referring to:
 - 1) 4' perimeter around arrays
 - 2) 50'x50' maximum array sizes
 - 3) Reference to quick-release mounting hardware

How the State Guideline Process Started

- Many installation permits began being held up due to concerns over compliance with LA guidelines.
- Solar industry began voicing concerns to CalSEIA and the state fire marshal about delays.
- State Fire Marshal convened first meeting on August 17, 2007—approximately 20 participants—roughly half fire officials and half solar representatives.

Primary Concerns of Stakeholders in the Process

- Fire Fighters
 - Clear walkways on rooftops
 - Access and area on rooftops for purpose of venting.
 - Methods to protect firefighters from energized conductors
 - Warning signs to notify of dangers.
- Solar Industry
 - Clearly defined process for permitting
 - Building department review of basic compliance
 - Minimize impact of requirements on installation

Education Process for Both Sides

- Fire Fighters
 - Residential, small commercial, and large commercial all have differing issues and differing needs for access.
 - Very difficult to prevent shock if fire fighters directly contact PV circuits during daylight hours.
 - Disconnects do not necessarily deenergize PV conductors—used primarily for maintenance.
- Solar Industry
 - Why fire departments ventilate buildings
 - Importance of roof access
 - Hazards of fire fighting

Summary of Fire Marshal Guidelines (3/10/08 DRAFT)

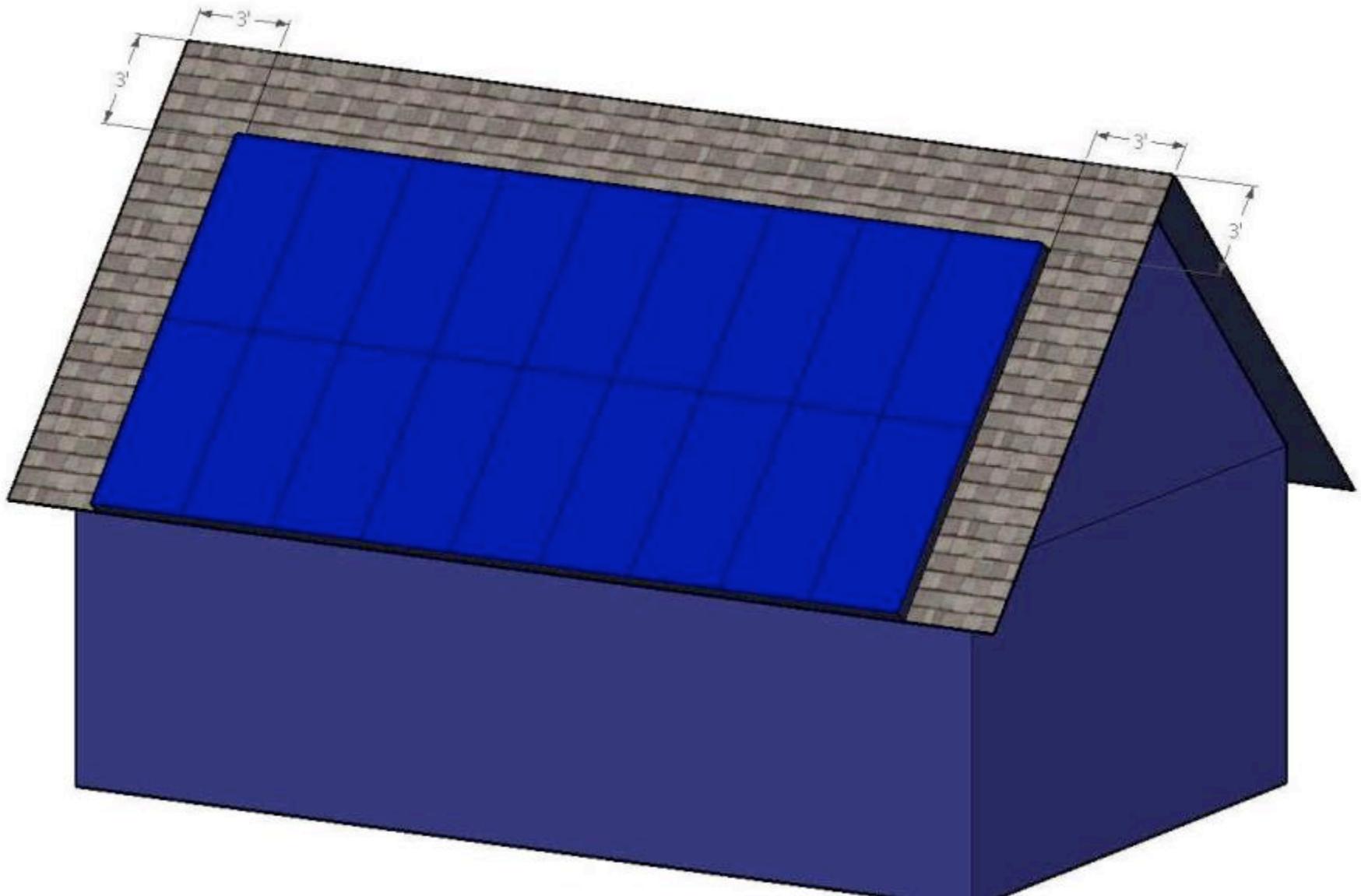
- Marking
- Access on Rooftops
- Location of DC Conductors

Summary of Fire Marshal Guidelines—Residential

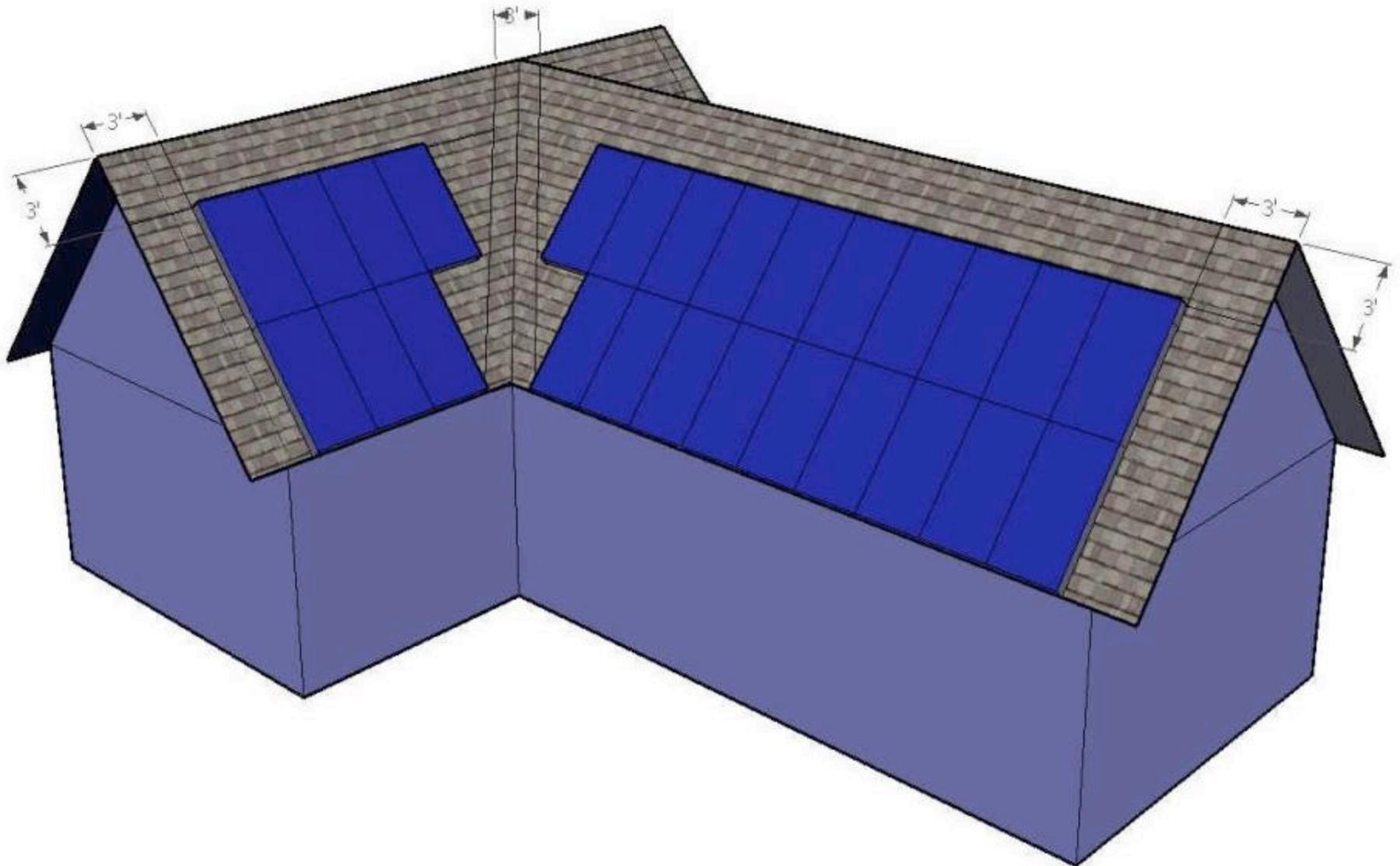
- 3' space along edge of load bearing exterior wall, 3' from ridge and 1.5' on either side of a hip or valley.
- Single ridge need two 3' pathways on array faces.
- No rooftop disconnect requirement.
- Each roof face treated independently.
- PV array and wiring is off limits to fire fighters.



Full Gable



Cross Gable with Valley



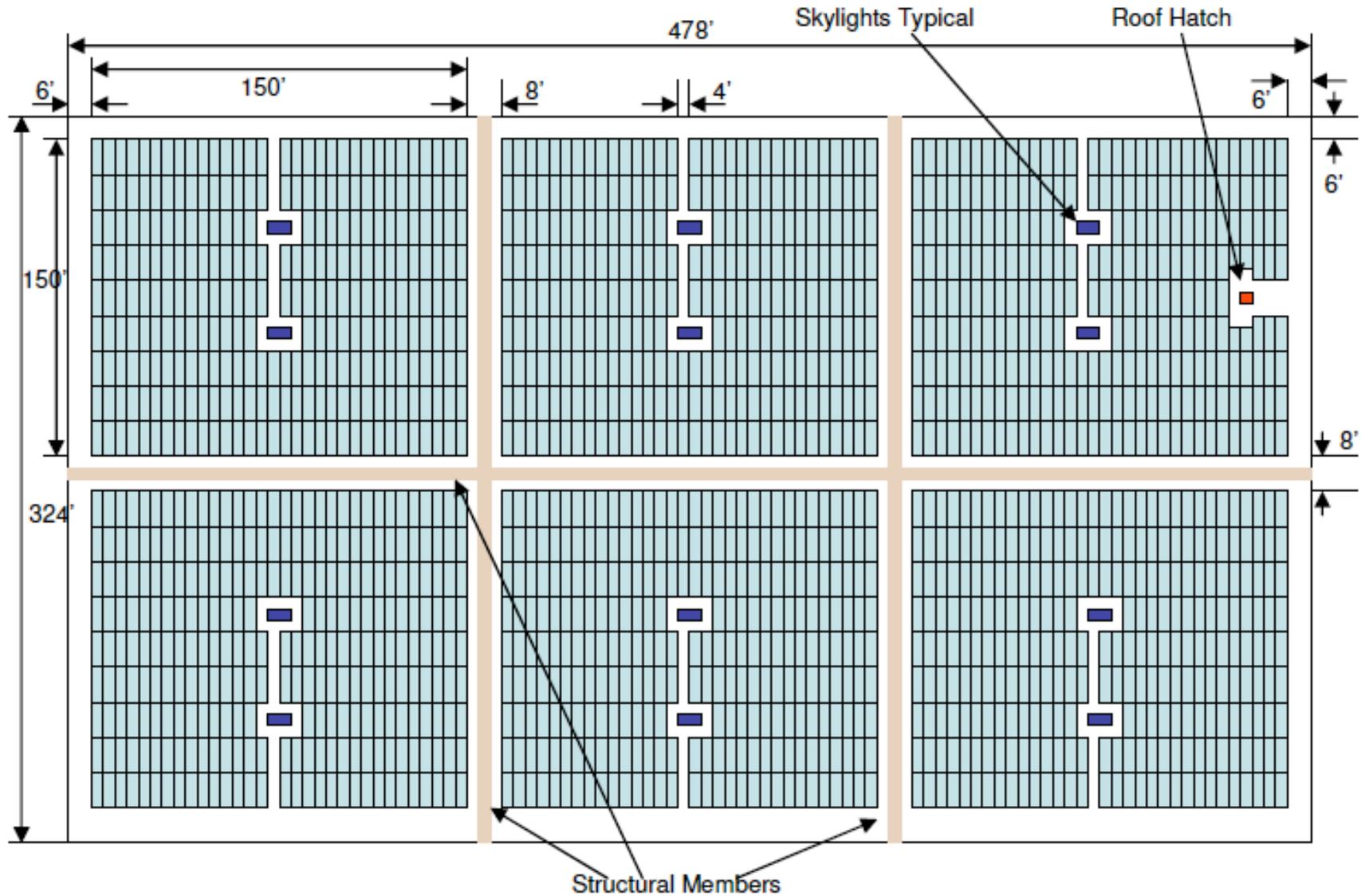
Summary of Fire Marshal Guidelines—Commercial

- Commercial flat roof with no roof dimension more than 250 feet—4' space around perimeter wall.
- Commercial flat roof with a roof dimension more than 250 feet—6' space around perimeter wall.
- No rooftop disconnect requirement for fire fighters.

Summary of Fire Marshal Guidelines—Commercial (cont.)

- Minimum 4' pathway on center access of building in both directions. A 4' access to skylights, roof hatches, and fire standpipes shall be provided to the perimeter wall.
- Commercial rooftop arrays shall be no greater than 150 by 150 feet in distance in either axis.
- Array off limits to fire fighters.

Commercial > 250'



Current Code Activities

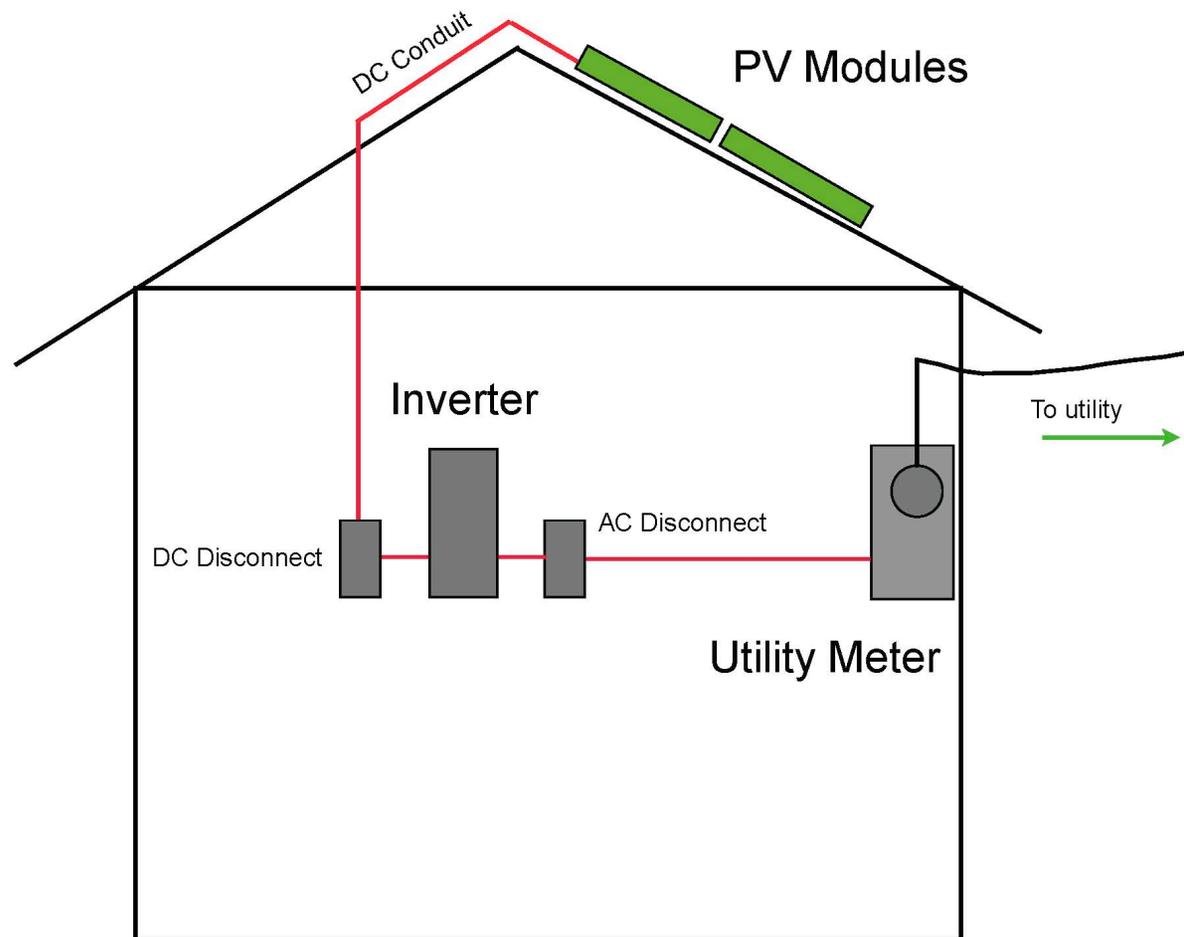
- California's guidelines are reasonable for suburban departments that routinely fight fires from rooftops regardless of regional location.
- Both the IFC and UFC (NFPA 1) are currently considering adopting language similar to the California document for the upcoming editions of these codes.
- The solar industry and the fire fighting community need to work together to establish construction codes and standard operating procedures for firefighters.

Basic hazard info for Firefighters

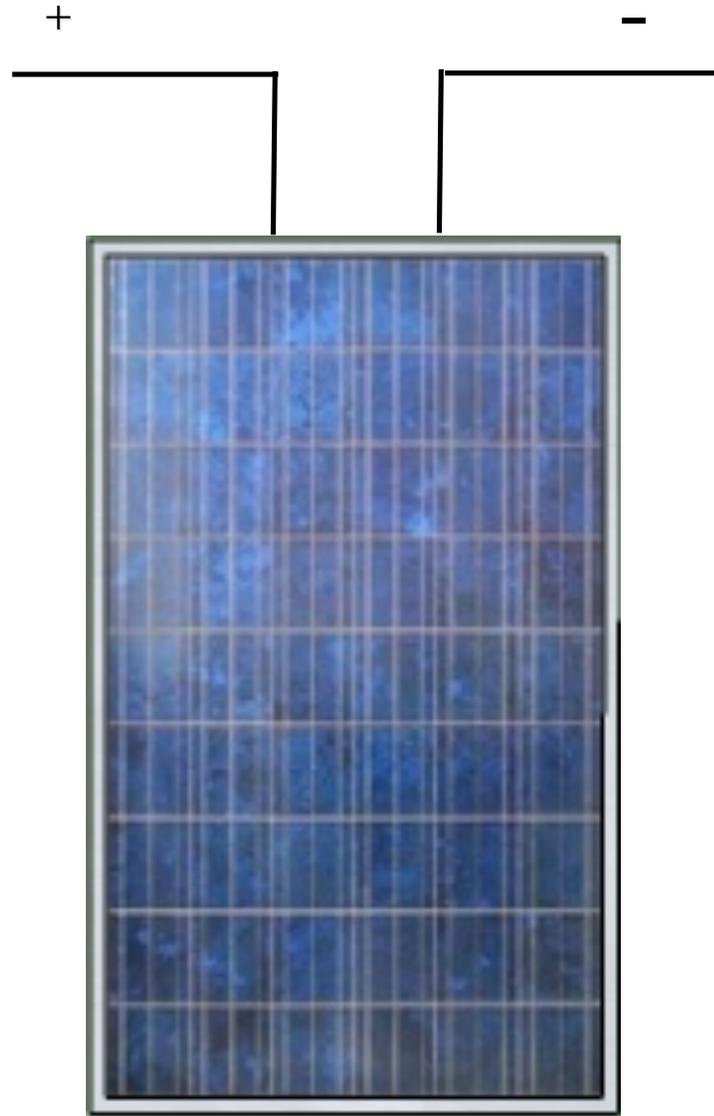
- Electrical Shock
- Trips and Slips
- Dead Load



Simple Grid-Tied PV System



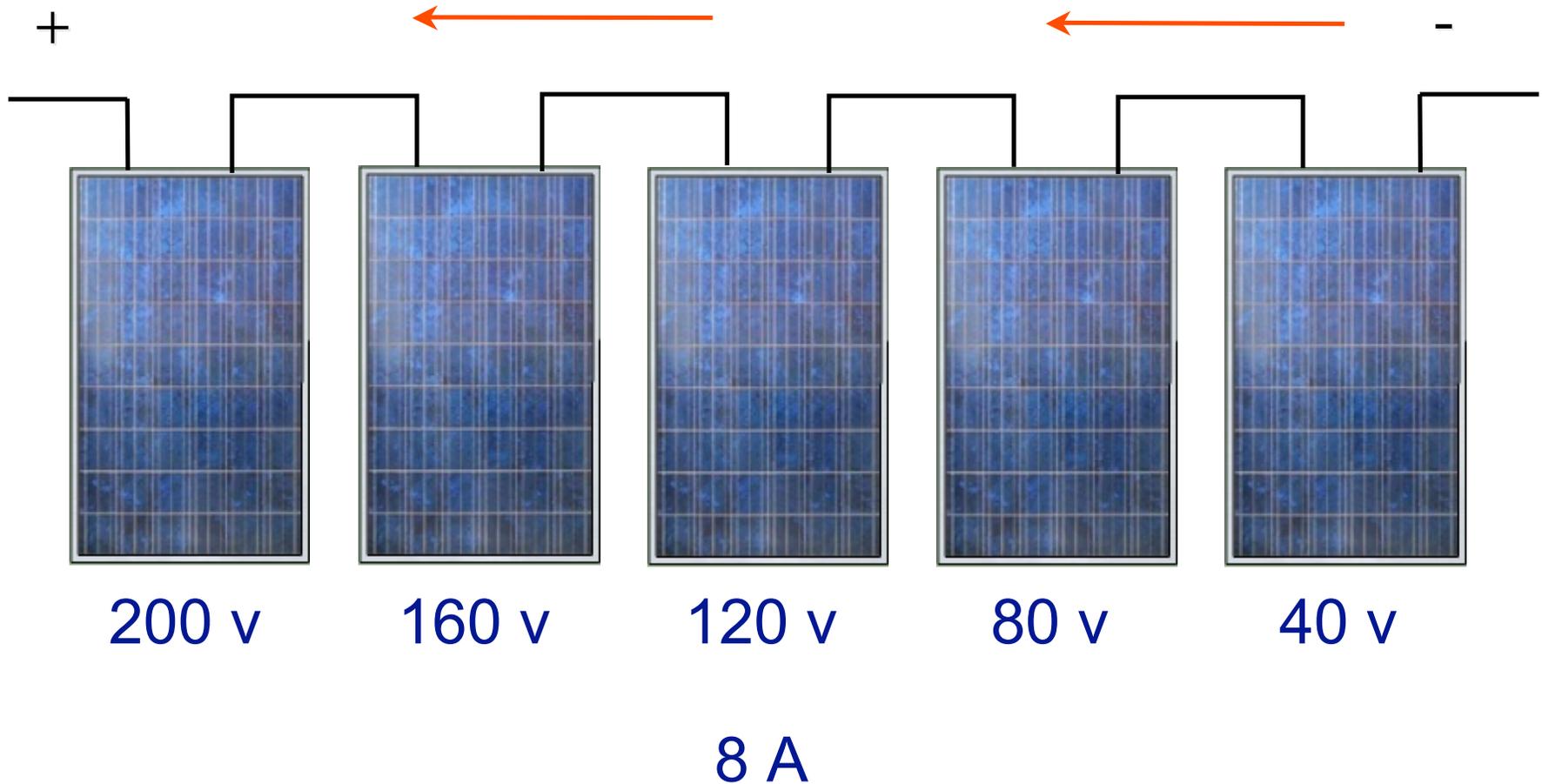
Module



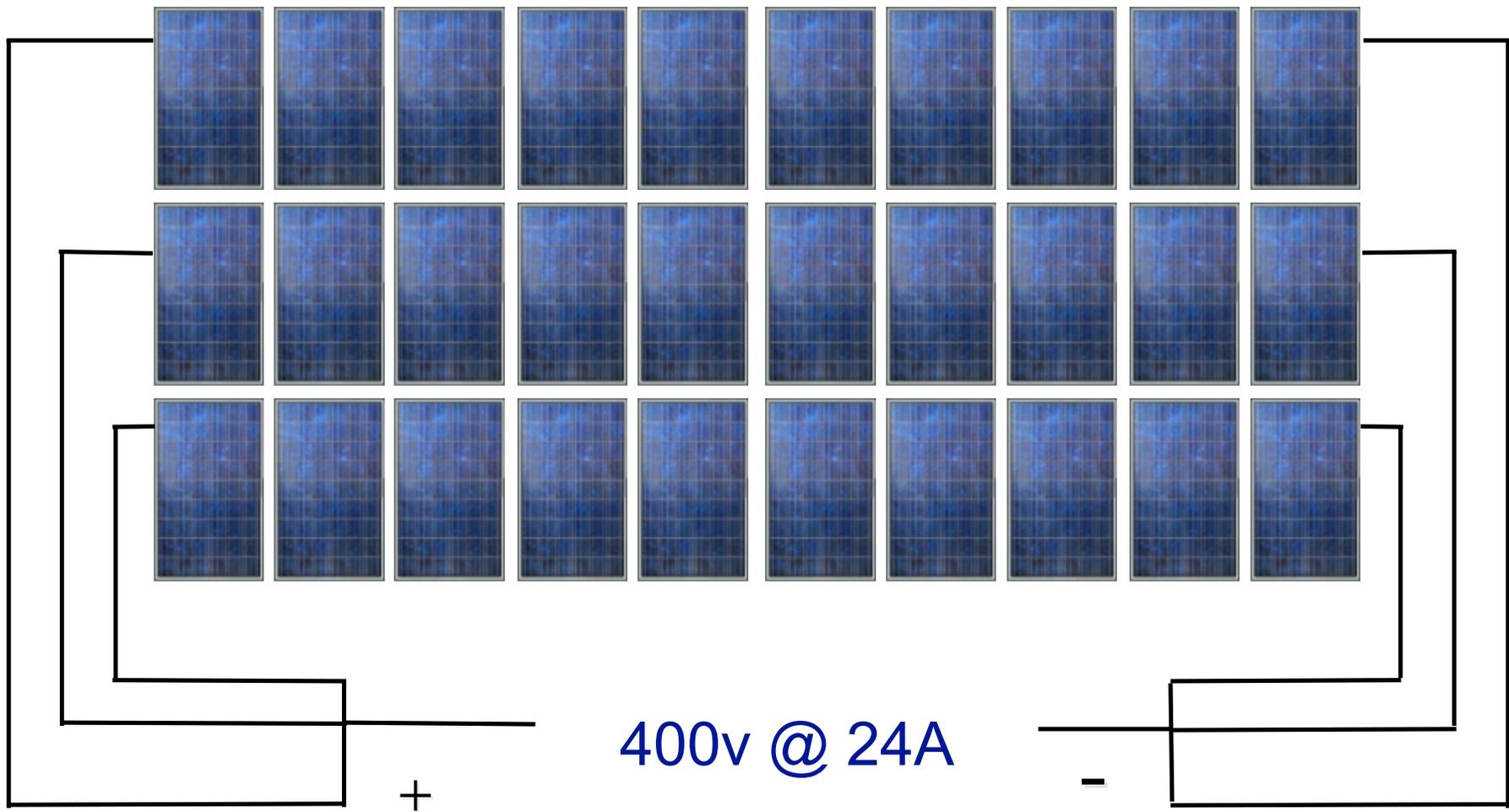
40 VDC
8 Amps



String



Array



Framed, BIPV, Flexible



Photo by M. Paiss



Photo courtesy of Sharp



Photo courtesy of Uni-Solar

Solar America Board for Codes and Standards



Inverters - Residential



Photo courtesy of Independent Energy Systems



Locations
will vary



Photo by M. Paiss

Disconnects
will vary



Photo courtesy of Independent Energy Systems



Microinverter



Photo courtesy of E.Oakes



Commercial



Photo courtesy of J. Perry



Photo courtesy of H. Barikmo

Key Points

- Identify & communicate the **PRESENCE** of a PV system.
 - Key components of a PV system:
 - Array, Inverter, Conduit, Labeling.
- Safely operate around a PV system
 - Isolate power to degree possible
 - Stay away from damaged system
- Request Solar Contractor to secure system

Next Steps with Fire Officials

- Educate officials about 2011 NEC updates.
- Provide basic PV operational-level training so they better understand the technology and hazards.
- Develop “white paper” recommendations for implementation of guidelines.
- Work with developments of NFPA 1 and the IFC F-30 documents to help see that regulations are properly implemented.