

---

# Solar ABCs Report on the Cal Fire Guidelines and IFC Code

Bill Brooks, PE

Brooks Engineering

Solar ABCs Stakeholder Meeting

October 15, 2010

Los Angeles, CA

Solar America Board for Codes and Standards



---

## **MAIN TOPIC AREAS OF GUIDELINE AND IFC**

- **1.0 MARKING (IFC 605.11.1)**
- **2.0 ACCESS, PATHWAYS AND SMOKE VENTILATION (IFC 605.11.3)**
- **3.0 LOCATION OF DC CONDUCTORS (IFC 605.11.2)**



---

## 1.1 Main Service Disconnect (IFC 605.11.1.3)

- *For residential applications, the marking may be placed within the main service disconnect. If the main service disconnect is operable with the service panel closed, then the marking should be placed on the outside cover.*
- *For commercial application, the marking should be placed adjacent to the main service disconnect in a location clearly visible from the location where the lever is operated.*
- *Adhesive-fastened signs may be acceptable if properly adhered.*
- *Jurisdictions that require mechanical fastened signs may necessitate mounting signs adjacent to equipment.*



# Examples of Plastic Engraved and Vinyl Signs



---

# Summary of Fire Marshal Guidelines

- MARKING (IFC 605.11.1 and 605.11.1.4)
  - Main Service Disconnect

CAUTION: SOLAR ELECTRIC SYSTEM

- dc conduit, raceways, enclosures, cable assemblies, and junction boxes. Every 10', at every turn, above/below penetrations, and all dc combiner and junction boxes.

CAUTION SOLAR CIRCUIT



---

# Sign Requirements

- MARKING CONTENT: CAUTION SOLAR CIRCUIT (NEC® and IFC uses “Warning: Photovoltaic Power Source)”
- RED BACKGROUND,
- WHITE LETTERING,
- MINIMUM 3/8” LETTER HEIGHT,
- ALL CAPITAL LETTERS,
- ARIAL OR SIMILAR FONT, NON-BOLD,
- REFLECTIVE, WEATHER RESISTANT MATERIAL (durable adhesive materials meet this requirement)







---

## 2.0 ACCESS, PATHWAYS AND SMOKE VENTILATION (IFC 605.11.3)

- Section 2.0 relates to fire departments that engage in vertical ventilation operations.
- Some departments are beginning to limit vertical ventilation for lightweight construction.
- Other buildings already have automatic roof vents making roof access unnecessary.
- Metal and concrete decked buildings are rarely trenched, so access to vents and skylights is all that may be necessary.





---

# Purpose of Section 2.0

*Access and spacing requirements should be observed in order to:*

- *Ensure access to the roof*
- *Provide pathways to specific areas of the roof*
- *Provide for smoke ventilation opportunities area*
- *Provide emergency egress from the roof*

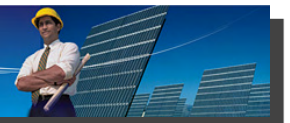


---

## Exceptions to Section 2.0

*Local jurisdictions may create exceptions to this requirement where access, pathway or ventilation requirements are reduced due to:*

- *Proximity and type of adjacent exposures*
- *Alternative access opportunities (as from adjoining roofs)*
- *Ground level access to the roof area in question*



---

## Exceptions to Section 2.0 (cont.)

- *Adequate ventilation opportunities beneath solar array (as with significantly elevated or widely-spaced arrays)*
- *Adequate ventilation opportunities afforded by module set back from other rooftop equipment (shading or structural constraints may leave significant areas open for ventilation near HVAC equipment, for example.)*
- *Automatic ventilation device.*
- *New technology, methods, or other innovations that ensure adequate fire department access, pathways and ventilation opportunities.*



---

# Roof Ventilation—Residential Roof Layouts Ventilation (IFC 605.11.3.2.4)

- 3' space along ridge of roof
  - Ridge setback based on enough room to make 2' wide ventilation cut.
  - ASCE 7, Minimum Design Loads for Buildings, requires this setback in high wind locations (e.g. eastern seaboard)
- No rooftop disconnect requirement. (see appendix)
- Each roof face treated independently.
- PV array and wiring is off limits to fire fighters.







---

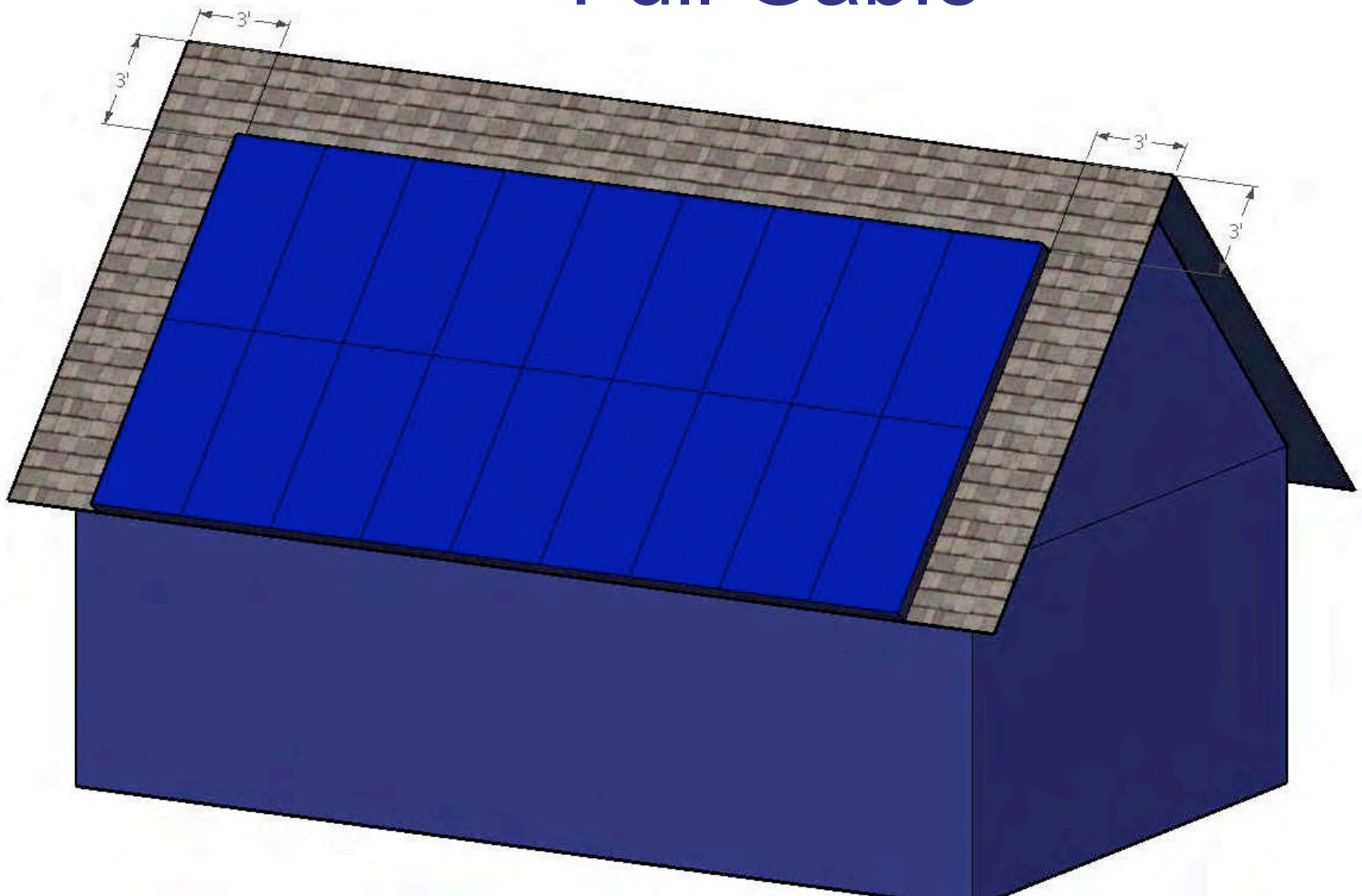
## Roof Access—Residential with Single Ridge (IFC 605.11.3.2.2)

- Single ridge needs two 3' pathways on array faces along edge of load bearing exterior wall.



---

# Full Gable









---

## Roof Access—Residential Hips and Valleys (IFC 605.11.3.2.3)

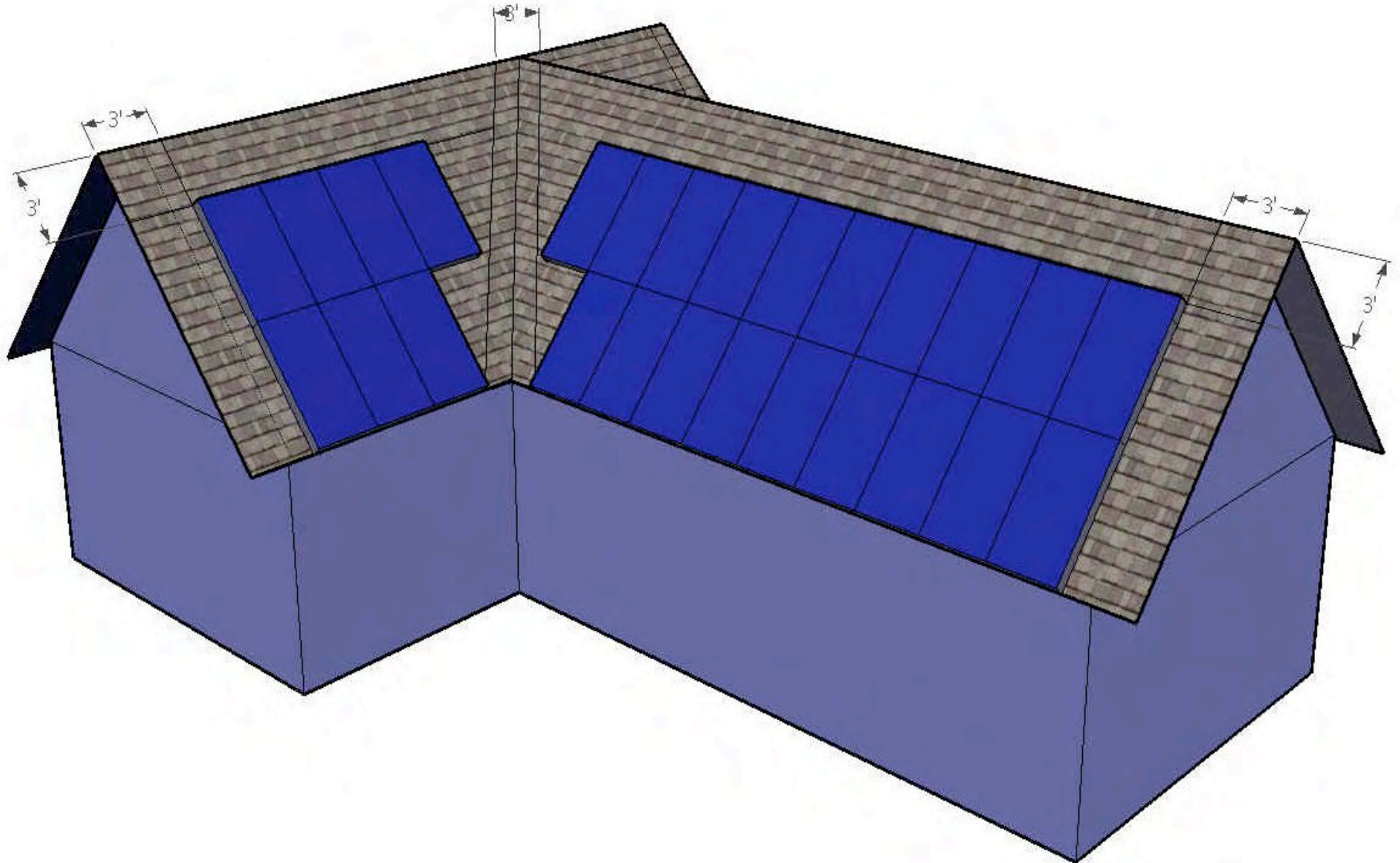
- 1.5' space on either side of a hip or valley.
- PV array can go to the center of the hip or valley if the hip or valley is of equal length on adjacent faces and no modules are on the adjacent face.





---

# Cross Gable with Valley



---

# Access—Commercial (IFC 605.11.3.3.1)

- 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.



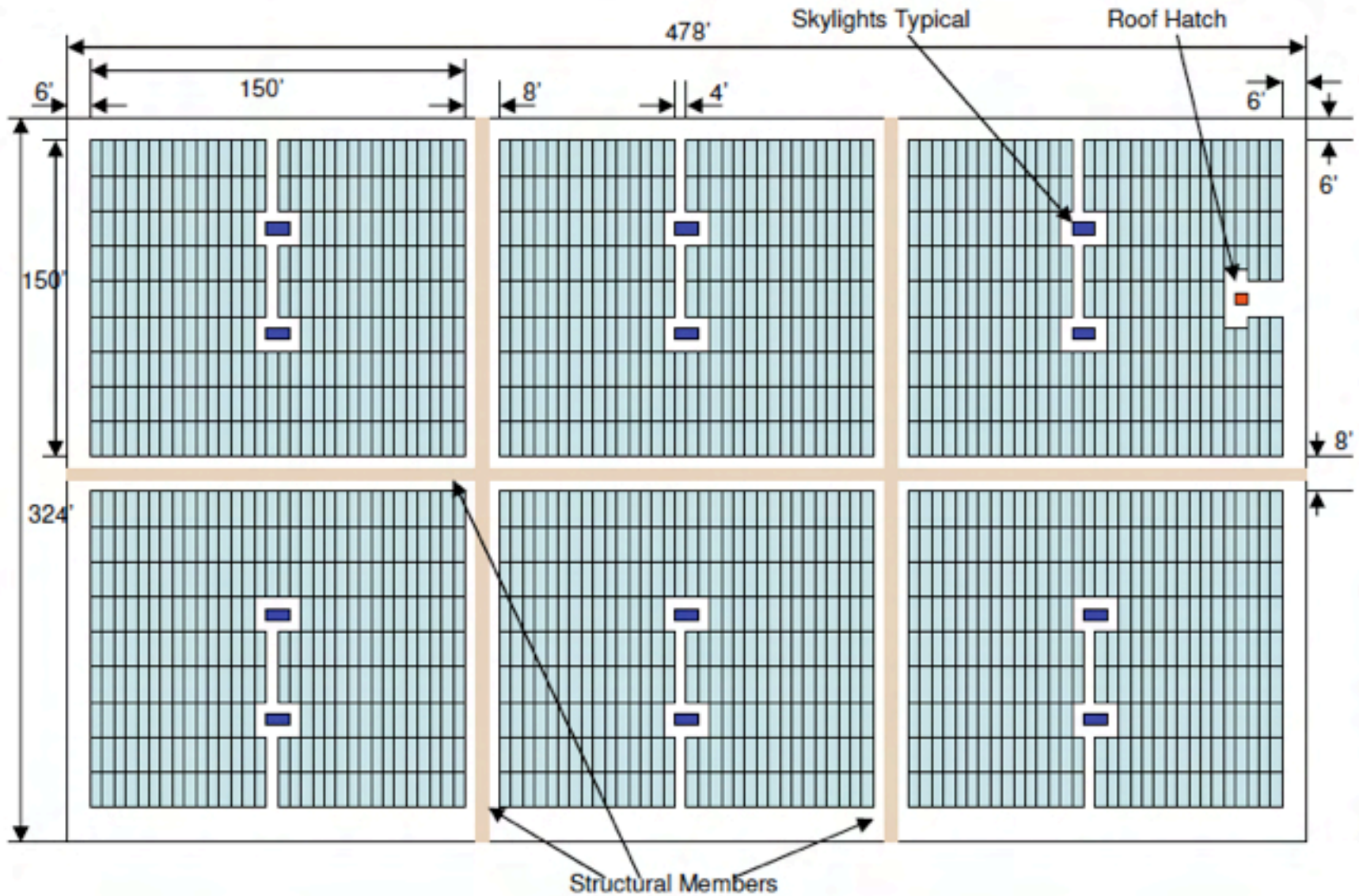
---

# Pathways and Ventilation— Commercial (IFC 605.11.3.3.2 & 605.11.3.3.3)

- 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'



---

## 3.0 LOCATION OF DC CONDUCTORS (IFC 605.11.2)

- Conduit, wiring systems, and raceways for photovoltaic circuits should be located as close as possible to the ridge or hip or valley and from the hip or valley as directly as possible to an outside wall to reduce trip hazards and maximize ventilation opportunities.
- The DC combiner boxes are to be located such that conduit runs are minimized in the pathways between arrays.

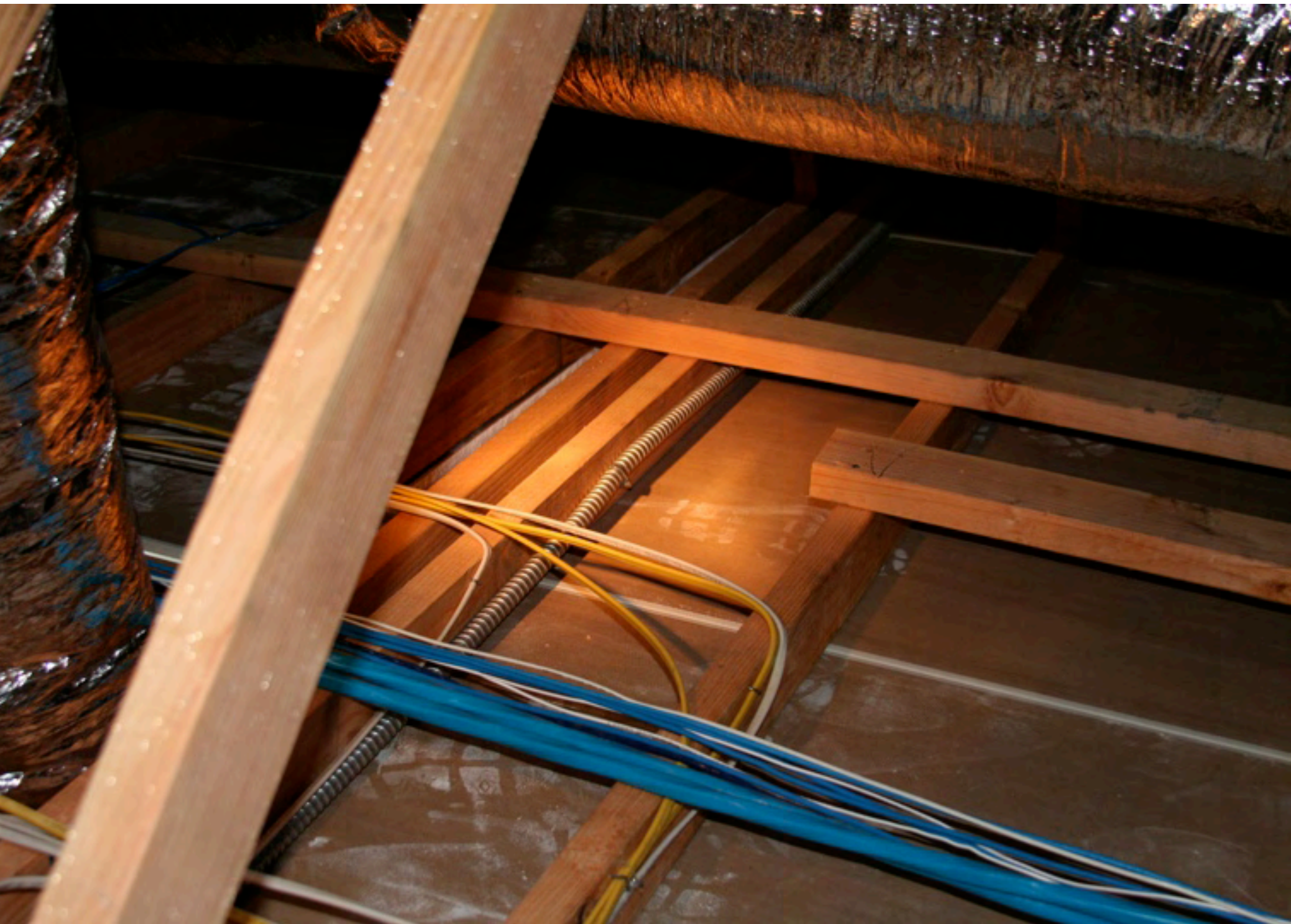




---

# LOCATION OF DC CONDUCTORS (IFC 605.11.2)

- To limit the hazard of cutting live conduit in venting operations, DC wiring should be run in metallic conduit or raceways when located within enclosed spaces in a building and should be run, to the maximum extent possible, along the bottom of load-bearing members.
  - Intent is to stay away from common ventilation locations near ridge. Staying under load-bearing members minimizes likelihood of saws cutting wiring system.



# CONCLUSION

**WORK WITH  
YOUR FIRE  
DEPARTMENTS**

**A GOOD  
RELATIONSHIP  
WILL HELP  
BOTH THE PV  
INDUSTRY AND  
FIREFIGHTERS**



Craig Allyn Rose Photography - Emergencyphoto.com

