

Reducing the Vulnerability of the Built Environment

by

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Buildings in wildfire prone areas must be protected from:

✓ Embers (also called ‘firebrands’; lofted vegetation or construction materials that are burning)

✓ Flame impingement (near-by vegetation or debris, construction material, fire wood or other woody debris)

✓ Radiant Heat (dense vegetation, an adjacent building/deck fire)

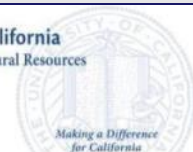
Retrofit ...

“Harden” the home:

- **Materials**
- **Vegetation Management**
- **Design**



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Five firebox / ember generators

5 ducts at
upper level

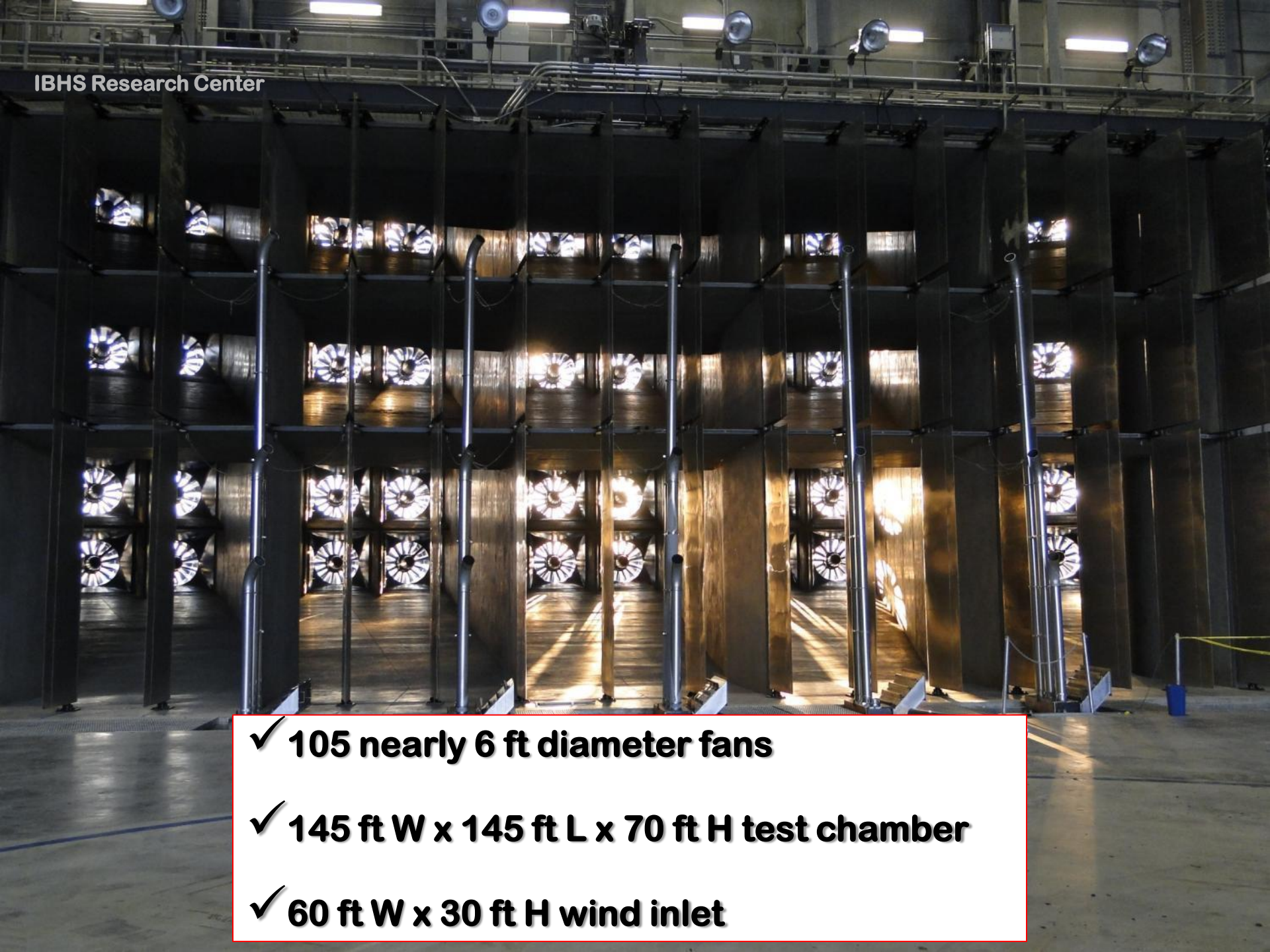
5 ducts at
mid-level

2 ducts at
low level
(end units)

3 ducts at
floor level
(center units)

Test Building



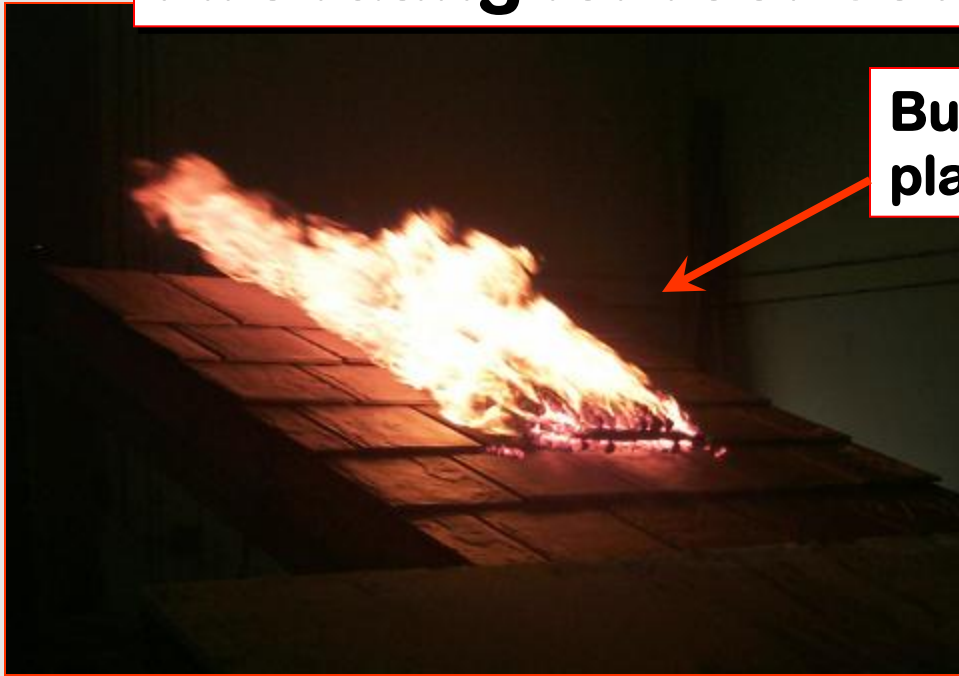
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- A large industrial wind tunnel facility, likely a closed-circuit, open-jet type. The chamber is a large, dark, rectangular structure with a grid of fans. The fans are arranged in a 3x3 grid of larger sections, each containing several smaller fans. The fans are illuminated from within, creating a bright, glowing effect. The structure is supported by a complex network of metal beams and pipes. The floor is a smooth, light-colored concrete. The overall appearance is that of a high-tech, industrial research facility.
- ✓ 105 nearly 6 ft diameter fans
 - ✓ 145 ft W x 145 ft L x 70 ft H test chamber
 - ✓ 60 ft W x 30 ft H wind inlet

A close-up photograph of a roof showing significant damage. Several dark asphalt shingles are missing or severely damaged, exposing the light-colored wooden sheathing underneath. The remaining shingles are cracked and peeling. A few dry, brown leaves and thin, light-colored sticks are scattered across the roof surface. The text "THE ROOF" is overlaid in the center-left of the image.

THE ROOF

Fire rating for roof coverings

Burning [12"x 12"] 'A Brand' placed on roof covering.



Flame penetrated through to the underside of the roof sheathing, into what would be the attic.





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A photograph showing a wooden eave structure, likely part of a roof or a large window frame. The structure is made of light-colored wood and is illuminated from within by a bright, warm fire. The fire is concentrated in the lower part of the structure, creating a strong glow that casts a warm, orange light on the surrounding wood. The background is dark, making the fire and the wooden structure stand out. The overall mood is warm and dramatic.

THE EAVE



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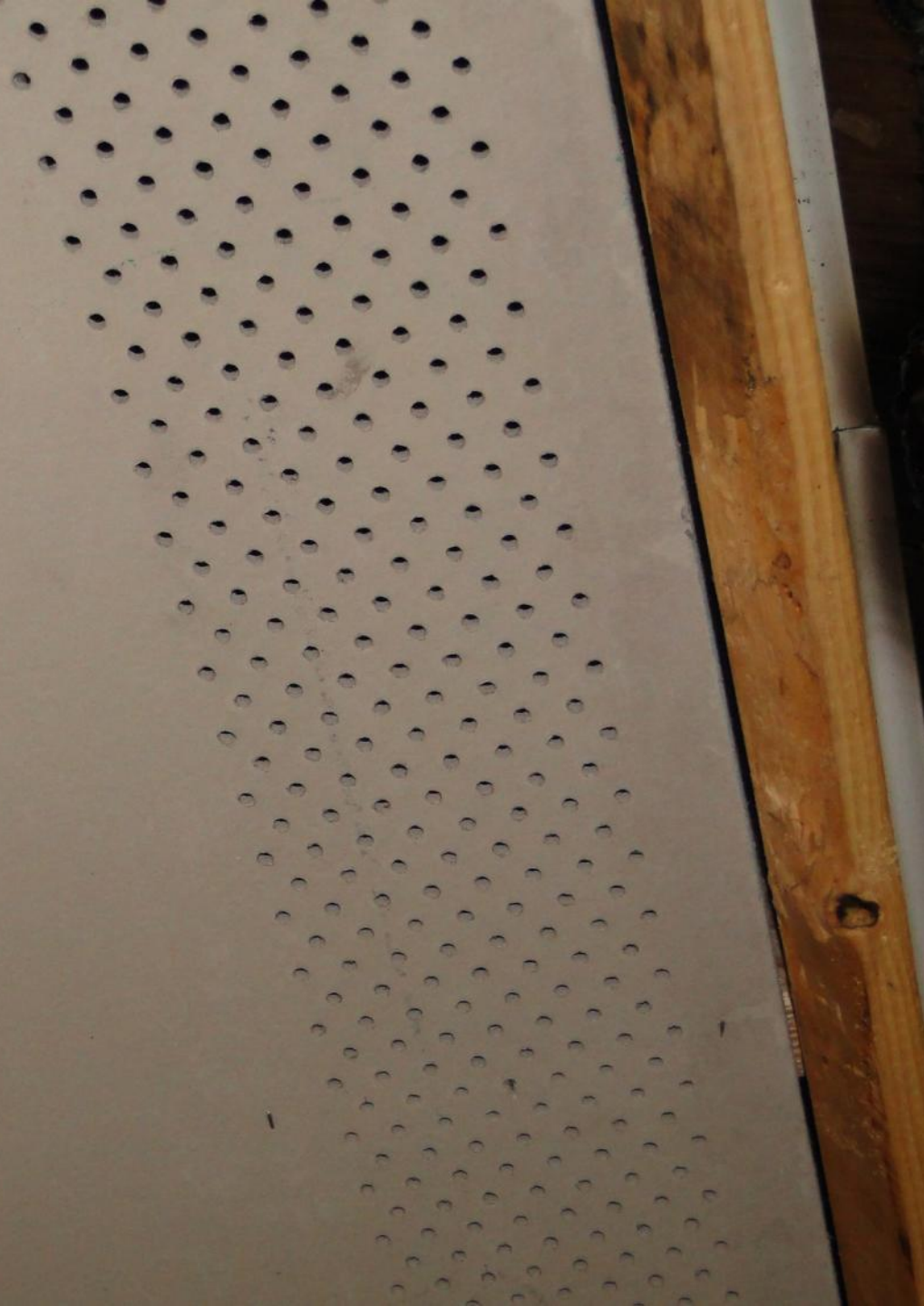
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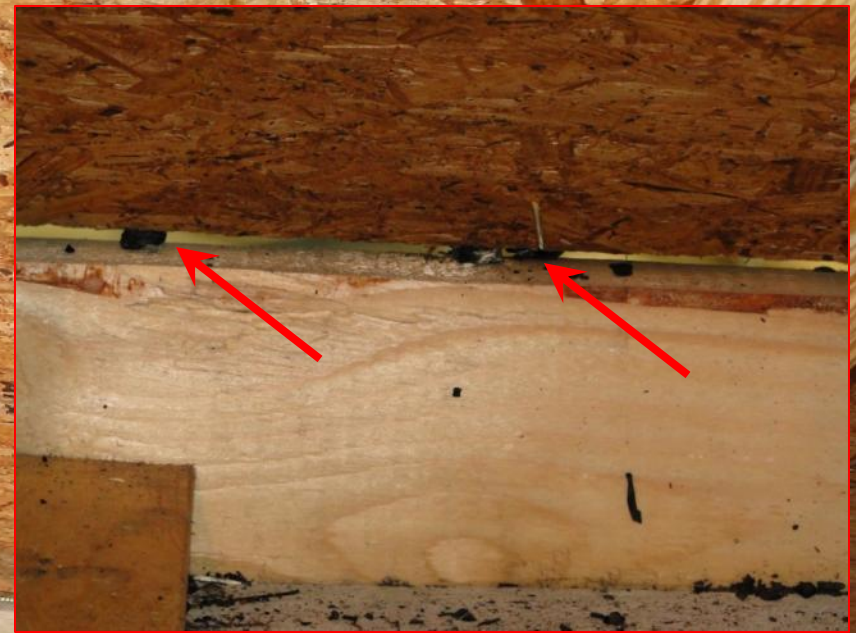


Vents

- Soffited eave
- Open eave
- Gable end



Truss bays, soffited eave - *no* angle flashing at roof edge



Accumulation of embers / firebrands

**Truss bay, soffited eave -
angle flashing at roof edge**



Minimal accumulation of embers / firebrands

Gable End Vent



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Demonstration



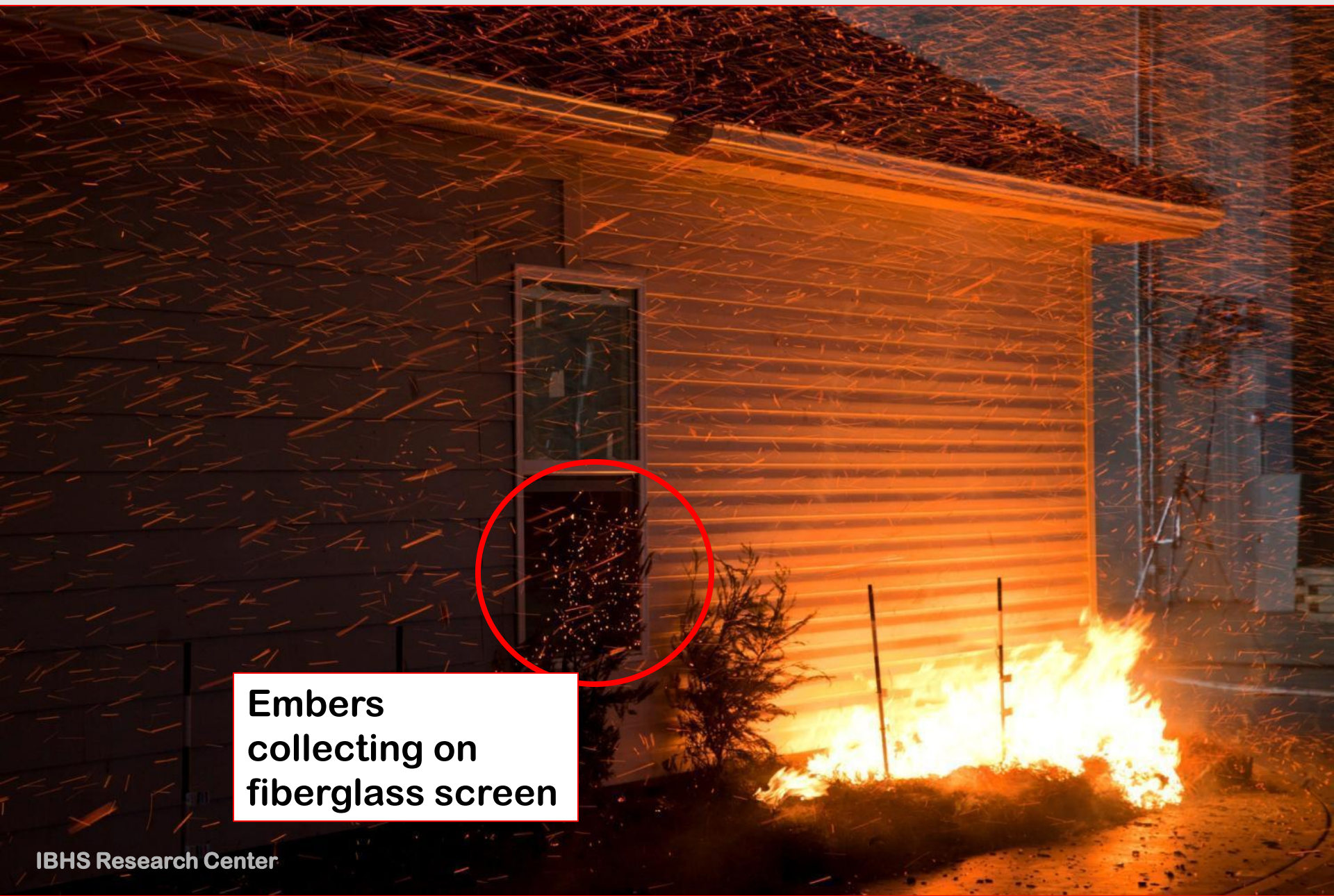


metal gutter

vinyl gutter

WINDOWS





**Embers
collecting on
fiberglass screen**

Radiant Panel

**Water-cooled
radiator panel**

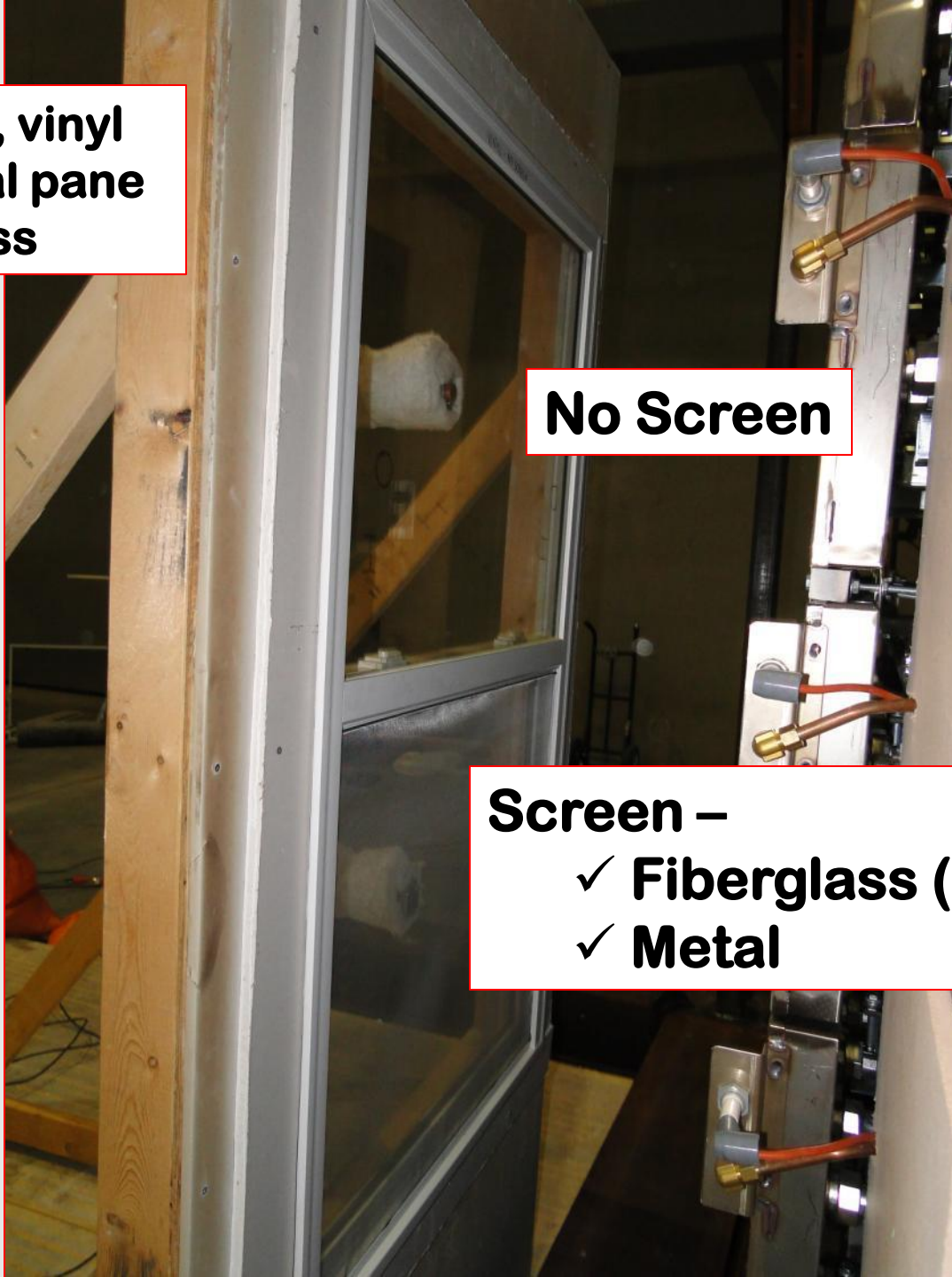
**Heat flux sensors
behind window**

Screen study, vinyl windows, dual pane annealed glass

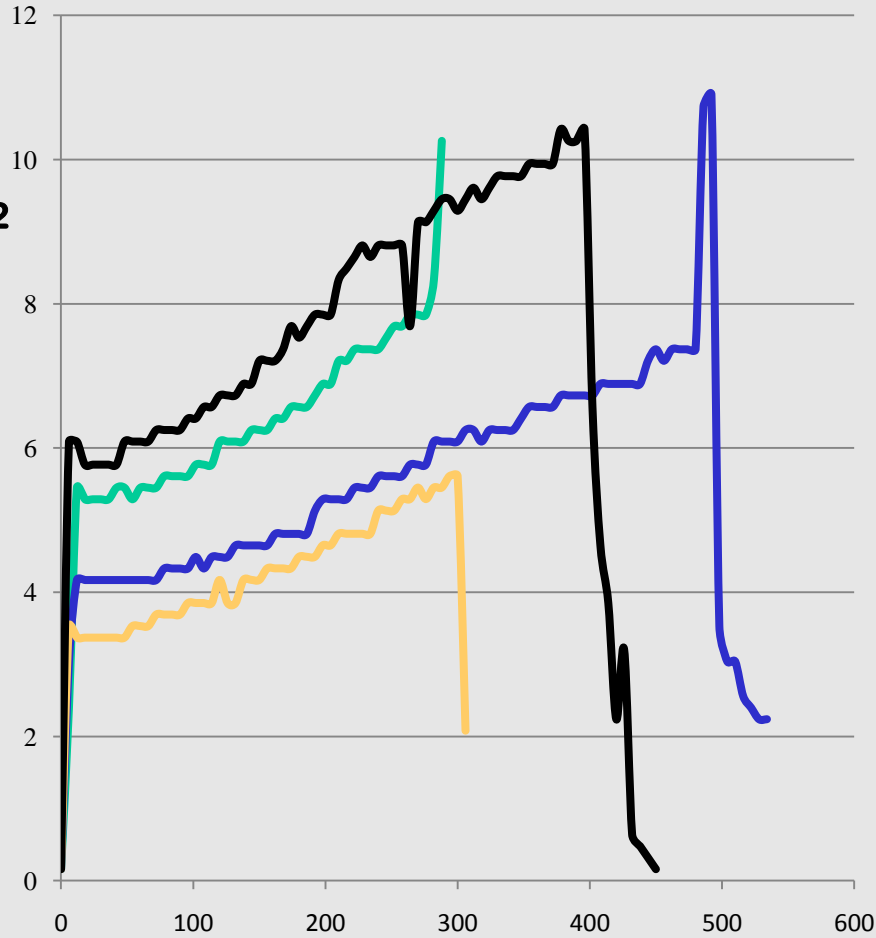
No Screen

Screen –

- ✓ **Fiberglass (plastic clad)**
- ✓ **Metal**



Heat Flux, kW/m²

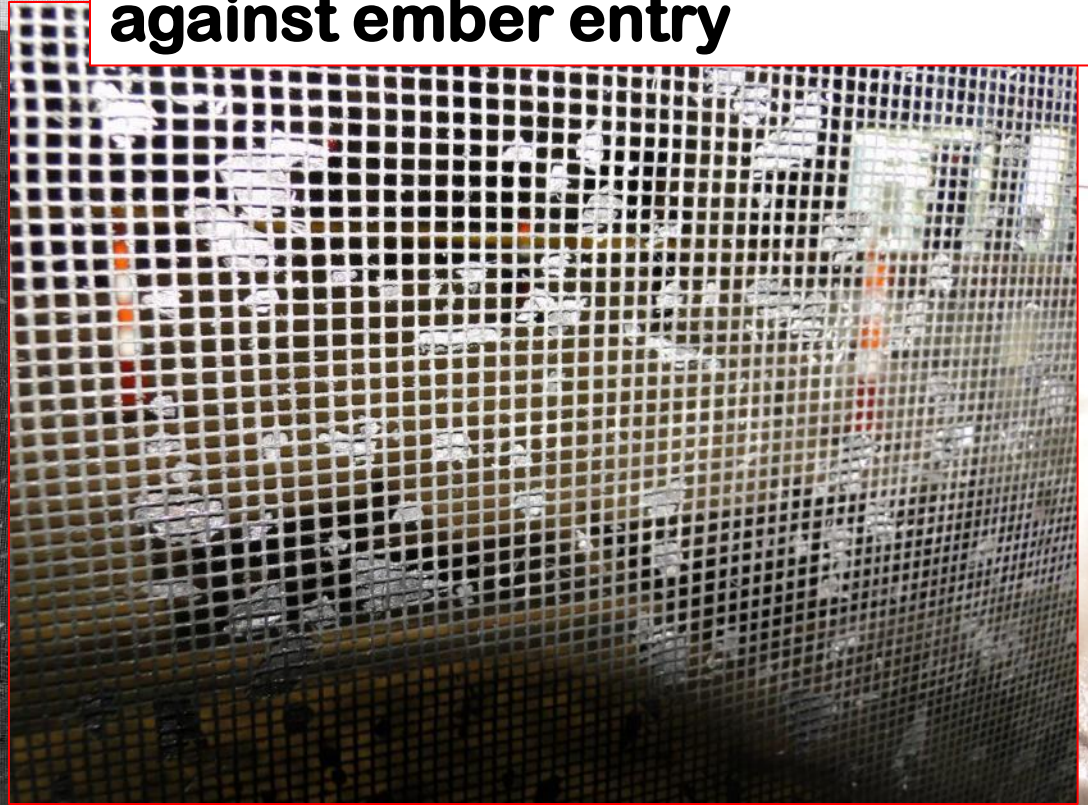


- No Screen
- Metal Screen
- Fiberglass Screen
- No Screen - Curtain

Time , s

Radiant Exposure: 35 kW/m²

Where screen intact, protects against ember entry

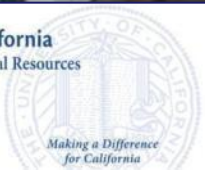


Screen failure after flame contact





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100% cotton curtain behind dual pane annealed glass, vinyl window



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Ignition of curtain occurred after both panes of glass in upper light failed

DECKS & DECKING



Looking down the slope





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Water staining on bottom of (wood plastic composite) deck boards

Long term performance of joist and wood and joist hanger?

Performance related to decking

WPC, not 7A compliant

'7A' compliant





**Flame spread up
the wall ...**

**Penetration into
stud cavity**



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Thanks for your attention!

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<http://firecenter.berkeley.edu>

http://www.eXtension.org/surving_wildfire

http://cecontracosta.ucdavis.edu/Wood_Durability/Wildland_Urban_Interface_Topics.htm

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