



Retro-fits to Reduce Structural Ignitability

(or how to harden a home for less than \$500.)

Presented by

Keith Worley, Forester

Forestree Development, LLC

Working toward Stand Alone homes

- The highest category of property triage (assessment) that allows for:
 - Fire fighter Safety
 - Good Access and Escape
 - Minimal expenditure of fire fighting resources to protect structures.

What if you are not home?

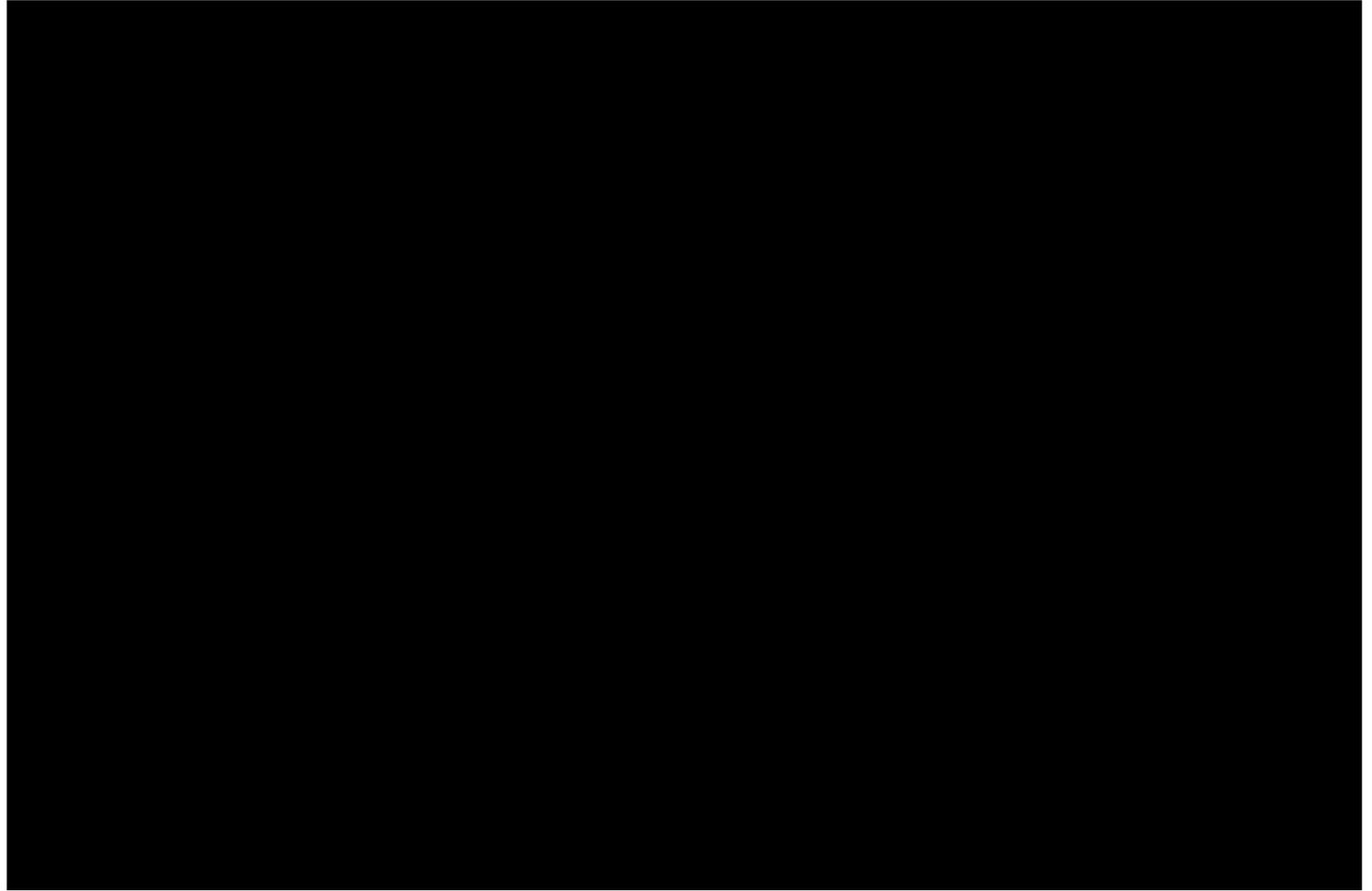
- Will your home survive?
- Will your family and pets be safe?
- How about your personal effects and cherished items?



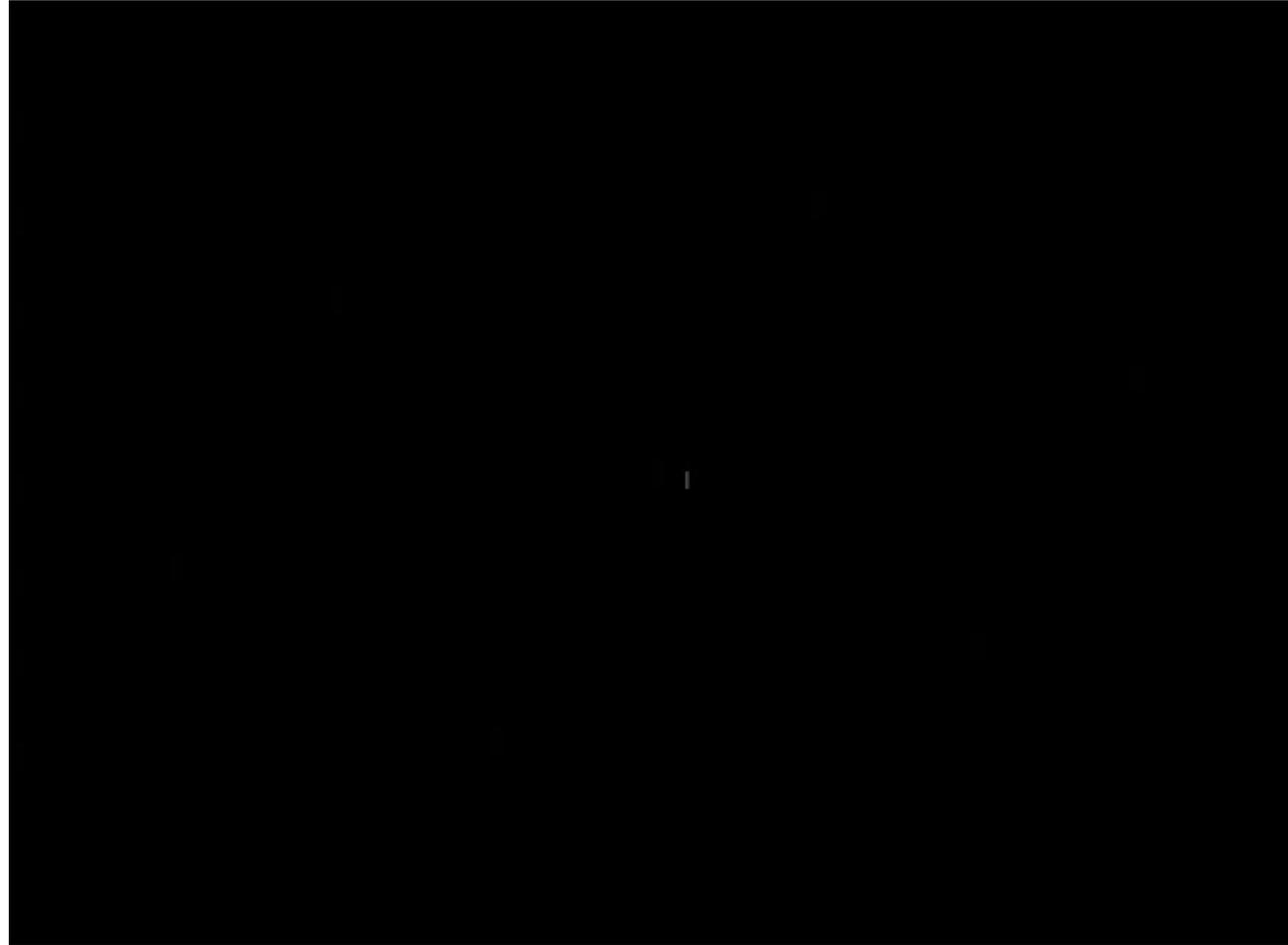
Why should a home be able to Stand Alone?

- Fire can happen at any time and any place.
- Weather and fire behavior are unpredictable and may prohibit control by local fire resources.
- It may buy you the time needed to get resources in place.
- You have more assurance your home may survive when you are gone.
- Evacuating is an easier choice knowing your home has an increased chance of survival.
- It makes the fire fighter's tools more effective.

Understanding Embers



Embers in the Lab



The Blank Canvas



Typical Landscape



Or just more fuel?





Photo by Keith Worley

Home and Structure = Fuel

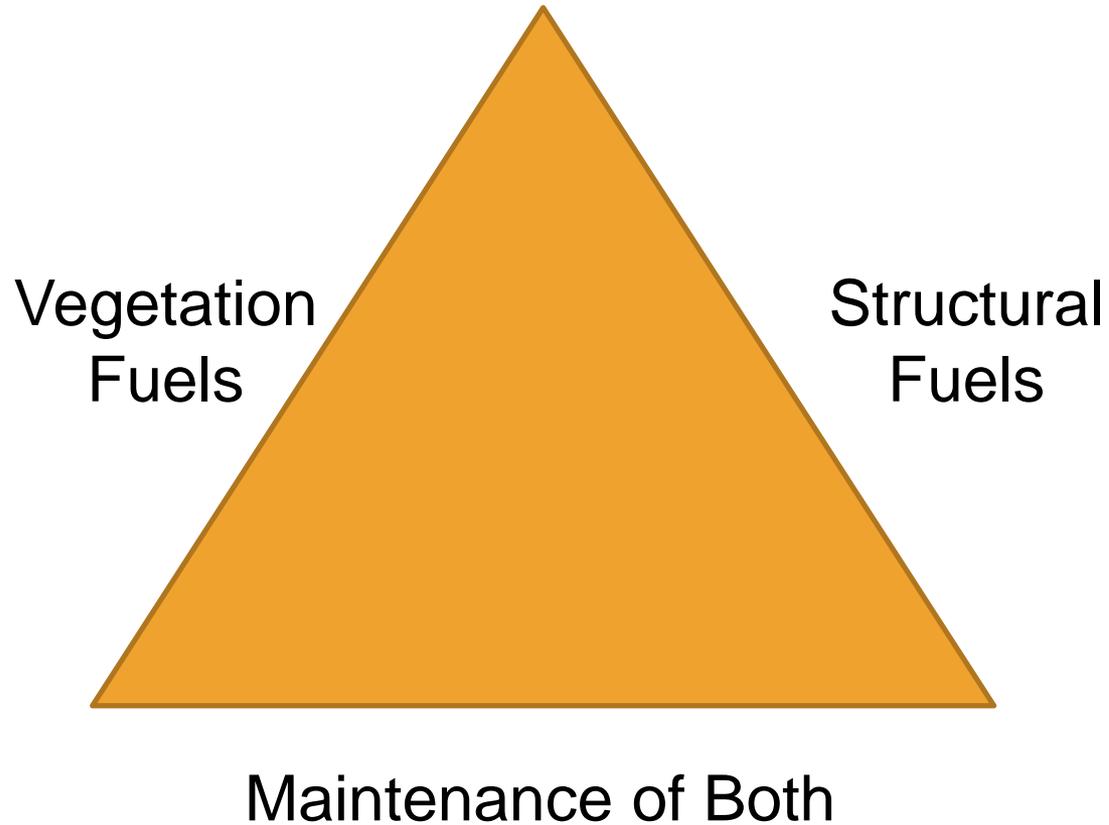
- Fire Triangle:

- Fuel
- Heat
- Oxygen

- Fire Behavior Triangle:

- Fuel
- Weather
- Topography

WUI Homeowner Triangle



How do you build a campfire?

- Tinder
- Kindling
- Small Sticks
- Once it's going, we add larger wood

How does an ember ignite a home?

- Tinder
- Kindling
- Small Sticks
- Once it's going, we add a house.

Some truisms:

- It takes tinder and/or kindling to start a fire with just a spark (ember).
- If debris (tinder/kindling) can get in, so can an ember.
- Fire burns faster on a vertical surface.

Managing Tinder and Kindling

- 1 hour fuels ($< 1/4''$)
 - 10n hour fuels ($< 1''$)
 - 100 hour fuels ($< 3''$)
 - 1,000 hour fuels ($> 3''$)
-
- Which of the above can be easily ignited by a spark or ember?

Building Materials Testing



Photo by IBHS

Five Categories

- Non-combustible
- Class A
- Class B
- Class C
- Unrated

The Myth of Non-combustible

- Even the best material, if not properly installed, will lose its effectiveness.
- Example:
 - Concrete tile roof with many openings that allow 1-hour fuels and embers to circumvent the tiles.
 - Stucco with openings and edges.

Sloppy Installation



Bird nest = tinder!



Photo by Keith Worley

Rated Assemblies

- Even Cedar Shakes can be installed to have an A rating when installed as a fire resistant assembly.
- Manufacturer's rating may include other elements such as:
 - Under-layments
 - Fire stops
 - Sealants

Conducting a Structural Assessment

- Learn a system that helps you cover all parts of the structure.
- A chimney top to foundation (top-down) order of assessment is my preferred method.
- Cover all edges.
- Look at all horizontal/vertical interfaces.

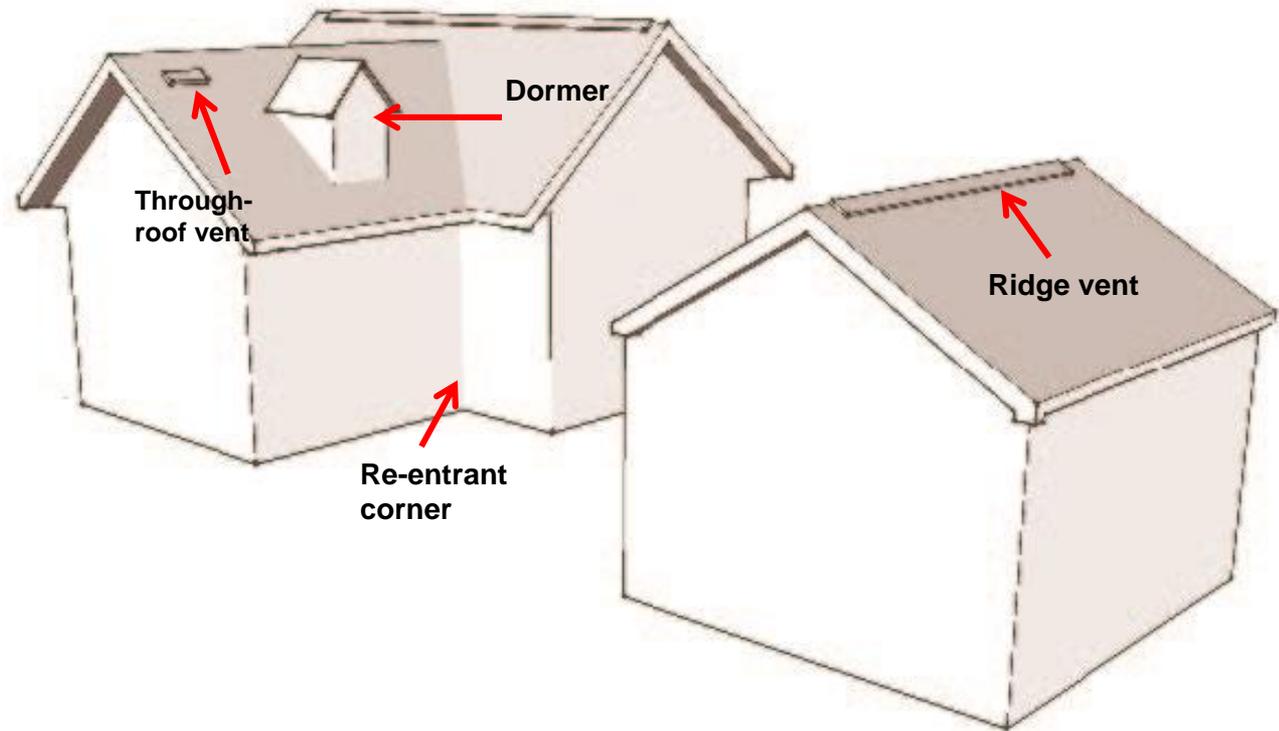
The Roof

- Roofing material
- Flashings
- Skylights
- Vents
- Chimney elements
- Complex elements

The Roof

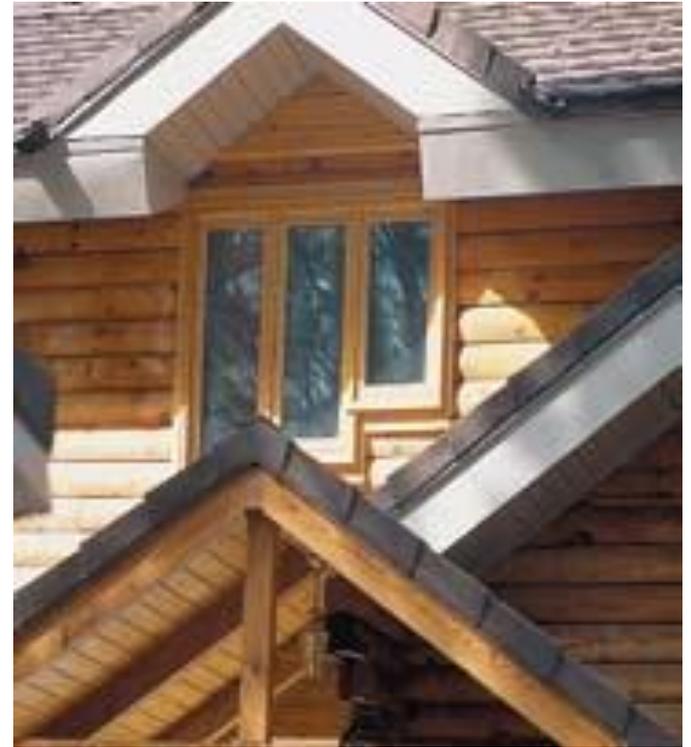
- **Class A Roofing material which includes:**
 - Asphalt/fiberglass composition materials
 - Metal or metal composites
 - Concrete/clay tile
- **Roof clear of all debris/needles along with cleaned gutters**

Complex and Simple Roofs



Detail from IBHS at www.disastersafety.org

Installation Critical



Photos from IBHS and IAFC



Photo by Keith Worley

Numerous Ignition Points



Photo by IBHS



Photo by Keith Worley



Photo by Keith Worley

Watch for

- Gaps
- Debris traps
- Siding that comes down to the roofing materials
- Flashings (or lack of)

Gaps sealed



Photo by IBHS

Missing bird stops



Photo by IBHS

Gutters



Photo by IBHS



Photo by IBHS

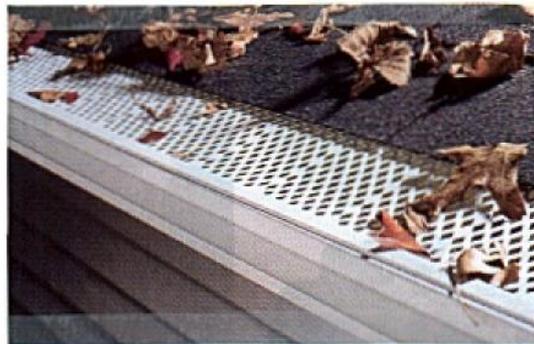


Photo by IBHS

Are Gutter Covers the answer?

- “Gutter Helmet” type covers can work well.
- Other issues may arise, such as ice damming.

Gutter Screens Pro/Con



Install Flashing to harden the interface between the gutter and the roofing material.



IBHS Test Burn

Eaves- Open and Boxed

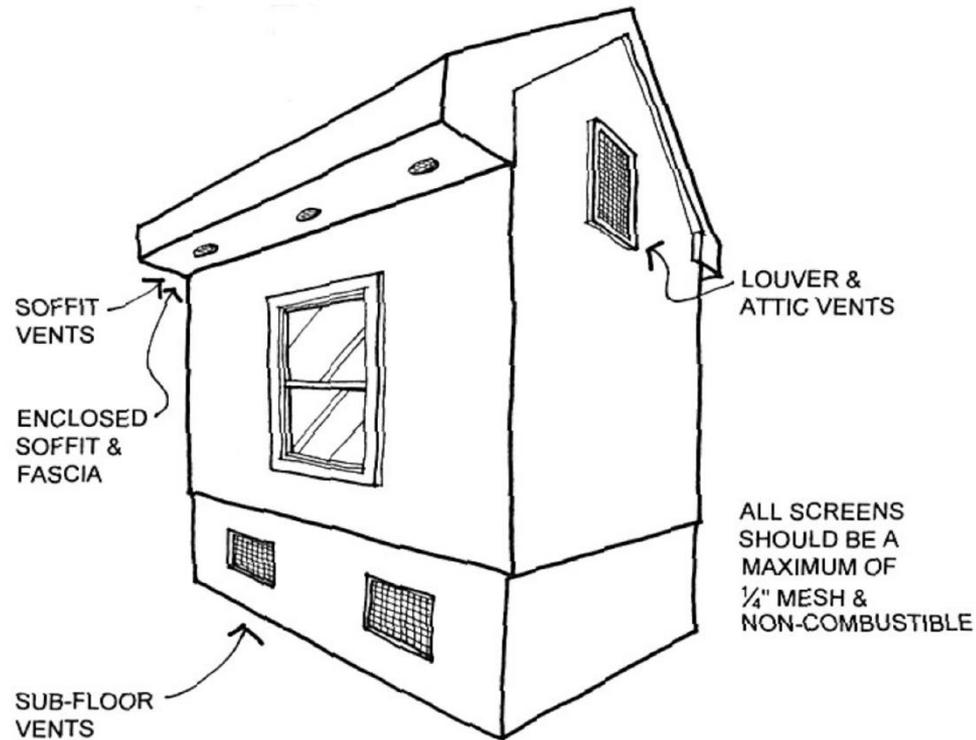


Photos by IBHS

Eave and Soffet Vents

- 1/8th or smaller opening size.
- Think like a wasp. If they can get in, then debris and embers can get in.
- Older construction may not have screening, or may have larger opening sizes.

Gutter and foundation Vents



SCREENS AT VENTS

Windows

- Double pane minimum.
- Reinforced frames for vinyl windows.
- Best protection is good vegetation clearances.

Glass Shattered by Heat



Photo by Keith Worley

Flames through the casement



IBHS Test Burn



Photo by Keith Worley

Heat Warped Frame. Glass dropped 3 inches from frame.



Photo by Keith Worley

Siding

- Wood
- Composites
- Cement board
- Stucco
 - Real?
 - Foam backed?

Important Considerations

- Clearances to heavy fuels
- Horizontal/Vertical edges
- Gaps at joints
- Vents for dryers, furnace air, interior fans, etc.
- Exterior lighting, electrical outlets

Are all penetrations screened?



Photo by Keith Worley

Fire entry point at panel seam



Photo by Keith Worley

Foundation Edge

- Have a non-combustible material below the siding edge.
- Maintain 6 inches of clearance.

Good Clearance



Photo by Keith Worley

Not so good clearance



Lookin' Good?



The weak spot!



**Debris in, ember in, equals fire
behind the 100 hour fuel.**



Decks

- Often the most vulnerable building element.
- Use rated materials.
- Protect Horizontal/Vertical edges.
- Flammables on the deck.
- Flammables under the deck.
- **Vegetation clearances are critical!**



Photo by Keith Worley



Photo by Keith Worley

Rated vs. Unrated Decking



Photo by IBHS

Are there enough 1-hour and 10-hour fuels to ignite this 1,000-hour fuel?



Firewise Strategies: Keep flames from touching the house and attachments



- Create a 'fuel free' area around your house that runs one yard out on all sides.
- When preparing your home ignition zone, start with the house and work out

Firewise Strategies: Maintain a clean landscape

- A clean, healthy garden is not a receptive surface for embers
- Keep plant debris to a minimum...
 - Rake
 - Mow
 - Dispose of debris promptly



Photo by IBHS

Under The Deck????



Photo by Keith Worley

IMPORTANT!!

- This is the area where firebrands may accumulate after the flame front has passed.
- If combustibles are pre-heated, an ignition source can ignite the house or deck.

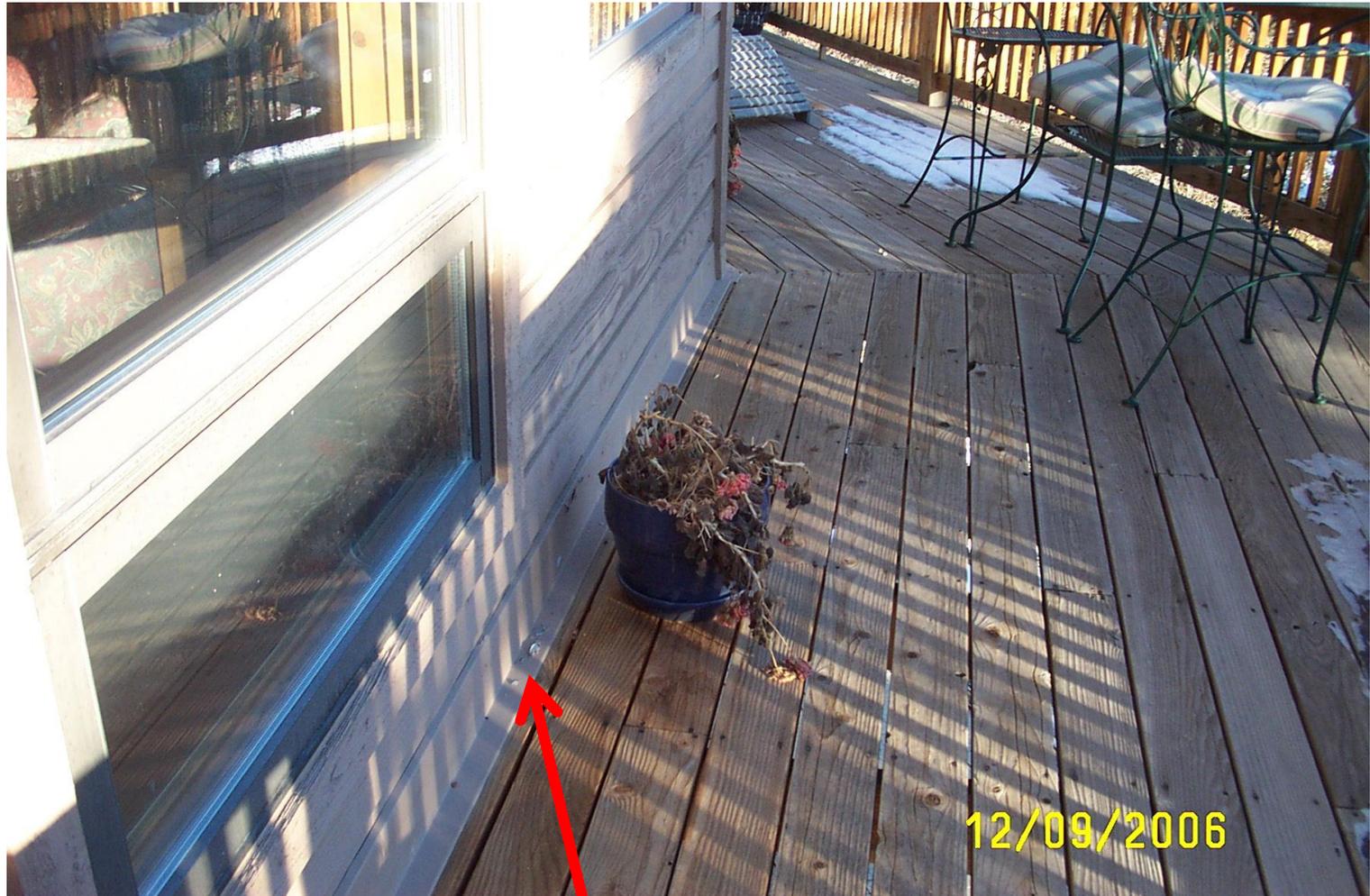
Where leaves collect, firebrands will collect.



Photo by Keith Worley



Photo by Keith Worley



**Metal flashing installed at
Horizontal/Vertical edge and painted
to match siding.**

Photo by Keith Worley

What is our fuel arrangement here?



Photo by Keith Worley

Firewise Strategies: Keep flames from touching the house and attachments

- Wood fences and mulch should not touch structures
- Keep mulch and pine needles away from house, fence and deck



Firewise Retro-fits

- Identify any openings.
- Debris collection points.
- Where will embers accumulate?
 - Check where leaves or snow accumulate after a windy day or blizzard. These may be the same spots where embers collect.
- Vegetation Clearances?

Cost Factors Affect Time Factors

- Inexpensive fixes can be done quickly and easily.
- Moderate cost items may be targeted for fixes within 1-2 years.
- Expensive measures, such as a roof change, may require 2-5 years for fixes.
- How do you eat an elephant?

Focus on the doable

- Caulking
- Screening
- Filling of voids
- Use flashing to harden horizontal/vertical edges on the structure.
- Pulling back combustible mulches
- Installing rock or gravel at horizontal/vertical interfaces

Think of other benefits

- Weatherization
 - Keep warm in, or embers out.
- Varmint Proofing
 - Keep bugs, bees, wasps, mice out
- Firewization- A new word for us in the WUI.

Maintenance

- **Situational Awareness:**
 - Fire Season
 - Red Flag Days
 - Extended absences from home
- **Checklist for:**
 - Daily
 - Weekly
 - Monthly
 - Yearly



Assuming your home is already well maintained, you will need the following:

- Caulk gun and caulk
 - Touch-up paint
- Wire mesh (< 1/8th Inch mesh)
- Tin snips
- Metal flashing (roofing section at hardware store)
- Shovel (for improving siding/ground clearances.
- Stone to replace combustible mulch

Cautions:

- Use rock < 1 to 1 1/2 “ in diameter
 - Larger rock will trap debris!
- Provide positive drainage away from the foundation
 - To avoid water ponding at foundation!
- Do not trap moisture in wood
 - Moisture + Wood = Rot!
- Consult with a construction specialist if unsure.

Firewise is:

- Keeping up with maintenance on a regular basis.
- Incorporating Firewise practices into how we live and where we live.
- Not a one-time deal. Firewise is forever if we want to live in a wildfire prone environment.



“Nature..... She pardons no mistakes.”

Ralph Waldo Emerson



Bitterroot National Forest - Montana

Bitterroot Fire, August 6, 2000, John McColgan