

An aerial photograph showing a landscape affected by a wildfire. In the foreground, there is a residential area with several houses, a dirt road, and solar panels. The middle ground is dominated by a large, dark, charred area where the forest has been destroyed. The background shows a healthy, green forest. The title 'WILDFIRE' is overlaid in large orange letters at the top, and 'HOME HARDENING GUIDE' is overlaid in large white letters in the center.

WILDFIRE

HOME HARDENING GUIDE

**How to harden homes
against wildfire**



Department of Consumer
and Business Services

About this guide

This guide¹ includes specific recommendations on how to construct new or retrofit existing components of a home to withstand wildfire. Each section of this guide contains an explanation on how the component is vulnerable to wildfire and what can be done to improve that component. The illustrations throughout this guide are intended to show best practices for reducing the vulnerability of a home to wildfire.

Oregon Residential Specialty Code (ORSC) Section R327 outlines specific wildfire mitigation construction standards that may be adopted locally. Where adopted, those provisions would apply to the construction of new one- and two-family dwellings and certain new accessory structures located within the locally designated wildfire hazard zones. This guide is not intended to summarize ORSC Section R327 in any way. It is intended to simplify the topic and outline protective measures of ORSC Section R327 within a user-friendly format.

ORSC Section R327 is available on the division’s website at: Oregon.gov/bcd on the Residential Structures web page.

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¹ Adapted from Wildfire Home Retrofit Guide, publication #SP-20-11, with permission from University of Nevada, Reno Extension and the Living with Fire Program.

Roofing

Making a roof "fire-safe" is a big step in reducing the vulnerability of the home to wildfire. There are three fire ratings for roof coverings: Class A, Class B and Class C, with Class A providing the greatest fire protection. The roof rating designation provides information for the roof covering material and does not include where the roof meets other materials at the edge of the roof. A non-fire-retardant treated wood shake or shingle roof covering is unrated and is not desirable—these roof types have less than a Class C rating.

To meet the minimum requirements of ORSC Section R327, roofing must have a minimum of a Class B rating.

A

CLASS A ROOFING

materials include asphalt fiberglass composition shingles, clay and cementitious tiles (both flat and barrel shaped), and some metal roofing materials.

B

CLASS B ROOFING

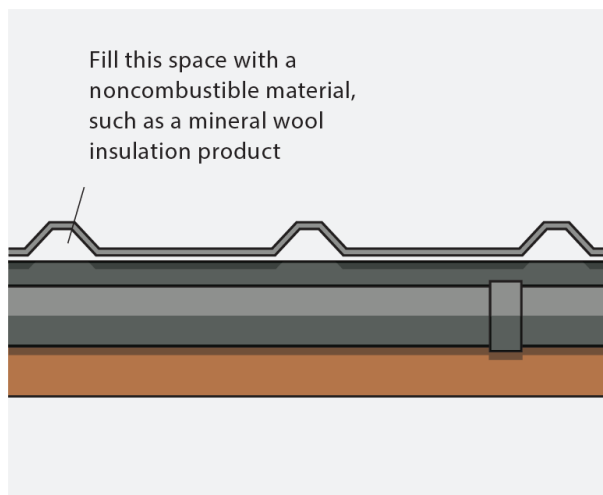
materials are most commonly exterior-rated, pressure-impregnated fire-retardant treated shake or shingle covering (not allowed in Oregon).

C

CLASS C ROOFING

materials include recycled plastic, rubber and aluminum.

METAL ROOF

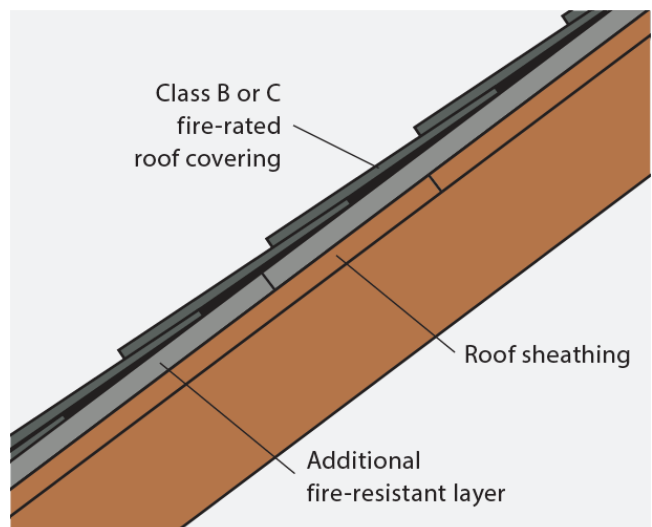


HOW TO FURTHER REDUCE THE VULNERABILITY OF ROOFS

- Remove accumulated vegetative debris from the roof.
- If there is a space between the roofing materials and roof deck, make sure that the openings between the covering and the roof deck are blocked. Repair areas as needed.

CLASS A "BY ASSEMBLY" FIRE-RATED ROOF COVERING

Class B and Class C roofing materials can have a Class A "by assembly" rating. In these cases, additional materials that enhance the fire resistance of the roof assembly (i.e., the roofing material plus other materials included in the roof assembly) must be installed. In these cases, be sure to follow the manufacturer's instructions.

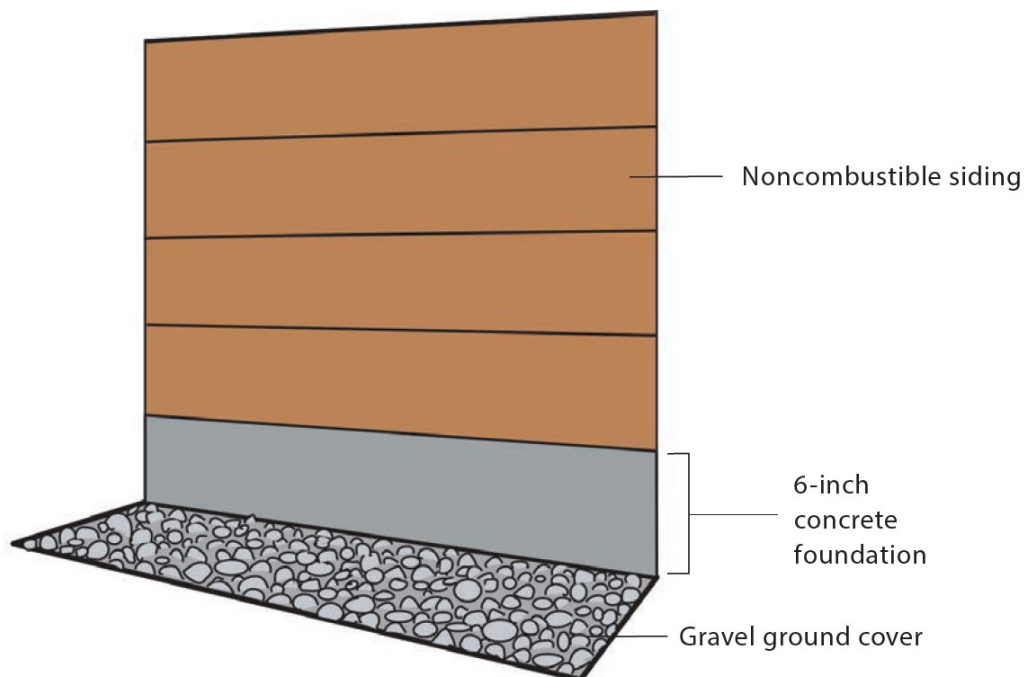


Exterior wall covering

If the siding ignites, a fire can: **1)** penetrate through the stud cavity into the home, **2)** spread up the side of the home and enter windows or other openings such as dryer vents, and **3)** spread into the attic at a gable-end vent or an under-eave area. Combustible siding can be ignited from direct-flame contact or radiant heat exposure. Ignition of siding from embers can occur, especially if embers ignite combustible materials close to the home (e.g., bark mulch or wood pile), and if siding extends all the way to the ground. Combustible siding products are widely used, including solid wood, wood composite materials and plastic/vinyl products.

To meet the minimum requirements of ORSC Section R327, exterior wall coverings must be one of the following materials or assemblies:

- ▶ Noncombustible – Common examples include fiber cement board, brick, and metal.
- ▶ Ignition Resistant – These are materials that have been tested in accordance with ASTM E84 or UL 723. An example of an ignition-resistant material is lumber that has been pressure impregnated with an exterior-rated fire retardant.
- ▶ Heavy Timber Assembly – Commonly known as post and beam or timber-framed is a system having main framing members measuring no less than eight inches by eight inches.
- ▶ Log Wall Assembly.



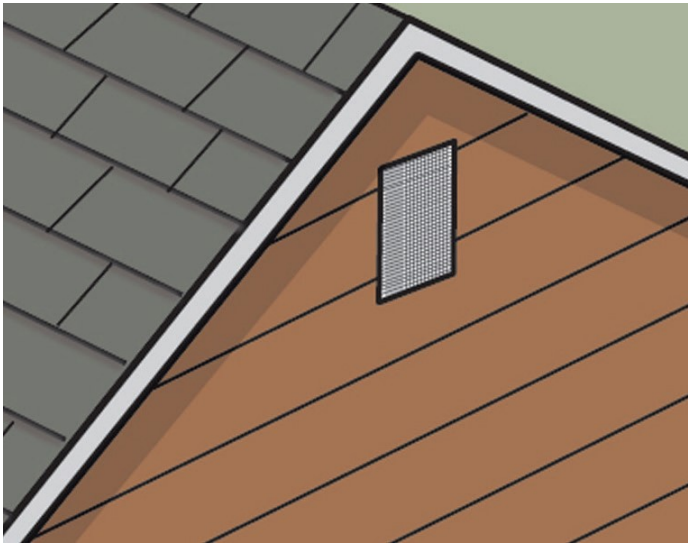
Recommended Exterior Wall Configuration

Ventilation

To meet the minimum requirements of ORSC Section R327, unless located greater than 12 feet above grade, crawlspace, eave, soffit, and cornice vents must be the following type:

- ▶ Specifically designed to resist the intrusion of burning embers and flame. Fire resistant vents must be certified under ASTM E2886.
- ▶ Vents other than crawlspace, eave, soffit, and cornice vents shall be covered with noncombustible corrosion-resistant metal mesh a minimum of $\frac{1}{16}$ inch and maximum of $\frac{1}{8}$ inch.

(Unvented attic assemblies also qualify. An unvented attic is one in which no vent openings are installed.)



WHAT IS THE DIFFERENCE BETWEEN VENT SCREEN SIZES?

Small screens ($\frac{1}{16}$ inch) can reduce both the size and number of embers that can pass through. Because the embers are smaller, they self-extinguish quickly after entering the attic and crawl space. While this screen size is ideal for resisting ember intrusion, it does require more maintenance because it gets easily clogged. Accumulated debris on vents can become a source of embers if not cleaned regularly. Air flow is also reduced with this size screen.

Mid-size screens ($\frac{1}{8}$ inch) allow more, larger embers to enter the attic and crawl space, but these are still better than $\frac{1}{4}$ -inch screens. This size screen is a common choice because the maintenance is lower while still being relatively effective.

Large screens ($\frac{1}{4}$ inch) allow many, larger embers to enter the attic and crawl space. It is recommended you replace or cover $\frac{1}{4}$ -inch screens with a smaller grain.

HOW TO REDUCE THE VULNERABILITY OF ATTIC AND CRAWL SPACES

- Avoid storing combustible items (e.g., cardboard boxes, newspapers and magazines) near attic or crawl space vents.
- If $\frac{1}{4}$ -inch mesh screening is present, replace or add, at a minimum, a $\frac{1}{8}$ -inch noncombustible corrosion resistant metal mesh screen.
- Consider replacing vents with a flame- and ember-resistant option.

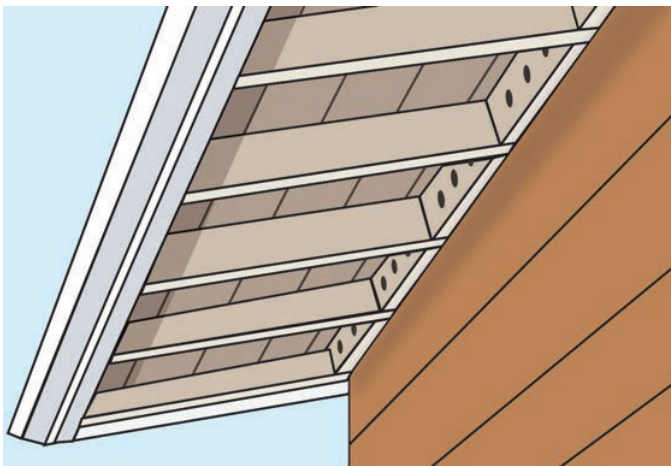
Overhangs, cantilevers and projections

The under-eave area provides a point of entry for flames if nearby vegetation or other materials are burning. There are two basic designs for under-eave construction: open-eave and soffited-eave (i.e., one that is boxed in). Open-eave designs are more vulnerable to flames—heat can build up in an area between the roof rafters allowing for more rapid fire spread laterally, which increases the likelihood that fire will find a location to enter the attic. Vents that are in the blocking between rafters in open-eave construction are more vulnerable to the entry of embers than vents in a soffited-eave.

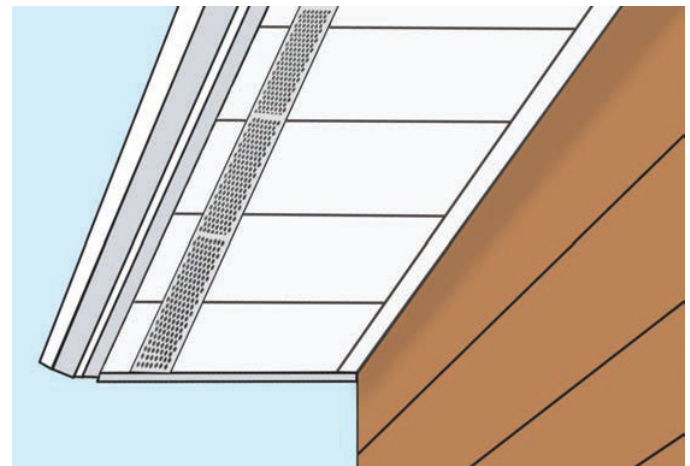
To meet the minimum requirements of ORSC Section R327, overhangs, cantilevers and projections less than 12 feet above grade and greater than 200 square feet must be protected by one of the following materials:

- ▶ Noncombustible – Common examples include fiber cement board, brick, and metal.
- ▶ Ignition Resistant – These are materials that have been tested in accordance with ASTM E84 or UL 723. An example of an ignition-resistant material is lumber that has been pressure impregnated with an exterior-rated fire retardant.
- ▶ 1-hour Rated Wall Assembly – A typical one-hour fire rated wall consists of 2 x 4 studs spaced 16 inches from the center of one stud to the center of the next, covered by $\frac{5}{8}$ -inch Type X gypsum board. Type X gypsum board is wallboard to which non-combustible fibers have been added.
- ▶ 1 Layer of $\frac{5}{8}$ -inch Type X Gypsum – Type X gypsum board is wallboard to which non-combustible fibers have been added.

OPEN EAVE



SOFFITED EAVE



HOW TO FURTHER REDUCE THE VULNERABILITY OF EAVES

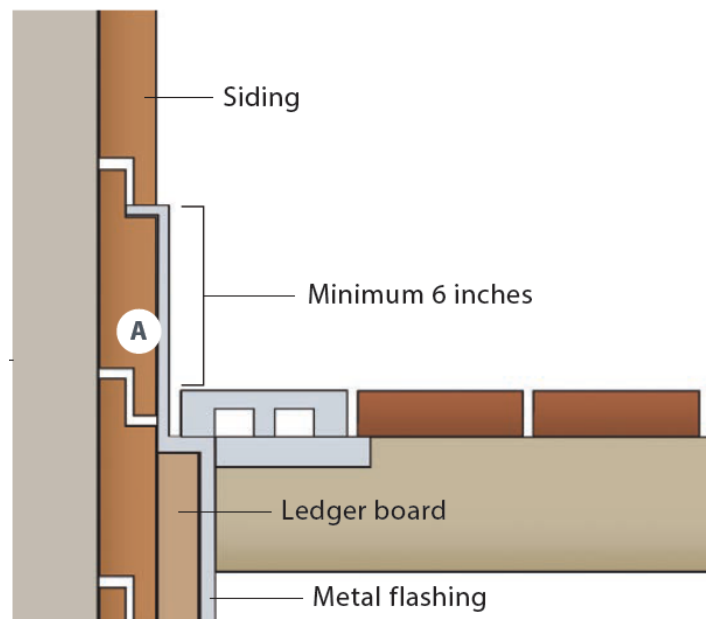
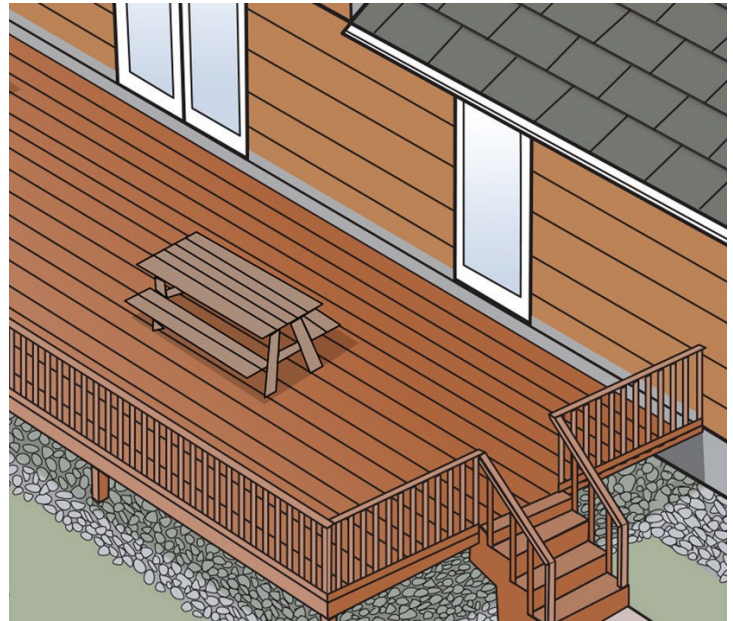
- Inspect open-eave areas for gaps where embers could lodge or pass through into the attic. All vents should be screened, and all other gaps should be filled with durable caulk.
- Enclose under-eave area to create a soffited eave.

Walking surfaces

If a deck, porch or balcony attached to a home ignites, the home can be exposed to flames and radiant heat. What is stored underneath and on top of these structures can also be an ignition source. Depending on the material, embers can also directly ignite the walking surface of these structures. Structures that overhang a slope can be exposed to flames if trees and other vegetation downslope ignite, resulting in flames contacting the bottom of the structure. Most commercially available deck boards are combustible.

To meet the minimum requirements of ORSC Section R327, walking surfaces that are greater than 30 inches and less than 12 feet above grade must be one of the following materials:

- ▶ Noncombustible – Common examples are fiber cement and aluminum
- ▶ Ignition Resistant – These are materials that have been tested in accordance with ASTM E84 or UL 723.
- ▶ Exterior Fire-Retardant Treated Wood – EFRT wood must undergo ASTM E84 testing, conducted on material that has been through the ASTM D2898 accelerated weathering test.
- ▶ Material meeting ASTM E2632 – This standard prescribes a method to assess the fire-test response characteristics of deck materials when used as the walking surface of a deck or similar structure



- A** Install metal flashing between the ledger board and joists to protect the combustible siding material. The flashing should extend above and below the ledger board.

Windows and skylights

WINDOWS

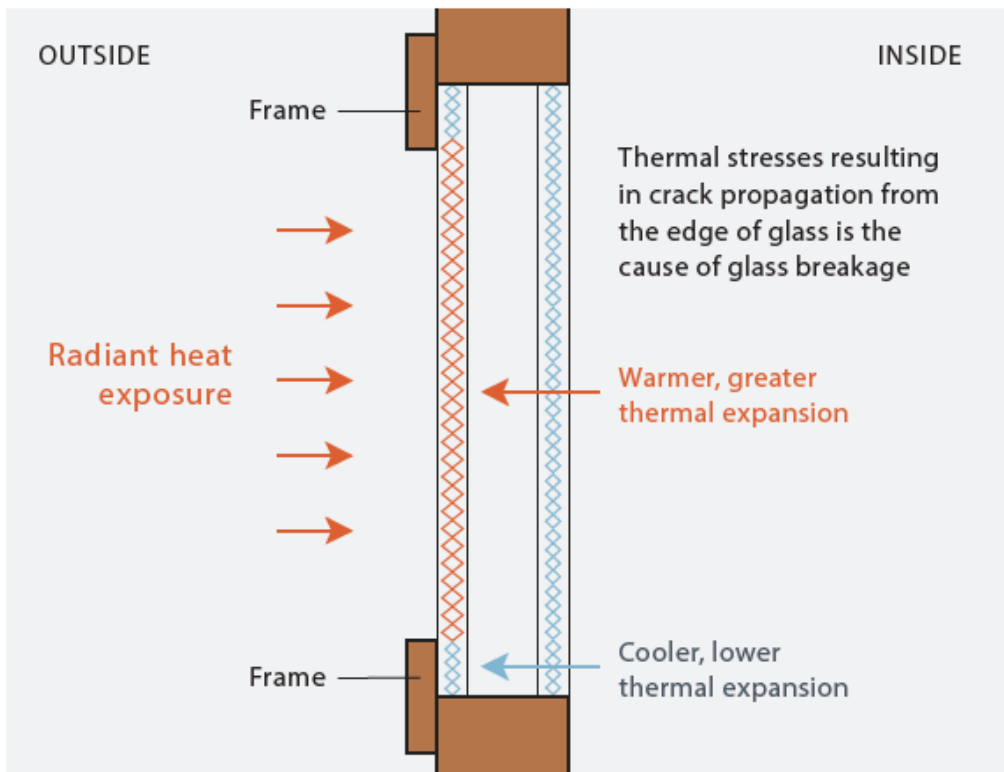
Windows and windows within exterior doors can be a vulnerable component of a home if the framing material ignites or deforms, or if the glass breaks and falls out, both allowing embers or flames to enter the home. The most vulnerable part of a window is the glass. Glass breakage occurs when cracks, spreading from the outer edge inward, occur due to thermal stress that develops when a window is exposed to flames or radiant heat.

Tempered glass is three to four times more resistant to heat exposures than typical annealed glass and is therefore a better choice when selecting windows.

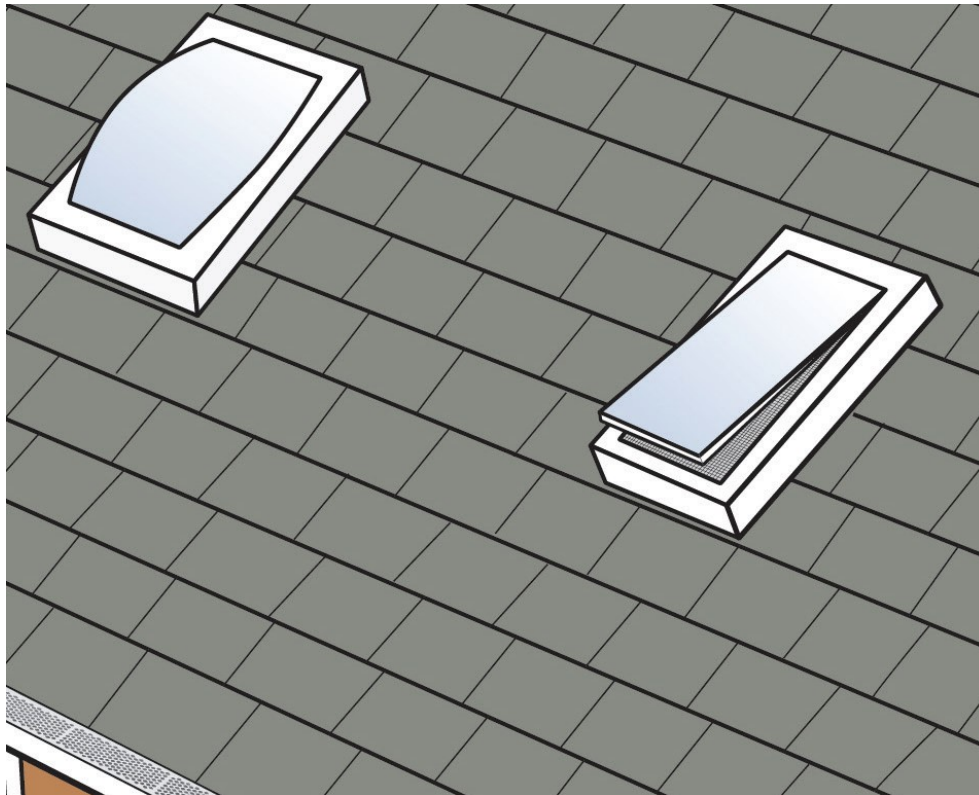
To meet the minimum requirements of ORSC Section R327, windows and windows within exterior doors must be one of the following:

- ▶ Tempered Glass – This glass undergoes a thermal process that increases its strength.
- ▶ Multi-layered glazed panels – A standard double paned window meets this requirement.
- ▶ Glass block
- ▶ 20-minute Fire-Resistant-Rated Assembly – This is a window assembly that is rated for fire exposure for 20 minutes. These windows will come as a complete assembly with frame and glass together.

DUAL-PANE WINDOW



SKYLIGHTS



Skylights can be a point for ember and flame entry if the cover fails, or if skylights are left open when a wildfire threatens. There are two basic kinds of skylights: domed-style made of plastic and flat-style made of glass. Flat-style, glass skylights have less risk than domed-style, plastic skylights that may melt and burn when exposed to heat from a wildfire. Typically, the glass in skylights consists of two layers, the outer being tempered glass and the inner being a safety glass, such as laminated glass.

Skylights on steeper sloped roofs can be vulnerable to radiant heat and flame contact exposures if nearby combustible materials ignite and burn. Skylights on low-slope (flatter) roofs are more prone to the accumulation of vegetative debris (especially flat-style skylights).

To meet the minimum requirements of ORSC Section R327, skylights must be one of the following:

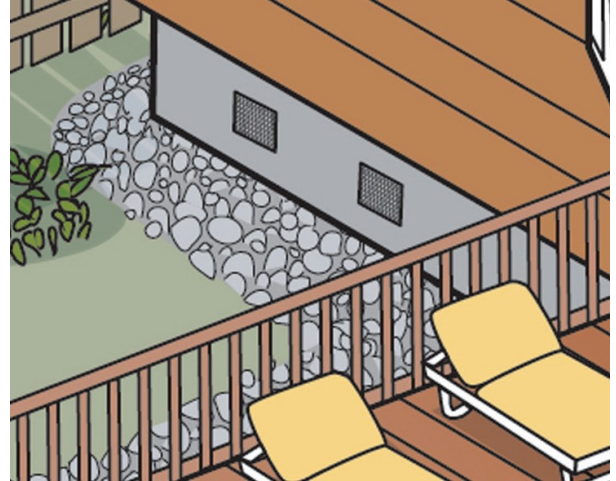
- ▶ Tempered Glass – This glass undergoes a thermal process that increases its strength.
- ▶ Multi-layered glazed panels – A standard double paned window meets this requirement.
- ▶ Glass block
- ▶ 20-minute Fire-Resistant-Rated Assembly – This is a skylight assembly that is rated for fire exposure for 20 minutes. These skylights will come as a complete assembly with frame and glass together.

Manufactured home skirting

Combustible skirting installed to enclose the space under a manufactured home is a vulnerable point for wildfires. There are many readily available products that are non-combustible. Installing a noncombustible or ignition resistant skirting along with vents that are designed to resist flame and embers will help protect the space under a manufactured home.

Manufactured homes are not subject to ORSC Section R327. The following materials are recommended:

- ▶ Noncombustible - Common examples are fiber cement board, metal and masonry.
- ▶ Ignition Resistant - These are materials that have been tested in accordance with ASTM E84 or UL 723. An example of an ignition-resistant material is lumber that has been pressure impregnated with an exterior-rated fire retardant.



Accessory structures

Accessory structures could include detached garages, shops, agricultural buildings, pump houses and sheds. These structures are accessory to and located on the same parcel as a dwelling.

In order to be subject to ORSC Section R327, accessory structures must meet the following conditions:

- ▶ Must be within 50 feet of a building that contains habitable space.
- ▶ Must be in excess of 400 square feet.



Glossary

EMBER Also called firebrand. Burning (or glowing) particles of vegetation from tree branches, parts of shrubs or chaparral, or other combustible materials (e.g., construction materials) that ignite and burn during a wildfire and are carried in wind currents to locations beyond the wildfire front.

FIBER CEMENT A generic term for a siding product that is made using cement, wood fiber and other additives.

FINE-MESH SCREENING In the context of this document, $\frac{1}{8}$ -inch or finer screening that is used to cover vent openings and operable windows.

GYPSON WALLBOARD A panelized product made from calcium sulfate dihydrate. These panels are commonly used for paneling on the interior of homes and buildings. A special type of gypsum wallboard can be used as a fire-resistant component in a one-hour wall assembly.

ONE-HOUR WALL CONSTRUCTION An assembly that provides enhanced resistance to the penetration of fire.

OPEN-EAVE A type of construction whereby roof rafters are exposed in the area where they extend beyond the exterior walls of the building. In this type of construction, wood members, typical nominal 2-inch thick lumber, are used to fill the space between roof rafters.

PRESSURE-IMPREGNATED FIRE-RETARDANT TREATED A process whereby a fire-retardant chemical is injected into the material (e.g., wood) under a pressurized process. This process results in a deeper penetration of the chemical into the wood.

ROOF COVERING The part of the roof assembly visible from outside the building. Common roof covering materials include asphalt composition shingles, tile and metal.

SHEATHING The first covering of boards or of waterproof material on the outside wall of the house.

SOFFITED-EAVE A type of construction where the area of the roof rafters that extend beyond the exterior wall of a building are enclosed, typically by attaching a panelized product that connects the edge of the roof to the exterior wall.

TEMPERED GLASS A heat-treated glass that enhances resistance to heat exposures three to four times over that of regular (annealed) glass.

UNDERLAYMENT A panel or sheet material in the roof assembly, underlying the roof covering, that improves the fire rating of the covering.