

The Care and Maintenance of Wood Shingle and Shake Roofs

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Wood has served as a roofing material for centuries, especially where other traditional materials, such as slate, were in short supply. The two most common forms of wood roofing are shakes and shingles.

Shakes are typically thicker than shingles and historically were prepared by splitting off sections of material with a maul. As a result, they tended to be rougher and required some type of building paper to limit the risk of water intrusion. Many of the shakes produced today have at least one smooth side so that they can be more easily laid on a roof. Shingles are sawn from wood blocks and tend to be thinner and more uniform.

Both materials can provide long, reliable service when properly installed and maintained. Shake or shingle roofs also make use of wood, a renewable material. Alternative roofing materials, such as asphalt shingles or steel, require large amounts of nonrenewable energy to produce.

Shingle species

Almost any wood can be used for roofing, but the preferred woods are more durable and dimensionally stable. The most common wood species used for roofing is western redcedar (*Thuja plicata*) (Figures 1a and 1b). Coastal redwood (*Sequoia sempervirens*), bald cypress (*Taxodium distichum*) and eastern redcedar (*Thuja occidentalis*) are also used in areas where these species are abundant. These species are characterized by a core of wood (called the heartwood) that contains compounds that tend to resist moisture. These compounds, called extractives, are toxic to fungi and insects that could colonize the wood. Extractives also make the wood more dimensionally stable. As a result, shingles of these tree species resist deterioration far longer than woods of other species.

Alternatively, more perishable woods can be artificially impregnated with preservatives such as



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Figure 1a. Examples of western redcedar shakes (top) and shingles (bottom).



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Figure 1b. Western redcedar shingle grades: grade 1 (left), grade 2 (middle), grade 4 (right).

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copper-based biocides to prolong their useful life.

All materials eventually degrade, and wood roofing is no exception. Over time, chemicals present in the wood can be depleted, and sunlight can degrade the wood surface. You can partially offset these effects with periodic maintenance to maintain appearance and prolong the useful life of a roof. First, it helps to understand what can damage a shake or shingle roof.

Weathering

Weathering is a combination of damage from sunlight, rain and wind. As sunlight strikes the surface, its low energy is released into the wood, creating compounds that begin the degradation process. This process is typically slow (a few millimeters per century), but it causes the wood surface to slightly weaken. Cedar roofs will turn light gray within a year of installation, but the wood beneath retains its original color.

Rain or wind, which can carry tiny sand particles, can wear away the shallow weathered wood on the surface, exposing new wood to sunlight. This process results in a gradual wearing away of the surface. This process typically occurs more rapidly in the softer parts of the wood. In cedar, these parts are at the beginning of each growth ring (called earlywood). Over time, the shake or shingle can take on a washboard appearance (Figure 2).

Repeated wetting and drying can also lead to physical changes in the shake or shingle. Wood swells as it wets and shrinks as it dries. Repeated wetting and drying can induce stresses in the wood that eventually lead to cracks or splits, as well as cupping or warping (Figures 3a, 3b and 3c). The wood species used for roofing tend to shrink less than other species, but even these materials can eventually develop physical damage.

Fungal attack

A variety of organisms attack wood, but fungi are the most common. Fungal spores that float through the air or move with moisture settle on a roof. They germinate



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Figure 2. Examples of weathered western redcedar shingles.

to produce strand-like cells that grow through the wood cells. Some fungi live only on compounds stored in the wood, while others attack the structural materials that give wood its strength.

The fungi that live on the stored sugars present in the wood or on compounds that fall on the shingle surface do not cause structural damage. The color of these fungi, however, can mar the appearance of the wood. For example, cedar roofs are often colonized by dark-pigmented fungi that disfigure the wood surface (Figure 4a, page 3). These fungi tend to be more prevalent on the exposed surfaces of the shingle, where moisture conditions are more suitable for growth. Some of these fungi can detoxify the heartwood extractives, allowing other fungi to attack the wood.

Decay fungi also begin life as small spores and grow into the wood. But unlike other fungi, they produce enzymes that begin to degrade the wood structure. Eventually, these fungi can degrade the wood to the point where it is no longer serviceable (Figure 4b, page 3). Decay fungi are typically found under the shingle or shake overlap, where moisture conditions suit steady growth. Most species used for roofing are resistant to



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Figure 3a. Cupping of cedar shingles.



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Figure 3b. Cupping and shrinkage of cedar shingles.



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Figure 3c. Splitting and shrinkage of cedar shingles.



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Figure 4a. Dark-pigmented fungi color the surface of these cedar shingles.

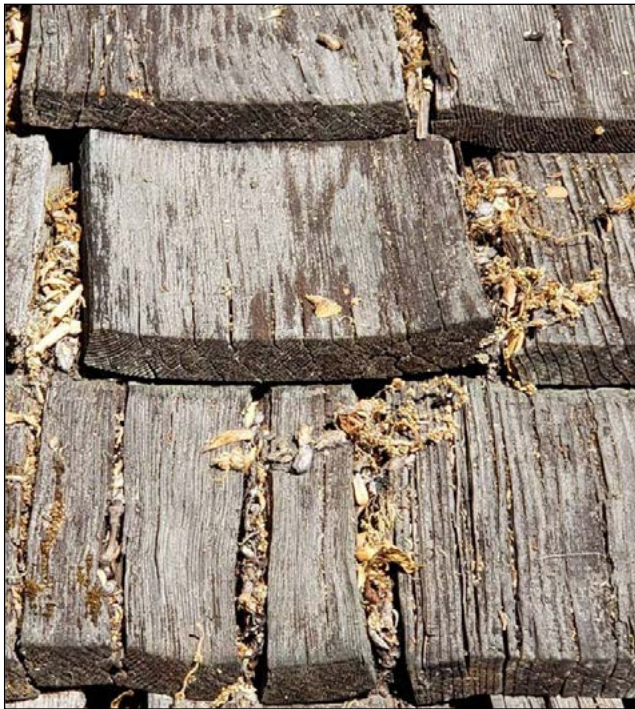


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Figure 4b. Decay fungi have degraded these wood shingles to the point where they are no longer serviceable.



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Figure 5a. Moss builds up quickly when roofs are shaded by trees.

these fungi, but even these materials can eventually succumb.

Mosses and lichens

Mosses are primitive plants, while lichens form from a symbiotic relationship between an alga and a fungus. Both groups of organisms can readily grow on roofs, especially in the Pacific Northwest (Figures 5a and 5b). The most common mosses found on roofs in the Willamette Valley are *Dicranoweisia cirrata* and *Bryum capillare*. The growth of these organisms by themselves is not detrimental to the wood; however, lichens and especially mosses tend to accumulate soil and other debris on the roof. Because of this debris, the roof wets quickly and remains wet for longer periods of time. This encourages the growth of fungi and accelerates decomposition.

How long does this process take?

There is no single answer to the question of a roof's life span. Durability is closely related to the temperature and amount of rainfall to which the wood is exposed. Wood degrades more rapidly when exposed to higher amounts of rainfall and warmer temperatures. A roof exposed on the wet, warm side of Hawaii may only last one-fourth as long as one exposed in cooler, wet western Oregon and only one-tenth of the time it might last in the dry high desert of eastern Oregon. The slope of the roof also plays a part; steeper roofs tend to shed water more quickly. Overhanging vegetation tends to shade the roof and drop debris that can accumulate and retain moisture. Wetter conditions encourage the growth of fungi, mosses and lichens. All of these shorten roof life.

Care and maintenance

Maintenance is essential for the performance of any roofing material, including wood. Regularly clean



Photo: Jay W. Pscheidt, © Oregon State University

Figure 5b. Moss builds up on the thicker cut ends first.



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Figure 6. Remove all leaf litter, conifer needles, and debris that accumulate between the shingles and shakes and in the valleys. It's best to do this before the wet season begins.

roofs of leaf litter, conifer needles and debris to limit the growth of organisms such as mosses and lichens (Figure 6). Remove debris by sweeping, leaf-blowing or washing. It is best to do this before the fall rains in the Pacific Northwest.

Vegetation removal: Remove any overhanging branches to improve the life of a roof. Trees can shade the roof, slowing drying between rainfalls. Debris falling from these branches can accumulate on the surface, acting as a water trap. Removing overhanging vegetation will also reduce the fire risk.

Cleaning gutters: Gutters are designed to move water away from a structure. Failure to maintain clean gutters can result in water backups that extend to the lowest course of the roof.

Surface cleaning: Many roof maintenance companies offer a power washing service, although this is more of a cosmetic treatment. This process strips away weaker wood that has weathered and can improve overall roof appearance. Improper power washing can damage the wood surface and fracture shingles. Typically, improper washing involves using excessive water pressure or washing against the downslope of the roof. Power washing will not alter the progression of weathering on the wood surface. The clean roof will begin to weather soon after it is washed. Power washing can be useful for removing moss, lichens and accumulated debris.

Many professional roof maintenance companies recommend applying oil or other surface treatments after power washing. (See page 5.)

Do-it-yourself vs. professional care

Roof maintenance is relatively simple, but it may be more practical to hire a professional who is licensed, bonded and insured. Your need for professional help may depend on the roof, its condition and your physical condition. Take a few precautions before climbing up:

- Use footwear that provides good traction and will grip the roof surface. Avoid leather-soled shoes.
- Use a ladder that meets all safety requirements. Be sure to set the ladder on stable ground.
- The ladder should extend at least 3 feet above the roof line and be secured to the roof at the top.
- Use a bucket and rope to transport tools and other items to the roof. Do not carry them up the ladder.
- If possible, walk across the roof rather than up and down to reduce the chance of slipping.
- Use safety lines and belts, especially where:
 - The roof pitch is 5 to 12 or greater (more than 23°).
 - The eaves are more than 16 feet from the ground.
 - You are working closer than 6 feet to the roof edge.

Cleaning solutions

Scrub with water or use mild pressure to remove large pieces of debris from shingles. You may need cleaning solutions to remove more deep-seated stains. For all cleaning solutions, wear eye protection, rubber gloves and some type of coverall to protect clothing.

Test any cleaning solution on a small, inconspicuous spot on the roof to make sure that it does not adversely discolor the wood.

RECIPE FOR COMMON CLEANING SOLUTION

3 ounces of trisodium phosphate (available in paint or hardware stores)

1 ounce laundry detergent

1 quart of 5% sodium hypochlorite (bleach)

3 quarts warm water

Mix thoroughly and apply with a soft brush or broom. Scrub lightly, allow to stand for 10–30 minutes, then rinse with fresh water. Be sure to rinse accidental splashes off plants.

Do not include the phosphate if your gutters lead directly into a storm drain. Phosphates can foster algal blooms in nearby lakes and streams.

For more persistent stains, repeat applications or use stronger bleaching solutions. You can use bleach at full strength, but be sure to thoroughly rinse the wood surface to remove excess bleach.

Surface treatments

Western redcedar shingles are inherently resistant to moisture uptake, which is why they make such a good roofing material. For this reason, any surface treatment will only penetrate a short distance into the wood. Roofs also experience severe sun exposure and rainfall that result in rapid degradation and loss of any treatment chemicals.

Surface treatments should contain a water repellent and an ultraviolet light inhibitor. Water repellents are usually waxes that resist moisture uptake, but they can also include resins that fix to the wood surface. UV inhibitors can include pigments, iron particles and a host of other compounds that slow, but do not prevent, the process of weathering. Some treatments also contain fungicides and algaecides that kill mosses and lichens.

Ensure that these treatments are used properly to avoid damage to plants. Any product that claims to control moss, lichens or fungi must be registered with the Environmental Protection Agency or exempt from registration under Section 25(b) of the federal Insecticide, Fungicide, and Rodenticide Act. State registration is still required.

While some roof treatments claim to protect roofs for up to 10 years, most treatments last no more than one to three years. Some products also claim fire-retardant properties. Be skeptical of such claims. Few



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Figure 7. Water beads on the surface of wood treated with a water-repellent wood protection system.

fire retardants resist rainfall, and these are typically applied at the factory prior to installation.

The protective period afforded by a surface treatment depends on the condition of the roof (heavily worn vs. new), the roof pitch, the presence of overhanging vegetation and the climate (rainfall, temperature).

Oil treatments

Many roof cleaning services claim that oils applied after cleaning can extend the life of the roof. Cedar and other species contain oils that do impart some moisture resistance, and oil treatments may have a similar effect (Figure 7). The depth of oil penetration is generally shallow, and the materials are exposed to UV degradation. The protective period of these treatments, if any, is limited. They do, however, improve roof appearance for a short time after cleaning.

Moss removal and control

When there is a lot of moss on the roof or the roof condition is too fragile to allow the growth to be removed mechanically, a pesticide may be necessary. These treatments can also be used before moss growth becomes heavy. These products tend to be most effective when applied to actively growing moss. Wetting dried moss before applying chemicals can improve effectiveness. Pesticides can be toxic if mishandled and typically carry warnings about what to do if accidental exposure or ingestion occurs. Call the manufacturer, the county Extension office or the poison control center (800-222-1222) for guidance on safe handling. Pesticides used to limit moss growth on roofs are listed in order of effectiveness:

Zinc sulfate (monohydrate): Mix 3 pounds of powder in 9 gallons of water. This volume will treat 600–1,000 square feet of roof using a pump sprayer, depending on the wood condition. In areas of heavy growth or where conditions favor moss growth, use a solution of 1 pound powder mixed in 1.6–3 gallons of water to treat 200 square feet. Do not use this treatment if you have copper gutters, downspouts or flashing; zinc sulfate corrodes copper.

Potassium salts of fatty acids: These soap-based biodegradable products kill moss by penetrating the cell walls and changing the membranes so that the cells leak and the moss dies. These products are noncorrosive and pose minimal risk to humans and animals. Avoid overspraying on adjacent plants, and rinse any plants that are accidentally treated. Thoroughly rinse any tools or equipment used to apply these chemicals.

Both products will wash off the roof with continued rainfall and so do not provide long-term protection against moss growth. Check the label for appropriate protective gear to wear, such as goggles or a face shield.

Fungal control

Fungi tend to be more deeply established in the shingle or shake, so it is not possible to completely eliminate them. However, several surface treatments can arrest wood decay. These chemicals, called wood preservatives, can help extend roof life. Treatment effectiveness depends on roof condition. Preservative performance is better on recently installed roofs than on roofs with existing decay and heavy weathering.

Apply treatments by brushing, rolling or spraying. Read the product label carefully to determine the best application method. Spraying, when allowed by the label, generally works better than rolling or brushing because of the uneven nature of the surface. Avoid spraying on days when wind speed exceeds 4 mph. Apply the coating uniformly, making sure to coat the exposed end as well as the surface as thoroughly as possible. Cedar is somewhat resistant to fluid uptake, so it may be better to apply two coats, with a drying period in between.

There are a limited number of preservatives that can be applied to cedar shingles or shakes. Use of these preservatives on shingle or shake roofs must be listed on the label. You can purchase some preservatives at the local hardware or building supply store, while others are restricted-use and can only be applied by licensed applicators. Regardless of classification, all are pesticides and should be handled carefully, following instructions on the label. These products are available in water or organic, solvent-based formulations. Oil-based systems can penetrate more



Photo: Jay W. Pscheidt, © Oregon State University

Figure 8. Metal flashings have prevented the growth of moss where water flows beneath the fixtures.

deeply, but water-based systems have improved in effectiveness.

AVAILABLE PRODUCTS:

Copper naphthenate: This is an effective preservative that is ideally suited for roof applications. The system is available for residential use as a ready-to-use solution containing the equivalent of 1% or 2% copper metal and can be pigmented brown (it is naturally green) to blend in with the natural cedar color. Commercial products may contain up to 8% copper metal equivalent and must be diluted prior to use. One gallon will typically cover 100–300 square feet, depending on wood condition. For shakes and shingles, a rate of 1 gallon per 100 square feet has been reported to provide up to five years of protection in the Pacific Northwest.

Copper-8-Quinolinolate (oxine copper): This is a less toxic alternative to copper naphthenate with many of the same attributes, but it is much more expensive and not as widely available.

3-iodo-propynyl butyl carbamate: This common

additive to paints and coatings is effective against a variety of fungi but is sensitive to UV degradation. It is likely to provide only a year or two of protection and is only available in commercially premixed wood preservative coatings.

Tributyltin oxide: This chemical is sometimes seen in roof treatments, but it is susceptible to UV degradation and is not likely to provide more than one or two years of protection. TBTO is only registered for use in Washington. There are no Oregon-registered wood treatment products containing this ingredient.

OTHER TREATMENTS:

Zinc strips: Placing strips of galvanized steel — which is protected with zinc — on the roof ridge can help protect portions of the roof. The strip slowly releases

the metal, which flows down the roof, inhibiting fungal growth (Figure 8, page 6). Larger roofs need multiple strips, since the metal concentration is diluted as it moves down the roof, losing effectiveness. This protection functions only on exposed surfaces, but it can help keep the roof clean and bright. Copper strips also could work, but there are no copper products registered as pesticides in Washington or Oregon for this use.

More information

For design criteria, contact an architect, building or roofing contractor or the Cedar Shake and Shingle Bureau, P.O. Box 1178, Sumas, WA 98295-1178, www.cedarbureau.org.

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Published and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914, by the Oregon State University Extension Service, Washington State University Extension, University of Idaho Extension and the U.S. Department of Agriculture cooperating.

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Use pesticides safely! Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use. Read the pesticide label—even if you've used the pesticide before. Follow closely the instructions on the label (and any other directions you have). Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

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Published January 2020