



Care and maintenance of wood shingle and shake roofs

S. S. Niemiec and T. D. Brown

A wooden shingle or shake roof once represented one of the few types available. Today it is a premium product that costs the home owner more to purchase and install than the more common asphalt shingle or rolled roofing product. Architects and building contractors choose wood roofs for their beauty and natural appearance that blends well with the surrounding environment and enhances the structure's landscaping.

Additionally, wood shingles and shakes can provide superior performance in areas that experience high winds or damage from hail. Although they do have certain limitations (susceptibility to rotting, splitting, and warping), proper maintenance and care can minimize these limitations.

A standard asphalt three-tab roof generally requires little maintenance during the time it's on the roof except for moss control. Asphalt-based roof coverings gradually degrade from the effects of sunlight and from the erosion of winds, rain, and snow. Assuming that moss is controlled, asphalt roofs tend to have a fixed term of usefulness that rarely can be extended.

But care and maintenance can extend the life of wood shingles or shakes. With an extended life, it may be possible to obtain a real saving in dollars and cents and make your wooden roof more cost-effective.

This publication will discuss the specific methods for extending the number of years that a wood shingle

or shake roof can provide an effective cover for your home or business establishment.

Most wood shingle and shake roofs are made from western redcedar (*Thuja plicata*) because of its exceptional properties, including defect-free straight grain, dimensional stability, low weight (low density), impenetrability to fluids, and—probably most important—decay resistance, derived from natural substances found within the wood.

Other wood species, notably redwood (*Sequoia sempervirens*) and cypress (*Taxodium distichum*), have similar properties and are sometimes used; but decreasing supplies significantly restrict production and distribution. In addition, there's limited distribution of other woods that have been impregnated with preservative chemicals either by pressure-treating (best) or by dipping.

For the purposes of this discussion, when we mention shingles and shakes, redcedar is the species we mean.

Shingles or shakes?

There's a difference between shingles and shakes. Shingles in all instances are sawn; shakes can be split, split and sawn, or simply sawn, depending on the type and grade you chose.

Initial coverage (bundles of material per 100 square foot of roof area) of a roof depends on the type of

product used, the desired pattern or appearance, the slope of the roof, and the application procedures. These variables also establish the quality of the roof.

Roof quality, the site and the type of exposure to the weathering elements, and the maintenance procedures all serve to determine the longevity of the roof. Simply stated, thicker, better roofs that are properly maintained under moderate exposure conditions will last longer than thinner, lower-grade roofs exposed to harsh conditions, without any care.

It's difficult, therefore, to predict how long any given roof will last. According to the U.S. Forest Products Laboratory, "...a good wood shingle roof will last up to thirty years under favorable conditions" (see USDA Handbook 481). Care and maintenance are the keys: The better care you take of your shakes and shingles, the longer you can expect your roof to last.

Weathering

When wood is exposed to the effects of sunlight and precipitation, its surface begins to change. This

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change is partly physical and partly chemical, and it's cumulatively referred to as *weathering*.

The first noticeable change is the color. The initial red-brown color tends to fade, and a graying process begins. This change to silvery gray is the result of ultraviolet (UV) radiation from the sun which strips the surface layer (less than 0.01 inch deep) of certain cell-wall materials.

This first change in color is rather rapid, occurring within the first year of exposure (under more severe conditions, within several months). Gradually, the silver gray will change to a darker, more graphite gray, indicating the surface is being colonized by microfungi, a step that completes the initial phase of the weathering process.

By nature, wood rapidly attracts water to its surface. When this happens, the wood swells. As it dries and the moisture content decreases, it shrinks. This repeated wet-dry cycling causes the development of compression and tension stresses; these, in turn, cause microscopic cracks to develop.

Over time, these cracks grow larger and larger, caused by additional wettings or by freezing and thawing. The cracks also trap water and allow wood-rotting organisms to penetrate deeper into the wood. As the water penetrates more deeply, the wood becomes harder to dry. With increased moisture, the wood-rotting organisms prolong their destructive activity and damage more wood material than would occur during normal weathering.

As the roof continues to age, the surface and sharp edges from manufacturing are eroded by abrasive particles carried in wind and water and by the action of sunlight. Wood-destroying organisms also continue to slowly degrade the surface and the thicker butt edge. The roof loses its new appearance. Debris from trees accumulates in the valleys and between the shingles.

After each rain, there are areas that stay wetter longer. Soon, other plants are beginning to grow, primarily

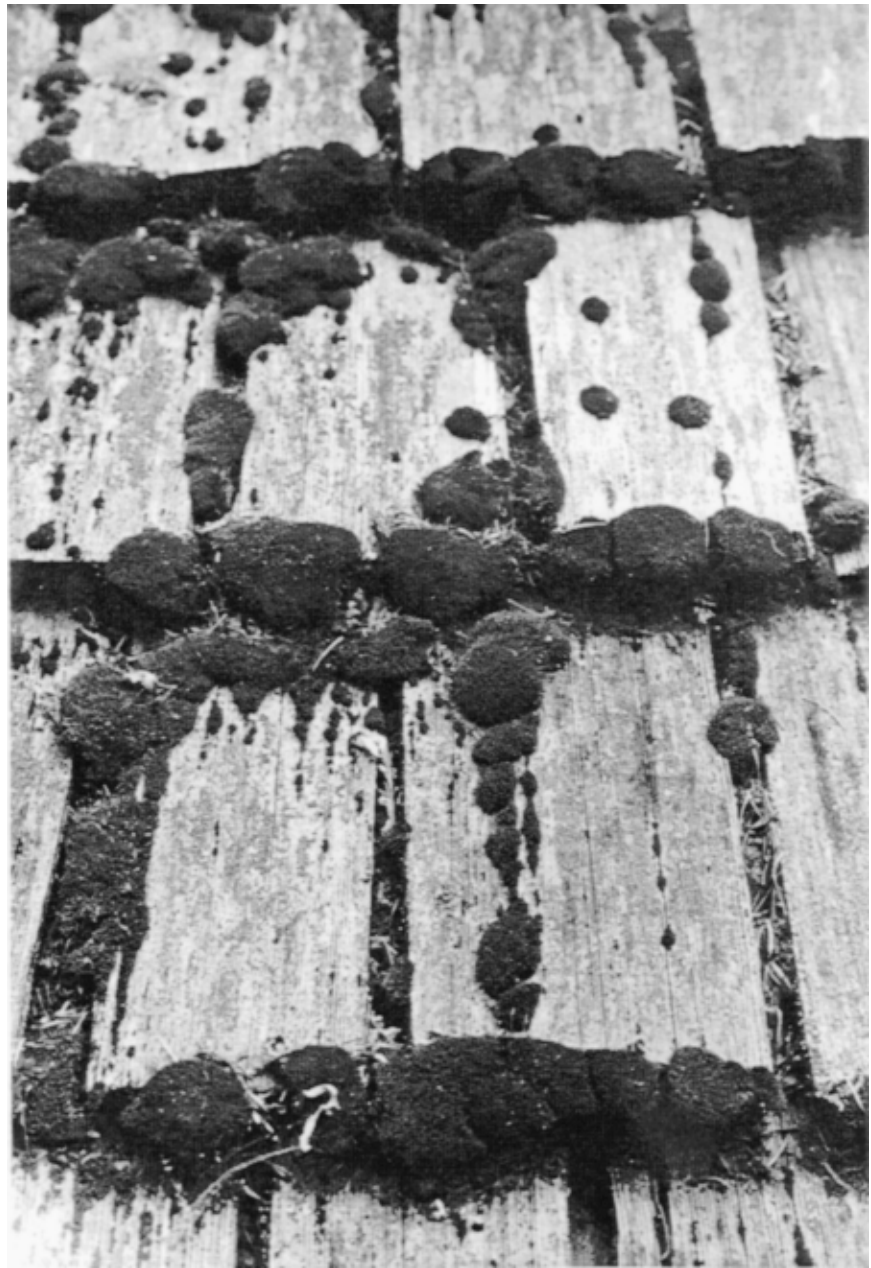


Figure 1.—Moss growing on shingles and shakes does double damage: (1) during a rain, it retards the shedding of water, which in turn promotes leaks; and (2) after the rain stops, moss prevents the surface from drying, which promotes the growth of wood-rotting organisms.

lichens and mosses (Figure 1). More debris collects, and the roof appears to be natural and rustic. There are splits developing, and in certain areas

cupping and curling begin to become more apparent. Then the leaks begin. Sometimes, this takes 30 years—sometimes, much less.

Care and maintenance

Good housekeeping for a wood roof requires removing all leaf litter, pine needles, and debris that accumulate over time between the shingles and shakes and in the valleys of the actual roof structure. It's best to do this before the wet season begins.

In the Pacific Northwest, this is before the autumn rains begin. Along the Gulf Coast or in areas that are conducive to the growth of molds, mildews, and fungi, this housekeeping may be required several times each year.

The debris that accumulates has two deteriorating effects on the roof. First and foremost, debris tends to retard the shedding of water. Secondly—and more destructively—debris retains moisture that allows wood-destroying fungi to grow.

Wood-rotting fungi require water as part of the life cycle. If you can reduce the amount of water so that the minimum level is never reached, the organisms can't grow.

Roof safety precautions

- Use footwear that will provide good traction and grip the roof surface (avoid leather-soled shoes).
 - Use a ladder that meets all safety requirements. Check the ladder to ensure that it is in good condition and good working order, that it is set on stable, level ground, and that it is set at the proper slope.
 - Your ladder should extend at least 3 feet above the roof line. Tie it off at the top.
 - Use a bucket and rope to transport tools, etc., to the roof. Don't carry them up the ladder.
 - As much as possible, walk *across* the roof surface rather than up and down.
 - On slopes with a 5-12 pitch (about 23°) or greater, use safety lines and belts. On roofs more than 16 feet from eave to ground, use safety lines and harnesses when you work within 6 feet of the edge.
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Figure 2.—High-pressure washers are effective in cleaning roof surfaces of debris and moss. Be careful when you use them in order to prevent unnecessary erosion of the shingle or shake surfaces.

To promote drying, it's very important to remove overhanging branches that excessively shade sections and retard the drying of the roof surface. *Never* allow tree branches to touch and rub against the surface of the roof. The mechanical action of this rubbing can literally wear sweeping grooves into the surface of the shingles or can loosen the fasteners that hold them.

Finally, in excessively woody areas, branches may retard the flow of air so that surface drying may occur very slowly. In all cases, you'll need to make sound judgments about pruning, trimming, or removing problem-causing trees. Excessive growth of lichens and mosses is a sure indicator that your roof is not drying properly—and that enough moisture is available to support wood-rotting organisms.

Removing the debris accumulation is relatively simple. In most cases, anyone who's willing to climb on the roof can wash off most of the material with a garden hose. And a stiff broom is handy for removing all the leaf and

pine needle litter.

It's easiest to remove litter from around chimneys and in valleys, but you'll also need to clean all the keyways (those areas between the individual shingles and shakes). The wet sweeping of the surface in a careful manner will additionally remove the initial growths of moss and lichens.

Professional services sometimes use high-pressure washers (available through rental firms, Figure 2). These are effective, but you must use extreme care because cedar is a soft, low-density wood. Excessive or imprudent use of high-pressure systems can detach shingles or erode many years of wear in moments—even though the roof will “look like new.”

If you don't choose to climb on your roof, you can hire a professional. Look in your phone book under either “Moss control” or “Roofing contractors.” As you would with any contract for service, choose a reputable firm that can provide proof of insurance, references if you ask for them, a written description of the work to be done, and an estimate of the amount you'll be charged.

Chemical treatments

There are several types:

1. You can easily prepare *cleaning solutions* to help remove dirt, mild stains, and light growths of molds and mildew.

2. For more persistent stains, *bleaching formulations* will be recommended.

3. In some cases of excessive moss growth, you can apply *chemical solutions* to kill the mosses and any fungi that may be present.

4. You may sometimes apply *preservative chemical solutions* that will retard the growth of molds, fungi, and mosses.

5. Finally, additives such as *pigments* and *ultraviolet absorbers* can slow deterioration caused by sunlight.

Considered as a whole, the chemicals in steps 3 and 4 are chosen for their fungicidal or herbicidal effects. It's important to note that the chemicals listed in the following sections will perform differently under various environmental conditions. As a result, the frequency of application required for long-term protection depends on the chemical you use, the amount of precipitation, average temperatures, and the roof exposure conditions. The chemicals we recommend are available in products sold in hardware stores, building supply centers, or lumber yards.

Cleaning solutions

You've removed the debris from your roof, and you can see light staining or irregular discoloration. Cleaning the roof with a mild detergent solution may provide an improvement. The recommended solution is:

- 3 ounces trisodium phosphate (also known as TSP, available in paint or hardware stores)
- 1 ounce detergent (for example, Tide or All)
- 1 quart 5% sodium hypochlorite (liquid bleach—Clorox, for example)

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.

3 quarts warm water

Apply this mixture and scrub the surface with a soft brush or lightly with a broom. Then rinse the surface with water to eliminate any residue. If you accidentally splash any plants, rinse them thoroughly.

Bleaching formulations

For more persistent stains, you can increase the sodium hypochlorite (chlorine bleach) concentration, even to the point of using it full strength from the bottle for spot applications.

Formulate stronger solutions by using granular chlorine (calcium hypochlorite), mixed at a rate of 2 ounces per gallon of water. This chemical is used for algae control in swimming pools and is available through pool supply houses.

For safety, wear eye protection, rubber gloves, and aprons.

It's best to apply these bleaches with brushes for small spots; spray large areas (use plastic or stainless steel sprayers). Don't let bleaching solutions remain on the wood for more than half an hour before rinsing. Experience shows these solutions provide more uniform results when you use them in lower concentrations; repeat the application, rather than use a single high concentration when you

start.

Some further tips: It's best to use these solutions out of direct sunlight. Apply the chemical only to the stain. Avoid drips, runs, and splashes of bleach or *excessive* bleaching on the roof surface—these can mar the roof's appearance. It's not necessary to scrub bleached areas, but rinse the wood thoroughly.

Chemical solutions for moss control

Note: It's extremely important to be careful when you apply the chemicals listed in the following pages; otherwise, you can seriously harm surrounding vegetation and—more important—people or pets. These chemicals often carry prominent warnings about exposure or ingestion.

Remember: The chemicals you apply to roofs to remove existing growth or prevent its recurrence are toxic—*handle them with care!* If you have any doubts about safe handling, write the manufacturer, see your county Extension agent, or phone the closest poison control center (see the list on page 8).

When there's so much moss that patches or mats are present, abrasive removal by sweeping may not remove it all. Scraping may not be possible because of the contours of the shakes, and it may damage the roof surface.

In these cases, applying moss-killing chemicals or using high-pressure washers (or both) may be a more effective method for removing the residual growth. Remember that the wood surface may not dry under a covering growth of moss. And this wet condition promotes the growth of wood-decaying fungi.

Moss-killing chemicals are recommended in the following order of effectiveness (most effective first):

Zinc sulfate (monohydrate). Mix 3 pounds powder in 5 to 10 gallons of water and apply to 600 square feet of moss growth. Apply higher concentrations to exceptionally heavy growths or where conditions

favor moss growth. Use a watering can or pump sprayer. Don't use this solution if you have copper gutters, downspouts, or flashings, because zinc sulfate corrodes copper.

Copper sulfate (also called blue stone). Mix 0.25 to 0.5 ounce per 10 gallons of water. This chemical is also corrosive to metals—although safer than zinc sulfate for copper flashings—so be cautious where you apply it. Wash all exposed gutters, flashings, and application equipment thoroughly. Apply the same way you would apply zinc sulfate.

Zinc chloride. Mix 1 pint in 3 gallons of water. Apply at rate of 3 gallons per 100 feet of moss area by thoroughly soaking the moss but avoiding runoff. Because zinc chloride is corrosive to metals and harmful to plants, dilute all spills or accidental applications to plants by spraying with water. Apply it the same way as zinc sulfate.

Potassium salts of fatty acids. These soap-based, biodegradable products kill the moss by penetrating the cell walls and changing the membrane characteristics, causing the loss of cell contents. These chemicals are noncorrosive and offer minimal hazard to people and animals. Even so, overspray on plants and foliage still requires thorough rinsing.

Other weed-killing (proprietary) compounds. Some compounds used as weed killers are effective for moss control and are available at garden supply centers. Follow manufacturer's directions and precautions for use.

Any of these chemicals are more effective if applied when the moss is actively growing than when it's in the dormant phase. Moss grows vigorously during the rainy seasons—in Oregon, this is during the late fall, winter, and spring. There's very little growth during the summer.

If you plan to apply the chemicals during dry periods, it's often recommended that you wet the moss first to promote chemical uptake. To control

runoff and to increase effectiveness, apply when rain is not likely, for it may be several days before the growth is killed and you can effectively remove it by sweeping it from the surface of the shingles or shakes.

Remember to use care when handling and disposing of moss and litter treated with chemicals to avoid accidental exposure.

Some of the chemicals listed earlier will provide minimal protection against future growth, depending on the concentration applied and the exposure conditions. As a whole, however, their long-term effectiveness is limited, and you should consider them only to kill existing growth.

The corrosive nature of these chemicals means that you must prevent unnecessary damage by thoroughly rinsing metal tools, gutters, and flashings that have come in contact with the solutions.

Preservative treatments

Chemical solutions may also be applied to redcedar shingles and shakes that will retard the growth of molds, mosses, and (more importantly) wood-rotting fungi. These chemicals are most commonly referred to as *wood preservatives*, and they're an effective means of extending the life of your roof.

When you apply preservative chemicals to your roof, the roof condition at the time of treatment will determine the actual amount of increased longevity. If a roof has aged for many years, the treatment won't be as effective—simply because the years of exposure will have taken their toll. In all instances, except when the roof is badly deteriorated, you can expect preservative chemicals to extend the life of your roof.

It's best to apply preservative treating solutions to wood shingle and shake roofs as soon as possible after the wood has gone through an initial weathering process. Treatment should be within 3 to 12 months of the roof's installation because of the general effectiveness of the treating solutions

especially in enhancing the natural decay-resistant extractives within the wood and because of the potential UV-radiation protection imparted from pigments or other additives.

When you apply preservative chemicals to shakes and shingles, you need to remember several important considerations.

First, the coating should be as uniform as possible. Avoid drips and runs, if possible. It's better to apply several light coats and obtain good absorption than to try and force it in all at once. The important point is that you're trying to reach a certain level of preservative retention. If the retention level is too low, your treatment will be ineffective.

Second, since much of the decay occurs in the butt region of the shingle or shake, it's a good idea to be conscientious when you apply the solutions, making sure to cover the exposed butts as well as the exposed shingle surface.

The three methods available to provide proper application are brushing, using a thick-napped roller, or spraying. Because of the irregular surface, you'll probably get a more uniform coating with a multigallon, pump-type sprayer set to produce a coarse spray.

Spraying also requires a calm day (wind less than 4 mph) to prevent spray from drifting over plants or into your neighbor's yard. Brushes are also effective because they allow for the thorough treatment of the keyways and ends.

The chemicals listed on pages 6 and 7 will most likely be part of formulations in over-the-counter products or part of the formulations applied by roof servicing contractors. These chemicals are also available in concentrated form but only through specially licensed supply companies. This is because of the toxicity, possible problems in preparation, and the limited demand from home owners.

In every case, regardless of the concentration you use, be extremely careful when you apply, handle,



Figure 3.—Below this zinc chimney flashing, moss growth was inhibited, as indicated by the lighter colored roof surface. This leads some wood scientists to recommend using copper or zinc

strips across the roof surface (as an alternative to toxic chemicals) to retard moss growth.

expose, and store the chemical. When you purchase over-the-counter products for long-term moss control, be sure one of the wood-preserving chemicals listed below appears on the label.

Currently, the preservatives in the following sections are available as either aqueous solutions or oil-based products.

Copper naphthenate. This is an effective preservative well suited for applying to roofs. Solutions should consist of at least 1% copper (2% is better); apply them at a rate of 1 gallon per 100 square feet for shakes and 1 gallon per 150 square feet for shingles.

Literature indicates that using this concentration will provide up to 5 years of protection in the Pacific Northwest. Note that copper naphthenate has a greenish color that may prove unsightly. To overcome this, choose a solution that's pigmented to simulate the red-brown cedar tones, or use another type of preservative.

Zinc naphthenate. While copper is a much more effective chemical than zinc in retarding the growth of biological organisms, zinc solutions are used by people who wish to retain the more silver or gray appearance on the roof surface. It's best either to make more frequent applications or to use higher concentrations of active

metal content — for example, 2% to 3% solutions for 3 years of protection (or 4% for 5 years) per 100 to 150 square feet, as specified in the preceding section on copper naphthenate.

MTC (methyl bis [thiocyanate]) and TCMTB (2-[thio cyanomethyl thio] benzo-thiazole). These generally are used in combination as an effective roof treatment. They can be used in clear coatings or in pigmented solutions, and either as waterborne solutions or with solvent/oil mixtures.

Copper 8 quinolinolate While this chemical is a safer alternative to those listed above, some tests indicate its effectiveness is short-lived. It's not

very effective in controlling moss or mildew on roofs for much more than 12 to 18 months.

3-iodo 2-propynyl butyl carbamate (Polyphase). In solutions where concentration levels are greater than 0.58% to 2.0% active ingredient, you might get 2 years of protection. The durability and long-term performance of this product is still unknown, but it's limited because of light and water sensitivity.

Tri-butyltin oxide (TBTO). Some literature indicates its use is questionable in treating existing roofs because of mold and mildew resistance and chemical degradation. It's often used together with trichloromethyl thio phthalimide (Folpet), which has weak fungicidal properties.

Pentachlorophenol. Though widely available in the past, this product is no longer available over the counter because it presents health and environmental risks.

If you have solutions containing this chemical, *do not apply them. Contact the Oregon Department of Environmental Quality about proper disposal.*

Zinc and copper strips For those who prefer not to use toxic chemicals, there appear to be safe and relatively inexpensive treatments to control moss growth. Galvanized metals have a surface coating of zinc. For example, if you fasten a 2-inch-wide strip to either side of the ridges and run it the entire length of the roof, rain will leach zinc from the metal's surface and wash it down the roof.

As we noted earlier ("Zinc sulfate," page 4), zinc can effectively kill or retard the growth of mosses and fungi. Its effect has long been noted in personal correspondence between wood scientists; this effect is prominent below chimney flashings and vents (Figure 3).

However, we couldn't find any scientific study to verify how long a

zinc strip will remain effective or how much metal is required. Its effect below chimney flashings can be seen for at least 15 feet and appears to last for the life of the flashings.

If your roof is so large that the material at the ridge doesn't retard moss growth at the bottom, place additional strips across the surface. After a year, you should be able to judge how well the strips are controlling the growth of moss. Add more strips if they're needed.

The greater effectiveness of copper over zinc has been noted with copper and zinc naphthenate. So copper strips are also likely to control moss, and possibly retard wood-decaying organisms, because of the greater effectiveness of the copper. This fact has been observed below copper flashings.

In one case, a roof was observed that would be considered a favorable site for moss growth. Two strands of 10-12 gauge copper wire had been placed, one near the ridge and one some 15 feet below (at the halfway point on the slope). No moss was observed growing. As with the zinc strips, we couldn't find any supporting scientific studies to confirm these methods, but those willing to try may obtain favorable results.

Chemicals under evaluation. A number of compounds collectively termed *quaternary ammonium compounds* have shown promise and may be available shortly.

UV protection

Ultraviolet (UV) radiation from the sun degrades exposed wood surfaces by breaking down cell wall materials. This part of roof deterioration can be reduced with additive compounds that block or absorb UV rays.

Two types of material provide some level of protection: pigments, and clear, organic formulations.

Pigments generally are powdered substances added to the treating solutions to impart color. Pigments are inexpensive, durable, and effective,

but they also obscure the natural color of the roof. However, pigments can be mixed to imitate natural hues ranging from a weathered silver-grey to the roof's original red-brown color.

Clear, organic-based additives impart no color to the roof but are short lived—generally, less than 2 years. In the longer term, pigments give better results and therefore are the recommended additive for roof treatment solutions.

Oil treatments

Oils are sometimes advertised to replenish "the natural oils in the wood." In redcedar, these oils account for less than 3% of the total mass. While they do contribute to dimensional stability and decay resistance, applying "replenishing oils" to weathered shingles may be of questionable value especially if they contain no preservative or water-repellent chemicals.

You might get some temporary benefit, however, with regard to controlling cupping and warping. But some information indicates that applying oils may have some limiting factors. The main limitation is that unless you include an effective mildicide or preservative, an oil like linseed may provide an additional food source for mold, mildew, and fungi.

Furthermore, petroleum-based products are likely to be oxidized (broken down) by sunlight, to have only a short-lived effect, *and to increase the flammability of your roof.*

Roof leaks

A word of warning: At the time of this writing, there's nothing available that you can apply to a shingle or shake roof that will stop it from leaking. Leaks generally indicate either damage or deterioration of the roof. In these cases, it's advisable to seek the advice and services of a reputable roofing contractor.

New products may become available in the future, but be sure of the effectiveness of the product before you spend your money. If you have doubts about a company, check with your local Better Business Bureau.

Conclusion

Wooden roofs are an asset to the homes or buildings to which they're applied. Their natural appearance and inherent properties make them well suited to provide durable and attractive roofs. By using simple, inexpensive housekeeping techniques on a regular basis, it's possible to extend the life of the roof. Applying moss- and decay-retarding chemicals helps obtain even longer service from the roof system, makes it more cost effective, prevents costly repairs, and preserves the resource.

But if you climb on your roof to apply these treatments, *be careful—use good judgment and follow safe procedures*. When you handle chemicals, *be careful to follow all directions on the manufacturers' labels*.

For further information

For design criteria, contact an architect, building or roofing contractor, or

The Red Cedar Shingle and Handsplit Shake Bureau, 515 116th Ave. NE, Bellevue, WA 98004.

Buchanan, Brian. 1981. *Evaluating Various Preservative Treatments and Treating Methods for Western Redcedar Shingles*. Publication 128, Texas Forest Service, Texas A&M University. No charge for a single copy; order from Texas Forest Products Laboratory, P.O. Box 310, Lufkin, TX 75902.

Poison Control Centers

Oregon

Oregon Poison Control
Oregon Health Sciences University
Room 2519,
University Hospital North
3181 SW Sam Jackson Park Road
Portland, Oregon 97201
phone (503) 494-8968
Oregon toll-free
1 (800) 452-7165

Idaho

Poison Control Center
St. Alphonsus Hospital
1055 North Curtis Road
Boise, Idaho 83706
phone (208) 378-2707
Idaho toll-free
1 (800) 632-8000

Washington

Spokane Poison Control
St. Luke's Hospital Emergency Room
South 711 Cowley
Spokane, Washington 99202
phone toll-free from all locations
1 (800) 572-5842

Central Washington Poison Center
Yakima Valley Memorial Hospital
2811 Tieton Drive
Yakima, Washington 98902
phone (509) 248-4400
Washington toll-free
1 (800) 572-9176

Seattle Poison Center
Children's Hospital
4800 Sandpoint Way NE
P.O. Box C-5371
Seattle, Washington 98105-0371
phone (206) 526-2121
Washington toll-free
1 (800) 732-6985

Mary Bridge Poison Center
Mary Bridge Children's Hospital
and Health Center
317 South K Street
Tacoma, Washington 98405-0987
Washington toll-free
1 (800) 542-6319

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