

AN OVERVIEW OF WOOD ROOFING

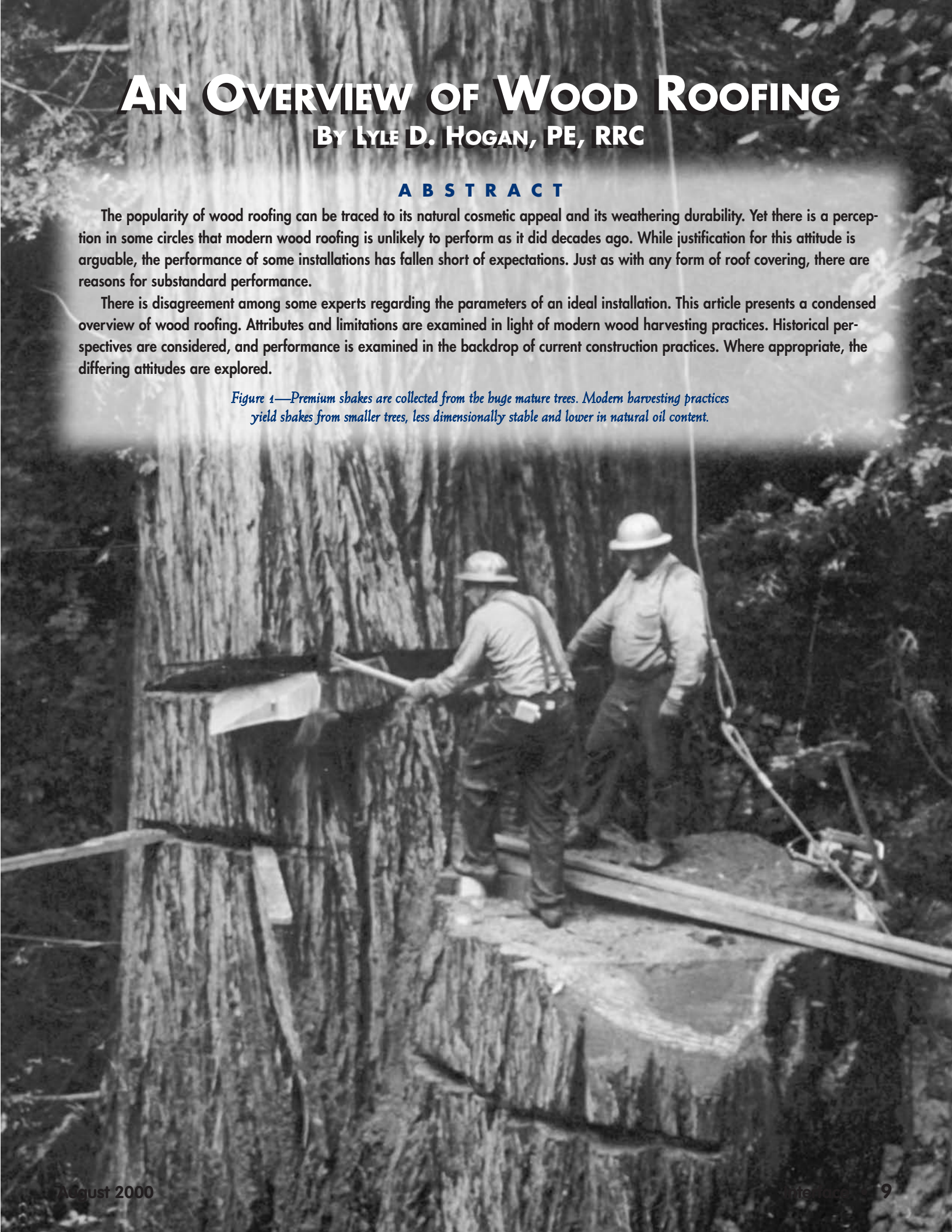
BY LYLE D. HOGAN, PE, RRC

ABSTRACT

The popularity of wood roofing can be traced to its natural cosmetic appeal and its weathering durability. Yet there is a perception in some circles that modern wood roofing is unlikely to perform as it did decades ago. While justification for this attitude is arguable, the performance of some installations has fallen short of expectations. Just as with any form of roof covering, there are reasons for substandard performance.

There is disagreement among some experts regarding the parameters of an ideal installation. This article presents a condensed overview of wood roofing. Attributes and limitations are examined in light of modern wood harvesting practices. Historical perspectives are considered, and performance is examined in the backdrop of current construction practices. Where appropriate, the differing attitudes are explored.

Figure 1—Premium shakes are collected from the huge mature trees. Modern harvesting practices yield shakes from smaller trees, less dimensionally stable and lower in natural oil content.



Distinguishing the products

Historically, all wood roofing products were referred to as "shingles." The term "shake" is a comparatively recent name used to distinguish hand-split products from machine-sawn units (Parks). Yet, a shake has a sawn face and a split face. Accordingly, the proper nomenclature is hand-split and resawn (HS & RS).

Shingles are more dimensionally uniform and are sawn on both faces. The sawing process yields a smoother surface than the split face, a matter of personal preference. Shingles can be sawn from wood that won't make shakes. Shakes are usually installed in a two-layer configuration (more in some instance) while wood shingles are arranged in three or more layers.

There is some confusion now because there are taper-sawn shakes, sawn on both sides (as are shingles). They are graded on shake rules, which are less stringent than shingle rules.

Where it starts

Harvesting for wood roofing is centered in northwestern Washington and western Canada. Unlike the United States, British Columbia allows no export of unprocessed timber. Although several parts of the U.S. did and continue to produce wood roofing products, figures compiled for 1984 indicate that 80-85% of the shake market was west of the Mississippi River (Laaly, 1992). Western red cedar is currently the favorite species although white oak, cypress, and eastern white pine have also been used as steep roof coverings. Other species used include larch, southern yellow pine, red oak, white cedar (northeastern, usually from Nova Scotia and New Brunswick), fir, spruce, and redwood. Almost any large growing tree with relatively few knots can (with proper chemical treatment) be used to make shakes. For purposes of this article, discussion will concentrate on red cedar products.

Harvesting practice

Trees were formerly brought from the forest one at a time, snaked out by draft horses, tractors, or other means. It was then common that only one log would be placed on the trailer. These were huge logs (only one would fit; see Figure 1), rich in the natural oils responsible for the good weathering properties with which cedar products are credited. This is sometimes termed "old growth" although such description means different things to different folks. West coast redwoods are considered old growth at 500 to 800 years old. Southeastern seaboard live oaks and longleaf pines apparently earn this title in only 400 years (Bugwood, 1998).

Old growth western red cedar is about 600 years old. A tree is not large enough to be used for shakes until it reaches 200-400 years old. Even at this age, growth rings are not suitably tight for manufacture into a roofing product. The newer second and third

growth trees can be used, but roofing products from them will not weather well. It is the tight arrangement of the grain that yields the performance sought.

Later harvesting practices placed a dozen or more logs on a given truck. These were juvenile growth trees, less dimensionally stable and lower in natural oil content. Juvenile heartwood (Figure 2) may contain only half the preserving extractives found in the old growth trees (ASHI). For comparative purposes, modern white cedar roofs may experience performance problems in less than four years in some climates.

In the 1940s and 1950s, cedar was considered by most loggers as junk wood. It was common to fell the large cedars first to serve as a bedding cushion, keeping the more valuable fir trees from shattering when they were dropped. Logging practices were not monitored as they are today—the fallen cedar was not hauled out. Today, everything must be cleaned up after the logging is complete, and new trees are then planted.

As cedar has become increasingly scarce, there is an attempt to salvage material from the old logging works. Bells are the huge stumps left in the forest from the logging activity many years earlier, and bolts are the segments cut from the bells. Bolt cutters hike in and cut the useable bells into bolts—16" long for shingles, 24" for shakes. The prepared bolts are helicopter-lifted

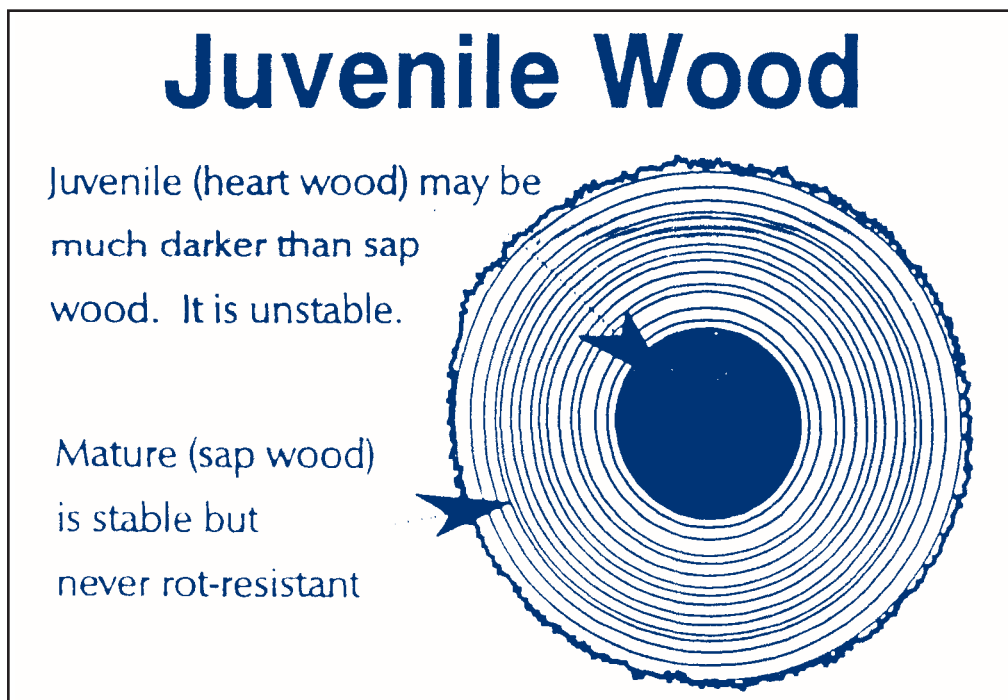


Figure 2—New growth heartwood may contain only half of the preserving extractives found in the old growth trees (reprinted from ASHI).

to a landing site where they are stacked and trucked to a mill for processing. This is an expensive way to retrieve wood, but as demand increases, the cost is factored into the mill's selling price.

The huge trees from the earlier harvests were so dense they sometimes sank to the bottoms of the millponds. Revived interest in purchasing the older products has led to reclaiming these logs from the mill pond bottom. These logs are in quite good condition and are known as pond-cured, bootlegs, or sinkers. When hauled out, they are extremely heavy and are consequent-



Above: Figure 3 —Over-roofing with shakes may inhibit the underside air circulation so vital for wood roofing products. However, over-roofing can be accomplished in a functional configuration.



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ly referred to by a number of other unprintable names. As might be expected, these logs are highly sought after and come with a cost premium.

Another expensive quest is retrieving sunken logs from the larger waters of the U.S. where huge log rafts were floated to steam-powered sawmills circa 1700-1920. At least one company is now involved in recovering underwater timber from the Great Lakes (Mitchen, 2000).

While an interesting activity, the practice of salvaging sunken logs is nothing new. Sizable swamps in 18th century New England were completely stripped of white cedar. The New Jersey merchants who floated these logs to the surface found them to be in excellent condition. They also found them to predate the arrival of Christopher Columbus in this country (Vogel, 1986).

President George Washington was also our nation's first shingle broker. He had men salvaging logs from the swamps and riving them (splitting, then dressing with a drawknife). The wood was termed swamp cypress, but it was more likely to have been northern white cedar.

Substrate arrangements

Marginal performance of steep roof coverings (of all types) can sometimes be traced to standard ventilation. Accordingly, there is nothing unique about cedar shakes experiencing problems in this setting. Spaced support sheathing (also called skip sheathing) is a preferred arrangement



Left: Figure 4—Spaced support sheathing is a preferred arrangement for wood roofing products (although this carpentry is marginal). Observing daylight from below a wood roof covering on spaced strapping does not always signal substandard construction.

Above: Figure 5 —Cedar shakes and shingles are a natural, organic product and may harbor moisture. Colonies of moss, lichens, fungi, mildew, bacterial spores, algae, or insects drastically shorten the service life expectancy of wood roofs.

for wood roofing products. Continuous sheathing can serve as support, but breathing room is mandatory, and continuous substrates are inherently more difficult to vent. When wood roofing must be installed over solid sheathing, the product can be elevated using furring strips. The furring strips must be spaced or have avenues to invite ventilation.

Over-roofing with shakes may create a similar ventilation malady. As shown in *Figure 3*, the old shingle roof left in place may inhibit the underside air circulation that is so vital for wood roofing performance. But even over-roofing can be accomplished in a functional configuration. The Cedar Shake and Shingle Bureau (now in Sumas, Washington) offers guidance with a publication entitled *Roofing, Shake-Over-Shake* to assist in construction of this nature.

Observing daylight from below a wood roof on spaced strapping (skip sheathing) does not always signal substandard construction (*Figure 4*). Indeed, a little rain may periodically blow through, and minor water staining may occasionally be evident. However, chronic leakage will not necessarily result from this condition.

Behaviors, observations, and distress signals

Cedar shakes and shingles are a natural, organic product and consequently retain moisture. Prolonged exposure to moisture is prone to foster biological colonies (i.e. moss, lichens, fungi, mildew, bacterial spores, algae, or insects). These colonies can drastically shorten the service life expectancy of wood

roofs (*Figure 5*). Equally important, biological development displeases some consumers because of the diminished sidewalk appeal. Among the wood species used, redwood and red cedar contain a natural fungicide in the cells. This serves quite well in all but the unusually warm and moist environments.

Curling and cupping are other sources of displeasure (*Figure 6*). The behavior is an inter-relationship of grain and drying rates (the top and edges dry rapidly in comparison to the bottom, a phenomenon more likely to occur with continuous decks). It is increasingly difficult to obtain "exceptional quality" wood, and some tendency toward cupping probably cannot be avoided (Carlson, 1996).



Figure 6—Curling and cupping are common sources of displeasure. The curvature is the result of uneven drying (the top and edges dry rapidly in comparison to the bottom).



Figure 7—Some installers are unqualified or unwilling to cull unacceptable materials. This shake has a significant knothole and should not have been used.

Many problems encountered by this author are caused by application of substandard materials. Some installers are unqualified or unwilling to cull inferior materials and apply functional wood roofs (Figure 7). This is particularly true in fast-track, developed construction. Interpreting the grain of wood shakes is a worthwhile skill to acquire. Products not made from 100% vertical grained wood generally develop curling and cupping. When quarter-grain, mixed-grain, and flat-grained products become



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Coursing Relationships

There is nothing waterproof about wood roofing. As with all steep roofs, it is a water-shedding form that depends heavily on slope, back-up felt (interlayment), and functional flashing. Accordingly, certain practices should be followed for satisfactory performance. For instance, the exposure dimension of the wood product hinges on the roof slope and the size of the unit being used. Acceptable exposures are described in several publications.

Sidelap offset, one course to the next, should be greater than 1-1/2 inches.

Another practice taught is that two vertical joints (Figure 8) should not align in any three courses (Meyers, 1981). According to industry experts, this practice is arguable in terms of its need. Indeed, the importance of such practice in two layers of wood shakes is reasonably different from that of wood shingles applied in three or more layers.

It should be noted that use of the felt in wood roofing is also

wet, the grain relaxes. A differential rate of drying prompts the curling.

Some building shapes are inherently difficult to ventilation. Building codes contain requirements to provide a minimum ventilation aspect (i.e. one square foot of net free ventilation area for each 150 square feet of plan view area). But, as stated, this is considered a minimum value for code compliance. It is perplexing why designers are reluctant to provide more ventilation than is required by the governing code.

For any steep roof assembly, it is desirable to have incoming fresh air wash the underside of the deck. This is best accomplished when there is roughly even sizing of the intake side (soffit) in comparison with the exhaust end (ridge). Stagnation of this critical airflow can lead to premature performance shortcomings of any steep roof covering. Wood roofing is certainly not immune and can exhibit its own form of distress.

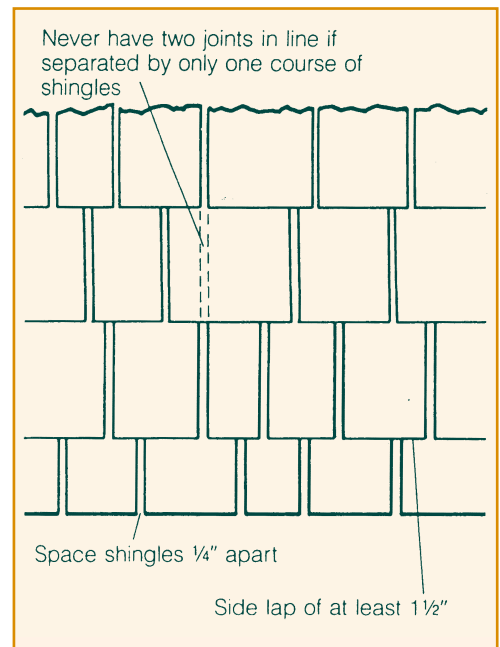


Figure 8—Accepted practice mandates certain offsets among respective courses. Sidelap offset, one course to the next, is to be greater than 1-1/2 inches. Two vertical joints should not align in any three courses. (Reprinted from Modern Roofing Care and Repair.)

arguable, particularly with wood shingles. The felt is an absorptive material and can harbor moisture against the underside of the wood units. This may lead to performance difficulty as discussed earlier. If used as interlayment for shakes, it should never show through in the finished array (Figure 9). Exposure in this manner is termed "rot-felting," and it may attract water upward to higher parts of the installation. Moreover, the organic felt routinely used will not endure such exposure.

Preservative treatments

The summer rings of the wood are quite vulnerable to water and are soft enough to rot quickly if unprotected. The natural preserving extractives mentioned earlier are, of course, water-based. Over time, they leach out, leaving the wood unprotected. Hence, the need to re-preserve (cedar-guild.com). Use of petroleum-based preservatives from the very beginning can forestall the curling and cupping discussed earlier.

As defined by the EPA, a wood preservative is a substance having no less than 2-4% active copper or zinc. Chromated Copper Arsenate (CCA) can be applied to any wood product to guard against decay. Brittle wood and cell collapse can sometimes result from the vacuum pulled in the treating chamber. This process should not be confused with pressure-impregnated, fire retardant chemicals. A substance that merely alters the com-

bustion chemistry of wood performs no weathering enhancement.

Other methods are used to treat installed shakes with chemicals to extend the service life expectancy. These are many and varied and bring about a similar variation in service life improvement. The permanency of any treatment should be scrutinized. Some vendors confidently market preservatives that tout a 30-year warranty against moss and fungal growth. As with most roofing warranties, the language and terms should be carefully reviewed. Figure 10 depicts a recent chemical treatment, draining over a copper roof covering below.

Conclusion

Wood is the only building material derived from a renewable resource. Wood roofing is a legitimate selection with potential to exceed the expectations of owners (Figure 11). Currently available products may or may not be equivalent to those of earlier times; however, it is clear that wood roof performance would benefit from honoring the recommendations of the product manufacturer. Better understanding of wood roofing attributes and limitations may not eradicate biased thinking, but improved performance will result. It is hoped that this article afforded some improved understanding. ■

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Figure 9—Felt interlayment should never show through in the finished array. "Rot-felting" may attract water upward to higher reaches of the installation. Moreover, the organic felt routinely used will not endure such exposure.



Figure 10—Runoff of certain chemical treatments may influence a copper roof covering. Note variation in patina. The permanency of all chemical treatments should be scrutinized.



Figure 11—Wood roofing is a legitimate selection with potential to perform to the expectations of the owner.



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