

# Best of Both Worlds — Clear Exterior Finishes

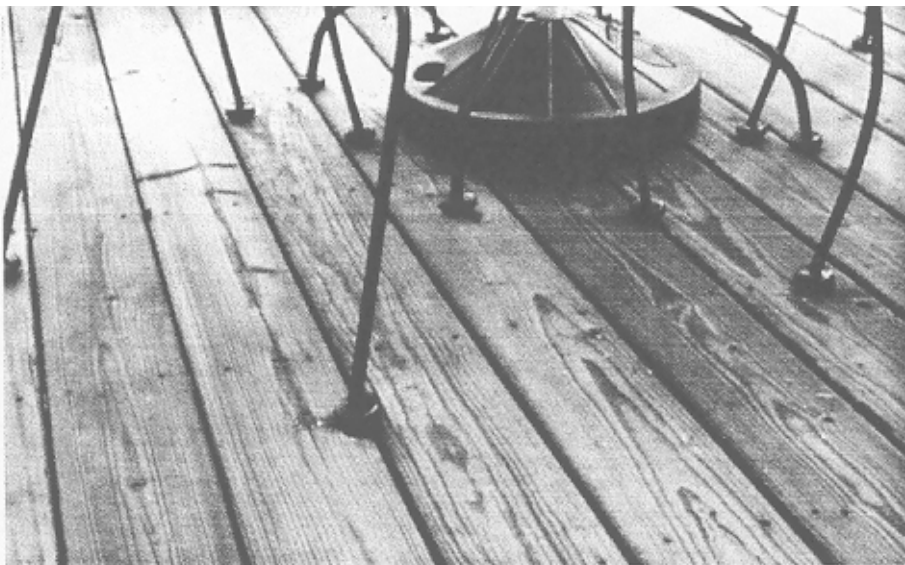
## In Search of Finishes That Protect Wood Without Hiding Its Natural Beauty

In recent years, a number of clear wood finishes have been developed that protect wood while accentuating its natural beauty. The focus of this publication is on those finishes having little visible pigment. In some cases, the pigments are included but are finely ground to create a coating that is transparent to visible light.

Most natural clear wood finishes are designed to protect and beautify wood. Although this may sound simple, manufacturer's claims that products protect, preserve, seal, last longer, work better, and spread farther than competitors' products can be confusing. In fact, many of the terms used to describe exterior wood finishes are used interchangeably and often incorrectly, thus adding to the confusion. So let's set the record straight.

When choosing a wood finish, there are two elements to consider: aesthetics and protection. These two qualities can sometimes be at odds. Aesthetically, there is a growing trend among homeowners to maintain the clear natural look of wood. However, the best protection from the sun's ultraviolet radiation is obtained from pigmented products, which tend to cover the wood's natural grain and texture, thus the problem of balancing aesthetics and protection.

Stain and paint manufacturers have produced a number of clear products to meet these needs. Clear natural finishes generally fit into four categories: Water-proofing, UV-Resistant Clears (blocking or absorbing), Water Repellent Sealers, Wood Preservatives (and combi-



nations of the four). Within each category you'll find high solids, water-based, oil emulsion, and traditional solvent-based formulations.

Some clear finishes are film-forming and therefore do not penetrate the wood's surface very well. Clear finishes also degrade from UV light and moisture. With penetrating finishes, wood can be refinished without extensive surface preparation. Film-forming finishes, on the other hand, often require extensive surface preparation, even to the extent of complete removal of the old finish prior to refinishing.

### Water-Proofing

Water-proofing clear products are often confused with water-repellents. Water-proofing products form a membrane designed to withstand hydrostatic pressure (like wind-driven rain) and keep water out of a home throughout long periods of wetting. Water-proofing coatings

are often elastomeric and are designed for brick, stucco and other masonry surfaces, not wood. They are products used around flashing to completely stop water absorption.

### Water-Repellent Sealers

Water-repellents shed water for short periods. They are not completely impervious to water absorption. Clear products that fall into the water-repellent category are penetrating finishes. They typically contain a small amount of wax (1 to 3 percent), usually paraffin, or other water-repellent material that decreases the amount of water absorbed into the wood. They also contain an oil or resin that helps seal the surface.

Water-repellent sealers designed for use prior to painting have about 1 percent wax or similar water repellent in a curable resin. Because moisture is repelled, mildew growth may be slowed but not prevented.

These products often provide initially spectacular beading of water. But they offer little protection from the sun's UV radiation or mildew growth - they weather to gray and then black from the growth of mildew unless a mildewcide is added to the product. When water-repellent sealers are subjected to degradation by the sun's UV radiation, the result is a gradual loss of the water beading effect.

The life expectancy of these products typically ranges from six months to one year on horizontal surfaces (e.g., decks) and one to two years on vertical surfaces. It should be noted, however, that the treatments absorb readily into the end-grain of lumber and thus give many years of efficacy, preventing end-grain absorption of water.

### Wood-Preserving Finishes

Wood-preserving clear finishes differ from water repellents in that they also contain an appropriate amount of an EPA-approved fungi-

cide. These clear finishes are very similar in appearance to water-repellent sealers. The commonly used fungicides are also effective in controlling mildew (mildewcides). Most manufacturers incorporate some level of fungicides into their products. Use of these EPA-approved fungicides allows manufacturers to make specific claims about controlling decay and mildew.

Penetrating wood-preserving finishes may also be used as a treatment for bare wood (new or old). This treatment gives a second wall of protection against water. For treating bare wood, make sure the manufacturer's label indicates that the clear wood preservative is paintable. Some products have too much wax or other water repellent to be painted.

Water-repellent sealers and clear wood preserving finishes give some protection to the wood surface from weathering by minimizing the effects of water. The wax in the product ultimately breaks down on the exposed lateral surfaces and the water-bead-

ing properties decrease. The water-repellent life expectancy of these products typically ranges from six months to one year. However, the water repellent absorbed in the end grain will be effective for many years. Also, after the wood has gradually weathered, additional treatments may last longer because the weathered boards absorb more finish.

### UV-Resistant Clears

The only way to slow the UV degradation of the surface is to incorporate a pigment or a UV stabilizer into the formulation. Thus, the UV-resistant clear water-repellent preservative represents the broadest category of clear natural finishes on the market. Pigments and organic chemical additives are used as light absorbers (or screeners) to protect the products' binders and the wood from degradation by the sun's **W** radiation. The pigments that are used most frequently are either a transparent form of iron oxide (transoxide) or ultrafine titanium dioxide

## Why Protect Wood?

Although wood is naturally durable and strong, the effects of outdoor exposure can degrade not only these physical properties, but its natural beauty as well. Wood exposed outdoors is subjected both to rain (moisture) and sun (ultraviolet radiation), two major factors that can ultimately cause wood to lose both its natural beauty and strength.

**Ultraviolet (UV) Radiation**  
Unprotected wood ages when exposed outdoors. The sun's UV radiation degrades the surface of unprotected wood within weeks of outdoor exposure. The early phase of UV degradation is manifest as a change in color. Dark wood, such as redwood and the cedars will tend to get lighter after initial installation as the colored extractives degrade. Light wood, such as pine and fir, tend to get darker. In some climates, such as along the seashore, wood tends to weather to a silvery gray. The sun's UV radiation also degrades clear natural finishes.

**Moisture.** Water also degrades wood, whether in the form of liquid or vapor, absorption and evaporation of water causes dimensional changes of the wood. Water causes cracking, checking and warping and can also lead to decay (rot) in wood. In general, it accelerates the weathering of wood exposed outdoors.

**Extractive Bleeding.** Certain types of lumber such as cedar, redwood, mahogany, Douglas fir, etc., contain water-soluble extractives that can be leached to the surface of the wood. As water moves through wood or as the surface of the wood gets wet, water-soluble extractives are dissolved; these extractives are deposited on the exterior surface as the water evaporates, and appear as a reddish brown stains. Although extractives in wood give the wood its natural color and resistance to decay (for some wood species), they must be sealed in the wood with a stain-blocking primer, when using light colored finishes. This is usual-

ly not a serious problem for dark stains or with natural finishes

**Iron Stain.** Iron stains occur in two ways. Rust from iron/steel fasteners can be washed down a structure by rain and absorbed by the wood or finished wood to cause brown discoloration. Iron can also react with the extractives in wood to give a blue-black stain. Although these stains can sometimes be removed by treatment with oxalic acid or sodium bifluoride, it is best to avoid the problem by using corrosion-resistant materials.

Mildew, Airborne mildew spores are ubiquitous and microscopic, and therefore are difficult to detect until they colonize a surface. These spores can cause mildew fungus growth on any surface that provides a food source. Because wood has readily available food for mildew growth, it grows more readily on wood surfaces than on painted wood, particularly wood painted with synthetic organic polymers such as acrylics.

that reflects UV radiation. The organic chemical additives are of two types - UV absorbers (U-VA) and hindered amine light stabilizers (HALS).

UV absorbers are designed to work by absorbing selective portions of sunlight, especially UV radiation, and dissipating the energy as heat. During this process, some are destroyed, limiting the effective life of the product. HALS act as scavengers for the components of the coating (binder and pigments) during degradation and through this process block further degradation of the clear finish and the wood. Generally, U-VAs, HALS and pigments are used together and offer the best protection to the wood surface.

UV-resistant clears are not "water" clear - they impart a slight color or tone to the finish from the use of translucent transoxide pigments or titanium dioxide. Thus with UV-resistant clears, various "colors" are available. Transoxide pigments are translucent and thus highlight the natural grain, texture and beauty of the wood. The life expectancy of a UV-resistant clear finish is typically twice that of other clear finishes and can range from one to two years on horizontal surfaces and two to four years on vertical surfaces.

### Summary –

High-quality, clear wood finishes should contain mildew-preventing ingredients, provide some degree of water repellency and contain UV radiation absorbers. Generally, clear finishes fully exposed to the weather last one to two years; however, some last less than a year.

---

*This article was prepared by the Joint Coatings/Forest Products Committee - Clear Finishes Task Group, chaired by Tom Daniels of Cabot (Newburyport, Mass., [978] 465-1900). Members include Marc Hirsch of Dow Chemical Co. (Midland, Mich.), Ken McClelland of the Western Red Cedar Lumber Association (Vancouver, B.C.), Dr. Alan Ross of Kop-Coat Inc. (Pittsburgh, Pa.) and Sam Williams of the USDA Forest Products Lab (Madison, Wis.).*