Exterior Wood Stains

Types, Uses and a Look Ahead

1

William C. Feist

There are many occasions when homeowners and architects prefer a finish that preserves the natural color and appearance of wood as opposed to paints or other opaque finishes that hide the wood grain.

Clear film-forming finishes such as shellac and varnishes provide a desirable natural look. However, these film-forming finishes do not last more than a year or two because of damage from direct sunlight and from water. Even if a varnish is resistant to sunlight, the film still permits the sunlight to degrade the wood underneath the varnish causing loss of coating adhesion. Then the varnish often cracks and peels from the wood surface requiring extensive surface preparation before it can be refinished.

Penetrating finishes, either pigmented [stains] or clear [water repellents], leave no film and protect the surface of wood outdoors while allowing the grain to show. True penetrating wood finishes fall into two general categories: (a) water repellents and water-repellent preservatives, and (b) solvent-borne oil-based semi-transparent stains. The advantage of a penetrating finish compared to a finish that forms a film is that the penetrating finish allows the wood to breathe and the finish does not crack and peel. Moreover, penetrating finishes do not require extensive preparation of the wood surface before being applied.

Another category of wood finishes is the non-penetrating "stain" such as latex semi-transparent stains, and latex and oil-based solid-color [opaque] stains. These finishes do not penetrate the wood and form a film. They are used much like thinned paints.

Penetrating water repellents and water-repellent preservatives

A penetrating water repellent or water-repellent preservative may be used as a natural wood finish. The simple water repellents often used on decks are usually short-lived products which give a natural look to wood. The water-repellent preservatives contain a preservative [a fungicide], a small amount of wax [or similar water repellent], a resin or drying oil, and an organic solvent such as turpentine or mineral spirits. Some may contain small amounts of ultraviolet stabilizers or be lightly pigmented.

Waterborne formulations are also available. Most of these unpigmented or lightly pigmented finishes do not prevent ultraviolet damage however, and have minimal protection for wood. They may last only 1 to 2 years depending on exposure. However, they are easily refinished requiring minimal surface preparation.

Penetrating Stains

Solvent-borne, oil-based semi-transparent stains are the finish of choice for wood that is fully exposed to the weather. Although they can be used on both smooth and roughsawn wood, they will perform much better and last longer when applied to roughsawn wood. The advantage of a penetrating stain compared to a finish that forms a film is that the penetrating stain allows the wood to breathe and will not peel.

The true penetrating wood stains are formulated so that the solvent carries the stain components into the wood surface and no film is formed. The stain then slowly weathers away. These stains are mixtures of pigments, water repellents and fungicides [usually mildewcides], and organic solvents like those used for the water repellent-preservatives described above. The pigment provides color and greatly increases the durability of the finish by protecting the wood surface to some extent from the damaging effects of ultraviolet rays in sunlight.

Oil-based semi-transparent stains can be used on new or weathered wood without excessive surface preparation and permit much of the wood grain to show through. They can also be used on wood previously finished with other penetrating finishes [water repellents and water-repellent preservatives] after the finished wood has weathered. However, they cannot be used on wood that has previously been finished with a film-forming finish like a paint or solid-color stain unless that finish is completely removed.

Non-penetrating Stains

Another category of wood finishes used outdoors is the non-penetrating stain — finishes that do not penetrate the wood but can be used much like thin paint even though they are still described as stains.

2

These finishes include latex semi-transparent stains, and latex and oil-based opaque [solid-color] stains. Because they do not penetrate the wood surface, they are used and applied just like paint or other film-forming finishes. Most manufacturers recommend that these non-penetrating finishes not be used on horizontal surfaces such as decks, porches, railings, steps, patios or outdoor furniture.

• *Latex Semi-transparent Stains* – The latex semi-transparent stains are similar in appearance to the oil-based semi-transparent stains. The semi-transparent look is achieved by the formation of a thin film. This film is often not thick enough to provide durability, and it tends to degrade by flaking from the wood surface. Like oil-based stains, more finish can be applied to roughsawn wood and therefore longer service life is obtained on these surfaces.

Refinishing wood that has been finished with a latex semi-transparent stain may require substantial surface preparation. If the previous finish has begun to flake or peel or if the wood surface has been degraded through weathering, the surface must be sanded or power-washed. If the wood is refinished before the finish begins to flake, a second application of stain will increase the thickness of the film and improve its durability. However, the thicker film will further obscure the original wood.

• *Latex Opaque Stains* – Opaque or full-bodied [solid-color] stains are similar to latex semi-transparent stains but contain a higher amount of solids [i.e., they form a thicker film when applied to the same area per amount of stain] and are essentially thin paints.

Like paints, latex opaque stains have good color retention, are flexible, and less prone to mildew than oil-based solid-color stains. Two coats are often recommended for best performance and a stain-blocking primer may also be needed for woods like western red cedar and redwood.

1. **Solvent-borne oil-based semi-transparent stains allow much of the wood grain to show through and are easy to refinish.**
2. **Latex opaque stains are essentially thin paints that provide color while revealing the texture of the wood.**

QUICK TIPS

1. Stain all sides and edges when finishing wood siding or decking to minimize water penetration. One coat of finish on the underside of deck and siding boards provides adequate protection. Mounting wood siding so that air ventilates the back side will also extend finish life.

2. Brushing on is best to work the finish into the wood and to even out the application to prevent lap marks. Semi-transparent penetrating stains may be brushed, sprayed, or rolled on, but should be back-brushed while still wet for best performance. Lap marks are most common with penetrating stains and are prevented by staining only a small number of boards or one panel at a time to keep the front edge of the stained area from drying out.

3. Factory application of wood finishes to exterior wood products delivers excellent performance by avoiding quality control problems encountered in the field such as adverse weather, surface soiling, improper surface preparation, high moisture content, poor quality application, and weathering of wood prior to finish application.

4. Sun exposure most affects refinishing frequency, thus the south elevation should receive two coats. When refinishing a house, however, it may be necessary to finish only the most weathered side and not the entire structure.

5. Check product comparisons in the following Consumer Reports Magazine articles:

Interior Paint, September 2003, pp.33-35; House Paint, August, 2003. pp.26-28; Exterior Stains, August, 2003, pp.29-30; Deck Treatments, August, 2003, pp.31-32.

• *Oil-Based Opaque Stains* – These solid-color stains are less flexible than latex stains and more prone to crack and flake, particularly if applied as a single coat over smooth, flat-grained wood. These stains provide good service life if applied in multiple coats which build up the film, but they will not give the same appearance as a penetrating stain since they completely mask the wood underneath. They are essentially flat, thin oil-based paints. Two coats are usually recommended for best performance.

Exterior bleaching oils and weathering stains

Exterior bleaching and weathering stains or oils are available which give wood surfaces a weathered and gray look while acting as a water repellent. These pigmented penetrating finishes are sometimes recoated with clear water repelling stains and preservatives. Some of them contain oxidizing agents and/or bleaches that accelerate the natural weathering process and achieve a weathered gray look on the wood more rapidly.

Looking ahead

About 1980, manufacturers started to change semi-transparent stain formulations because of concerns about solvent evaporation from these finishes. Many solvents react with pollutants in the atmosphere to form ozone, a component of smog. These solvents are collectively known as volatile organic compounds [VOCs]. More stringent regulations that will affect paint and stain formulations are currently being developed. Formulations of finishes will continue to change to meet these regulations.

Changes in stain formulations include decreasing the amount of solvent, resulting in a formulation with a high solids content ["high-solids" formulations]; substituting solvents that do not cause smog; and using water-borne formulations. The penetrating characteristics of low-VOC formulations vary considerably. Many of these reformulated finishes penetrate the wood similar to traditional solvent-borne formulations, but others tend to form a film.

Many stain companies are working intensely to achieve water-borne semi-transparent stains that penetrate wood. So far, such water-borne formulations have been only moderately successful at duplicating the properties of traditional oil-based, solvent-borne stains. However, ongoing research suggests that penetrating, erodable semi-transparent latex stain finishes for wood will be available in the future.

A last word

As with any building material, how wood is used often depends on its finishing characteristics and maintenance requirements. Problems such as poor finish performance, mildew, checking and splitting, and warping can often be controlled with proper care and maintenance.

Water-repellent preservatives and the oil-based semi-transparent stains are penetrating finishes that are used as natural finishes and can greatly improve the durability and appearance of wood exposed outdoors. These finishes are very suitable for rough surface wood and are easily refinished. If wood structures are given proper care initially, and are maintained periodically, they can be functional, and aesthetically pleasing for decades.

William C. Feist, Ph.D is a consultant and information specialist in wood weathering and exterior wood finishing.

This article originally appeared in Wood Design & Building magazine, Spring 2004, issue #28. Visit www.woodmags.com