

# The finish line

A Forest Products Laboratory finishing factsheet



## Paint, Stain, Varnish, or Preservative? It's Your Choice

If you've ever admired an old, unpainted barn that has survived 100 years or more of weather, it's easy to wonder why you should use a finish on your home. However, the cracks, fissures, and air spaces that give weathered barn siding its character wouldn't be acceptable on most houses.

While you can't completely arrest or reverse the weathering of exterior wood, you can slow the process dramatically by using the right type of finish. Appearance, durability, cost, surface type, ease of application, and maintenance should all be considered when selecting an exterior finish.

Two basic types of finishes or treatments are used to protect wood surfaces from weathering: those that form a film or coating on the wood (film-forming finishes) and those that penetrate the wood surface. Film-forming materials include paints, solid-color stains, and varnishes. Penetrating finishes include preservatives, water repellents, and pigmented semitransparent stains.

What you choose to protect and enhance the beauty of wood always involves trade-offs. You should select the finish that best suits the application.

### Film-Forming Finishes

#### Paints—Latex is Best

Paints form a thin layer over the surface to which they're applied. The pigments in the paint protect the surface completely from the damaging ultraviolet (UV) rays of

the sun and erosion. The finish retards the movement of moisture into and out of the wood and seals in the natural resins. However, paint won't prevent decay if conditions are favorable for fungal growth.

Oil-base or alkyd paints are essentially suspensions of inorganic pigments in an oil or modified oil vehicle that binds the pigment particles to the wood surface. Latex paints are suspensions of inorganic pigments and various latex resins in water. Acrylic latex resins are flexible and very durable. A good acrylic latex outdoor house paint will generally outlast a good oil-base house paint. Latex paints are also more porous than oil-base paints; they can "breathe" while they shed water. This characteristic may contribute to their longevity. If water enters the wall from an interior source, it's more likely to get trapped in the wood beneath an oil-base finish, and it can cause the paint to blister. Moreover, oil-base paints tend to become brittle.

Acrylic polymers are more resistant to sunlight than oil-base paints and therefore do not weather as quickly. However, woods like redwood and cedar have water-soluble extractives that can bleed through latex paints. The best way to prevent this is to seal the wood with an oil-base or stain-blocking latex primer paint, then topcoat with acrylic latex paint.

Wood is easier to repaint before the first coat fails. Paints weather away; self-cleaning paints weather

at a faster rate than other paints. Ideally, wood should be repainted when the topcoats have weathered to the point that the primer is just starting to show. Painting too often can build up too many layers of paint.

The north side of a building does not need to be repainted as often as other sides because it is exposed to less direct sunlight. Apply one topcoat to this side instead of two, or paint this side less often. The optimum thickness for a primer and two topcoats is 4 to 5 mils (1 mil = 1/1000 of an inch), about the thickness of a sheet of newspaper.

If the paint has peeled, the easiest way to prepare the wood for repainting is by power-washing. Power-washing or sanding (with 50–80 grit sandpaper) also

#### Life span of different kinds of finishes

Water repellents	6–12 months
Clear water-repellent preservatives	1–2 years
Pigmented water-repellent preservatives	2–3 years
Varnish	2–3 years
Solid-color stains	3–7 years
Semitransparent stains	3–8 years
Paints	7–10 years

Note: The life span of water repellents, water-repellent preservatives (clear or pigmented), and semitransparent stains can be extended by refinishing if discoloration caused by mildew or other factors is a problem.



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improves the ability of new smooth siding to hold paint and removes weathered fibers of unfinished wood that have been exposed to sunlight for more than a few weeks.

Before applying paint, treat wood siding and trim with a paintable water-repellent preservative. This can be done by brush after the siding or trim is in place, or by dipping the wood before installation. All lap and butt joints of solid wood and all panel edges should be especially well-saturated.

Allow the treatment to dry for at least 2 warm, sunny days before applying the primer. If the wood has been dip treated, let it dry for about a week. Two coats of a good-quality acrylic latex house paint should be applied over the primer. In general, quality is directly related to price.

Brush application is always superior to roller or spray application, especially with the first coat. The job can be done faster if one person sprays the paint and another uses a brush to work the paint into the wood and even it out. Each coat should be applied within 2 weeks of the previous one, to avoid formation of a slick soaplike or chalky substance on the surface. If more than 2 weeks have elapsed, scrub the paint with water and a stiff-bristled brush before applying the next coat.

Temperature is important. Don't paint on a cool surface that will be heated by the sun within a few hours or at the end of a cool day when heavy dew will form at night. The temperature must stay above 40°F (4°C) for 24 hours for oil paints and above 50°F (10°C) for latex.

### **Solid-Color Stains**

Solid-color stains also form a film. They look and act like thin paints. Use a primer and two coats of stain. Refinishing may require only one coat. Like paints, latex solid-color stains are usually more durable than oil-base stains. Solid-color stains are preferable to paints when the wood is refinshed frequently.

### **Varnishes**

Varnish is another film-forming finish. However, because varnishes are clear, they require frequent maintenance to be attractive. Sunlight degrades both the varnish and the wood fibers directly beneath it. Some varnishes have chemicals that partially block UV radiation, but varnishes all soon begin to crack, peel, and flake, taking along the fibers of photochemically degraded wood. The wood needs to be cleaned and revarnished as soon as this breakdown occurs. Varnish lasts only 1 to 2 years on wood exposed to full sun, but longer on shaded wood. The life span of varnish can be extended by first staining the wood and then applying many coats of varnish.

### **Penetrating Finishes**

Penetrating finishes absorb into the wood, saturating the surface fibers and partially or completely filling the surface pores. Many penetrating finishes contain water repellents, usually in the form of paraffin wax dissolved in mineral spirits.

Water repellents are usually clear. They can be used alone as a natural penetrating finish or as a treatment prior to painting. Check the label of the finish to make sure that it is paintable.

Many clear penetrating finishes contain wood preservatives in addition to water repellents; these penetrating finishes are much better for outdoor use. The preservatives control the growth of mildew and other fungi. Some preservatives also discourage insect infestation. This is especially important in moist, shady locations.

Water-repellent emulsions have been developed for waterborne formulations, but these may not penetrate as well as the formulations made with mineral spirits.

### **Semitransparent Stains— Oil is Best**

Semitransparent stains are penetrating finishes with inorganic

pigments. High quality stains contain wood preservatives and water repellents. Semitransparent stains penetrate the wood without forming a film, allowing much of the wood grain to show through the finish. Latex-base semitransparent stains are film-forming finishes and will not perform like true penetrating stains. Oil-base semitransparent stains allow the wood to "breathe," so the finish doesn't blister or peel even if the moisture content of the wood is high. The pigment in a semitransparent penetrating stain greatly increases the durability of the finish by absorbing much of the UV radiation that would otherwise degrade the wood. The properties of the pigment, resin, preservative, and water repellent determine the durability of exterior stains.

Penetrating stains perform best on roughsawn, weathered, or coarse-textured wood. If you are finishing smooth wood, power-wash, sand, or wet the surface to relieve stresses and open the surface pores. Unlike paints, stains can be applied to weathered surfaces without preparing the surface. If the surface is dirty or has mildew, clean it with bleach and detergent before applying the finish. Penetrating stains are suitable for siding, trim, exposed decking, fences, and roof shingles.

Stains may be applied by brush, spray, or roller. To prevent lap marks, finish the board or panel in one working session.

Working in the shade will give the best results because longer drying time means greater penetration of the stain.

For best results, roughsawn or weathered lumber should be treated with two coats of penetrating stain; the second coat should be applied before the first is dry. If the first coat has completely dried, it may seal the wood surface so that the second coat scarcely penetrates. To prevent formation of a film, an hour after applying the second coat, use a cloth, sponge, or dry brush lightly wetted with stain to wipe off any excess stain

that did not penetrate the wood. Remember that sponges or cloths soaked with oil-base or alkyd-base stains are particularly susceptible to spontaneous combustion; they should be buried, immersed in water, or sealed in an airtight metal container.

### Natural Finishes

A natural finish means different things to different people. To some, a natural look means rough, gray, and weathered (nature's "natural finish"). To others, a successful natural exterior wood finish is one that retains the original, attractive appearance of the wood with the least change in color and the least masking of the grain and surface texture. In this case, the finish should inhibit the growth of mildew micro-organisms, protect against moisture and sunlight, and not change the surface appearance or color of the wood.

The "weathered look" can be obtained in several ways. Do nothing until the wood turns gray, then treat the wood regularly with a water-repellent preservative or a gray semitransparent stain. This will extend the life of the wood. If you want to obtain a weathered look quickly, apply a gray stain; as the stain weathers, the wood will turn gray naturally. Maintain the finish with a stain or water-repellent preservative.

You can preserve the original color of the wood in several ways. From the start, treat the wood with a water-repellent preservative at least once a year, or apply a semitransparent oil-base stain (containing a water repellent and preservative) of the same color as the wood. The pigment in the stain protects the wood and extends the life of the preservative. If the wood turns gray, the preservative has failed. Most gray discoloration is caused by mildew. Power-washing, bleach, and some commercial cleaners remove gray discoloration.

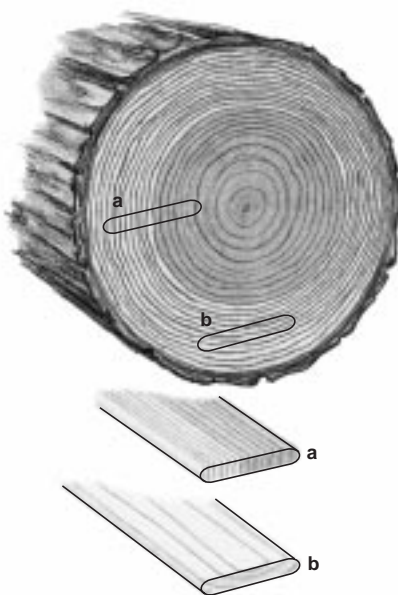


Figure 1—The position of wood in the log determines the grain of the sawn lumber. A, vertical- or edge-grained lumber; B, flat-grained lumber.

### Wood Properties

Since wood properties vary, the type of wood is an important consideration in choosing a finish. Wood that has minimum tendency to shrink and swell is the best for painting because there's less chance that the paint will crack as the wood shrinks and swells. Vertical-grained (edge-grained) wood is subject to about half the shrinking and swelling of flat-grained lumber (Fig. 1). Wood density also affects swelling. Low-density woods are better for painting than denser species. Low-density softwoods like western redcedar and redwood have excellent properties for finishing; pine and fir also retain paint well, particularly if the wood is free of knots. As more wood is being cut from younger trees, more boards are containing juvenile wood—wood formed during the first few years of growth. Juvenile wood shrinks and swells at a very high rate and requires a penetrating finish. Like wood with knots, juvenile wood easily releases extractives, which bleed through paint.

In general, it is best to paint over a fairly smooth and stable surface. Flatsawn and dense woods can be stabilized with a resin-treated paper overlay. This type of lamination is most frequently applied over exterior plywood or stabilized fiberboard, and it makes an excellent surface for painting.

Roughsawn exterior plywood siding is best finished with a semitransparent penetrating stain or solid-color latex stain.

### Preservatives

Preservative-treated wood such as wood pressure-treated with chromated copper arsenate (CCA) is frequently used for outdoor porches and decks. After a few years, some boards may check or crack as part of the natural weathering process. Weathering can be reduced by using a penetrating finish that contains a water repellent early in the finishing process. Allowing a deck to weather for a year opens the surface pores and permits the wood to accept more finish, but this weathering damages the wood. Research indicates that it is better to finish a deck as soon as it is dry (a few weeks after construction) and to refinish it in 2 years.

To paint treated wood, make sure the wood is clean and dry. Porches and decks can be painted, but be prepared for problems like decay, a slippery surface, cracking, checking, and flaking. Use a very good porch and deck enamel for the two topcoats. Water-repellent preservatives and semitransparent penetrating stains must be reapplied more frequently than paint, but reapplication is easy. Simply brush a generous amount of finish onto the wood; after 20 to 40 min, wipe off any excess finish that remains on the surface.

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