

Application of Exterior Wood Finishes

The following information is excerpted from the publication, *Exterior Wood in the South – Selection, Applications, and Finishes* by Daniel L. Cassens and William C. Feist; United States Department of Agriculture/Forest Service/Forest Products Laboratory/General Technical Report FPL-GTR-69, and a compilation of best known finishing practices from a variety of sources. Please contact your local knowledgeable paint/stain supplier for additional recommendations.

The correct application of a finish or coating to a wood surface is as important for durability and good performance as selecting the most appropriate finish. All finishes are brushed, rolled, sprayed, or applied by dipping. The application technique used, the quantity and quality of finish applied, the surface condition of the substrate, and the weather conditions existing at the time of application can substantially affect the life expectancy of the finish. In the following section, we discuss different methods of finish application along with other important variables. For optimum performance, manufacturers' directions should always be read and followed.

Opaque Finishes

Paint

Proper surface preparation is absolutely essential for the good performance of paint. Wood and wood-based products should be fully protected from the weather and wetting during and after construction or installation. Surface contamination from dirt, oil, and other foreign substances must be eliminated. All paints and primers used in humid climates should contain a mildewcide. Preliminary research has shown that even a 3- to 4-week exposure of a freshly cut wood surface to the weather (especially the sun) can adversely affect the adhesion of paint to the wood. Wood surfaces should be painted as soon as possible, weather permitting, before or after installation. Wood that has weathered badly before painting will have a degraded surface that is not good for painting, and a paint coating is more likely to peel from the more degraded areas. The weathered wood should be sanded and washed before painting.

To achieve maximum paint life, follow these steps:

1. Treat properly cleaned wood siding and trim with a paintable water-repellent preservative or water repellent and caulk all joints and cracks. Water repellents protect the wood against the entrance of rain and dew and thus prevent swelling and shrinking. This is especially true for species like southern yellow pine. Water repellents can be applied by brushing or dipping. Lap and butt joints and the edges of panel products such as plywood, hardboard, and particle board should be especially well treated since paint normally fails in these areas first. Allow at least 2 warm, sunny days for adequate drying before painting the treated surface. If enough time is not allowed the treated wood may be slow to dry, may discolor, or may dry with a rough surface that resembles alligator hide. If the wood has been dip treated, allow it to dry for at least 1 week, if the weather is favorable. The small amount of wax (less than 1 percent) in a paintable water-repellent preservative will not prevent proper adhesion of the paint.

2. After the water-repellent preservative or water repellent has dried, prime the bare wood as soon as possible. The primer coat is very important because it forms a base for all succeeding paint coats. For woods with water-soluble extractives, such as redwood and cedar, the best primers are good-quality oil-based, alkyd-based, or stain-blocking acrylic latex-based primer paints. The primer seals in or ties up the extractives so that they will not bleed through the topcoat. The primer should also be nonporous and thus inhibit the penetration of rain or dew into the wood surfaces, reducing the tendency of the wood to shrink and swell. A primer should be used whether the topcoat is an oil-based or latex-based paint. For species, such as pine, that are predominately sap wood and free of extractives, a high-quality acrylic latex paint may be used as both a primer and topcoat. Enough primer should be applied to obscure the wood grain, but the primer should not be spread too thin, and the application rates recommended by the manufacturer should be followed. A primer coat that is uniform, flexible, and of the proper thickness will distribute the swelling stresses that develop in wood and thus prevent premature paint failure. The topcoat should be applied as soon as the primer coat is dry – about 48 hours for oil-based paints – or as recommended by the manufacturer. Special knot primers are available.
3. Apply two coats of a good-quality all-acrylic latex house paint over the primer. If it is not practical to apply two topcoats to the entire house, two topcoats must be applied to fully exposed areas on the south and west sides of the house to obtain good protection. Areas fully exposed to sun and rain are the first to deteriorate. Vinyl-acrylic, modified-acrylic, and oil-based topcoat paint can also be used. Allow the first coat of oil-based paint to cure for 1 to 2 days before applying the second coat. In cold or damp weather, an extra day or two should be allowed between coat applications. Coats of latex paint can usually be applied within a few hours of each other. On those wood surfaces best suited for painting, one coat of a good house paint (acrylic latex) over a properly applied primer (a conventional two-coat paint system) should last 4 to 5 years, but two topcoats over one primer coat can last up to 10 years.
4. Apply 1 gallon of paint per approximately 400 ft² of smooth wood surface area. However, coverage can vary with different paints, surface characteristics, and application procedures. Research has indicated that the optimum thickness for the total dry paint coat (primer and two topcoats) is 3.5 to 5 mils or about the thickness of a sheet of newspaper. Some paints (especially latex) will successfully cover the primer coat at one-half this thickness, but these thin coats will erode rapidly. On the other hand, thick paint coats tend to build up and develop cracks. The coverage of a paint coat can be checked by applying a pint of paint evenly over a measured area that corresponds to that recommended by the manufacturer. Brush application is usually superior to roller, spray, or painting-pad application, especially for the first coat. Professional painters can usually spray paint and obtain good performance. The quality of paint is usually, but not always, related to the price.

To avoid future separation between paint coats, the first topcoat should be applied within 2 weeks of the primer and the second coat within 2 weeks of the first. As certain primer paints weather, they can form a soap-like substance on their surface that may prevent proper adhesion of new paint coats. If more than 2 weeks elapse before applying another paint coat, scrub the old surface with water using a bristle brush or sponge. If necessary, use a mild detergent to

remove all dirt and deteriorated paint, or, if mildew develops, clean the surface with bleach. Then, rinse the surface with water and allow it to dry before painting. Repriming may be necessary if the old primer has weathered more than 2 weeks.

To avoid temperature blistering, oil-based paints should not be applied on a cool surface that will be heated by the sun within a few hours. Temperature blistering is most common with thick paint coats of dark colors applied in cool weather. The blisters usually appear in the last coat of paint and occur within a few hours to 1 to 2 days after painting. They do not contain water.

Oil-based paint may be applied when the temperature is 40°F or above. A minimum of 50°F is desirable for applying latex-based paints. For proper curing of latex paint films, the temperature should not drop below 50°F for at least 24 hours after paint application. Low temperatures will result in poor coalescence of the paint film and early paint failure.

Wrinkling, fading, or loss of gloss in oil-based paints and streaking of latex paints can be avoided by not applying paint in the evening of cool spring and fall days when heavy dew can form before the surface of the paint has thoroughly dried. Serious water absorption problems and major finish failure can also occur with some latex paints when applied under these conditions. Allow the paint to dry for at least 2 hours before sunset. Likewise, do not begin painting in the morning until the dew has had time to evaporate.

Solid-Color Stains

Solid-color stains may be applied to a smooth surface by brush, roller, or pad application, but brush application is usually the best. These stains act much like paint. However, they are not generally recommended for horizontal wood surfaces such as decks, railing, fences, and window sills. One coat of solid-color stain is adequate, but two coats will always provide better protection and longer service. The all-acrylic latex solid-color stains are generally superior to all others, especially when two coats are applied. Oil-based solid-color stains are often used as the first coat over staining-type woods such as cedar and redwood.

Unlike paint, a solid-color stain may leave lap marks. Latex-based stains are fast-drying and are more likely to show lap marks than are oil-based stains. To prevent lap marks, follow the procedures suggested under application of semitransparent penetrating stains.

Natural Finishes

Water-Repellent Preservatives

The most effective method of applying a water-repellent preservative is to dip the entire board into the solution. However, brush treatment is also effective. When wood is treated in place, liberal amounts of the solution should be applied to all lap and butt joints, edges and ends of boards, and edges of panels where end grain occurs. Other areas especially vulnerable to moisture, such as the bottoms of doors and window frames, should not be overlooked. One gallon of preservative will cover about 250 ft² of smooth surface or 100 to 150 ft² of rough surface. When used as a natural finish, the life expectancy of preservative on new wood is only 1 to 2 years, depending upon the wood and exposure. Treatments on rough surfaces are generally

longer lived than those on smooth surfaces. Repeated brush treatment to the point of refusal will enhance the finish durability and performance.

Weathering of the wood surface may be beneficial for both water-repellent preservatives and semitransparent penetrating stains. Weathering opens up checks and cracks, thus allowing the wood to absorb and retain more preservative or stain, so the finish is generally more durable. However, much more finish will be required than if the wood were not weathered.

Oils

Oils should be applied in the same way as semitransparent penetrating stains. Care should be used in handling cloths used to apply the oils.

Semitransparent Penetrating Stains

Semitransparent penetrating stains may be applied by brush, spray, or roller. Again, brushing will usually give better penetration and performance. Spraying followed by back brushing is also a good method of application. These oil-based stains are generally thin and runny, so application can be messy. Lap marks will form if stains are improperly applied. Lap marks can be prevented by staining only a small number of boards or a panel at a time. This method prevents the front edge of the stained area from drying out before a logical stopping place is reached. Working in the shade is desirable because the drying rate is slower. One gallon will usually cover about 200 to 400 ft² of smooth surface and from 100 to 200 ft² of rough or weathered surface.

To achieve a long life for penetrating, oil-based stain on roughsawn or weathered lumber or plywood, use two coats and apply the second coat before the first is dry. Apply the first coat to one panel or area. Then work on another area so that the first coat can soak into the wood for 20 to 60 minutes. Next, apply the second coat before the first has dried. (If the first coat dries completely, the second coat cannot penetrate into the wood.) Finally, about an hour after applying the second coat, use a cloth, sponge, or dry brush, lightly wetted with stain, to remove the excess stain. Otherwise, the stain that did not penetrate the wood will form an unsightly surface film and glossy spots. Stir stain thoroughly during application to prevent settling and color change. Avoid mixing different brands or batches of stain.

For oil-based stains, a two-coat wet system on rough wood or plywood may last as long as 8 years in certain exposures. By comparison, if only one coat is applied on new, smooth wood, its expected life is 2 to 4 years; life expectancy is less on woods like western redcedar. However, succeeding coats will usually last longer because more stain can be applied.

CAUTION: Sponges or cloths that are wet with oil-based stain are particularly susceptible to spontaneous combustion. To prevent fires, bury the cloths, immerse in water, or seal in an airtight container immediately after use.

Latex semitransparent stains do not penetrate the wood surface but are easy to apply and less likely to form lap marks. For a long life, two coats should be applied. Apply the second coat anytime after the first has dried. The second coat will remain free of gloss, even on smooth

wood. These stains are essentially very thin paints and perform accordingly. New formulations are being developed that may have some penetrating characteristics.

Transparent Film-Forming Coatings

Although short lived, transparent film-forming coatings such as high-quality polyurethane or spar varnish are occasionally used for exterior applications. The wood surface should be clean, smooth, and dry before application of the coating. The wood should first be treated with a paintable water-repellent preservative as discussed under painting procedures. The use of varnish-compatible, durable, pigmented stains and sealers or undercoats will help to extend the life of the finishing system. At least three topcoats should be applied. However, the life expectancy of the coatings on fully exposed surfaces is only 2 years at best. In marine exposures, six coats of varnish should be used for best performance. Varnish built up in many thin coats (as many as six) with a light sanding and a fresh coat added each year will usually perform the best.