Finishing Exterior Wood Surfaces

Wood properties and finish durability

The durability of an exterior finish is affected by the characteristics of the wood. Hardwoods, obtained from trees with broad leaves, generally require more care in finishing than softwoods, which are derived from trees with needlelike leaves. Satisfactory finish life is usually more difficult to achieve on woods of higher density.

A tree adds a layer of new wood each year. In softwoods, softer, lighter springwood forms early in the season and heavier, harder summerwood forms later in the year. Finishes, particularly paints, usually last longer on surfaces with a low proportion of summerwood.

All wood shrinks as it loses moisture and swells as it absorbs moisture, but some species are more stable than others. Species that shrink and swell the most cause more stress on paint films than woods that are more stable. Checking and warping are more likely to be critical on woods that are sensitive to changes in moisture content.

Vertical-grain or edge-grain lumber is cut from the log with the wide face at right angles to the annual growth rings; flat-grain boards are sawed so the wide face is almost parallel to the growth rings (figure 1). Finishes usually perform best on vertical-grain lumber because the summerwood is distributed more evenly on the surface and because vertical-grain lumber shrinks and swells less in width than flat-grain material. The side nearest the bark in flat-grain lumber holds finishes better and is less subject to surface roughening than is the pith side.

Wood that is free of knots, pitch pockets, and other defects is the preferred base for exterior finishes. Planed surfaces are best for most paint finishes, while rougher or sawed surfaces may be preferred for stains or water-repellent treatments.

Always use corrosion-resistant fasteners when installing any wood product outside. Use only aluminum, stainless steel, or hot-dipped galvanized fasteners.

Follow recommended procedures for nailing wood siding to allow for natural expansion and contraction with changes in moisture content (figure 2).

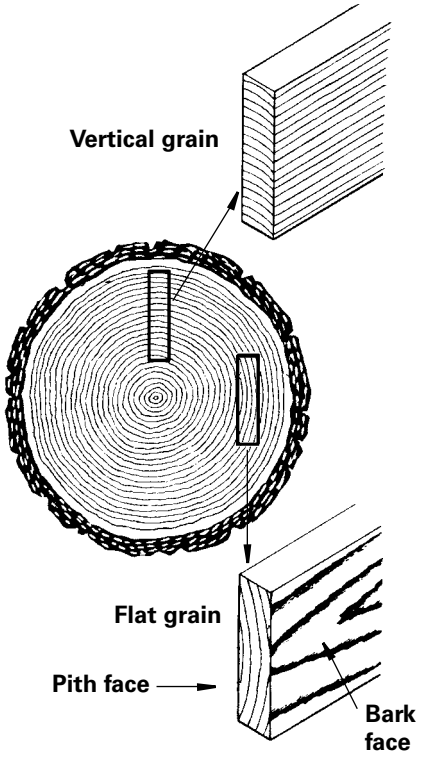

Figure 1. Vertical and flat grain lumber and how they are cut from a log.

Types of exterior finishes

Each type of finish that is suitable for exterior wood surfaces has advantages and disadvantages. Carefully examine the different types before selecting a particular finish.

Natural weathering

The simplest and most economical way of finishing an exterior wood surface is to allow it to weather naturally. Wood exposed to the weather will undergo color changes during transition from the original to the final gray color. The time required to produce a fully weathered appearance depends on the severity of the exposure to sun, wind, and water and will not be the same on all sides of a building. Untreated wood may exhibit blotchy discolorations during the weathering process due to the action of microorganisms. Stable woods such as baldcypress, western redcedar, and redwood, are best suited for natural weathering.

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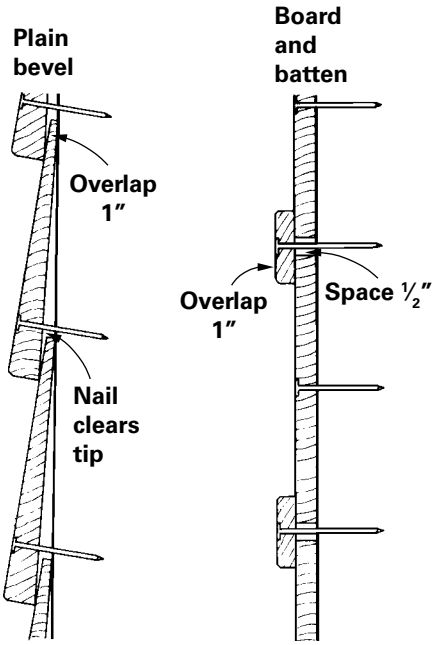

Figure 2. Recommended nailing methods for horizontal bevel siding and for vertical board-and-batten siding.

The color of wood is affected soon after exposure to outdoor conditions. Dark-colored woods tend to become lighter and light-colored woods become a little darker. All woods eventually exhibit a gray color.

Exposure to light and moisture changes the anatomy of the surface cells and induces minute checks. The checks or cracks enlarge and are easily visible as wood surfaces are repeatedly exposed to alternate wetting and drying. The degree of weather checking varies with species. Aspen, baldcypress, cedar, redwood, and yellow poplar are woods on which weather checking tends to be inconspicuous. Actual erosion of wood from the surface proceeds very slowly. Unfinished wood will wear away at the rate of only about 1/4 inch in 100 years on exposed vertical surfaces.

Unfinished lumber exposed to the weather warps and pulls at the fastenings. Warping varies with species, density, width, and thickness of the lumber, and the orientation of the annual rings. Baldcypress, western redcedar, and redwood are species that have only a slight tendency to warp and loosen fastenings.

An inclination to warp increases with the width of the lumber. The width of boards should not exceed eight times the thickness. The orientation of the annual rings also influences the tendency to warp. Flat-grain boards usually warp more than vertical-grain lumber.

The color and appearance of weathered wood can be adversely affected by mildew and other microorganisms in warm, humid climates. The growth of fungi on the wood surface can make unfinished wood exposed to the weather appear blotchy and unsightly.

Extractives in woods such as redwood and western redcedar may gradually diffuse to the surface and produce a dark brown stain that may persist.

Clear film finishes

Clear film finishes such as varnishes should not be used on wood that is fully exposed to the weather. These finishes are relatively expensive to apply and often begin to deteriorate within 1 year. The surface film must be removed before refinishing. Refinishing is a frequent, expensive, and time-consuming chore.

Water-repellent preservatives

A water-repellent preservative may be used as a natural finish. It contains a fungicide, a small amount of wax as a water repellent, a resin or drying oil, and a solvent such as turpentine or mineral spirits (figure 3). Water-repellent preservatives do not contain any coloring pigments. The preservative slows graying and reduces mildew infection.

Water repellents also are available. These are simply water-repellent preservatives with the preservative left out. Water repellents are not good natural finishes but can be used as a stabilizing treatment before priming.

The most effective method of applying a water-repellent preservative is to dip the entire board into the solution. However, brush treatment also is effective.

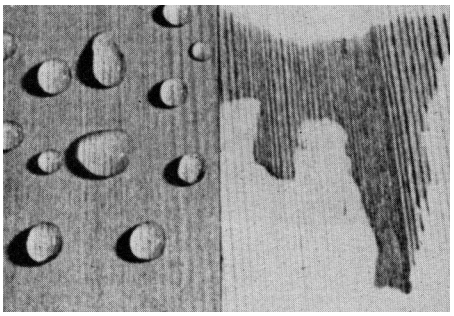

Figure 3. The action of water on treated (left) and untreated (right) wood following application of a water-repellent.

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 panels. One gallon will cover about 250 square feet of smooth surface or 150 square feet of rough surface. The life expectancy is only 1 to 2 years. Treatments on rough surfaces are generally longer-lived than those on smooth surfaces.

Water-repellent preservatives can be renewed by a simple cleaning of the old surface with a bristle brush and an application of a new coat of finish. To determine if a water-repellent preservative has lost its effectiveness, splash a small quantity of water against the wood surface. If the water beads up and runs off the surface, the treatment is still effective. If the water soaks in, the wood needs to be refinished. Refinishing also is required when the wood surface becomes gray.

Steel wool and wire brushes should not be used to clean surfaces to be finished with water-repellent preservatives since small iron deposits may be left behind. Chemicals used may cause iron remaining on the surface to corrode. The corrosion products may then react with certain wood extractives to form a dark-blue, unsightly discoloration.

Preservatives

Wood preservatives are not considered to be finishes. Common wood preservatives fall into three general categories: creosote, pentachlorophenol in oil, and water-

borne salt treatments. Wood treated with creosote or pentachlorophenol in oil is not recommended for use around the home where people will come in contact with it. However, wood treated with water-borne salts is suggested for use as patio decks, outside steps, privacy fences, and other home uses. This material is generally light to bright green or brown in color. Make sure wood treated with water-borne salts is completely dry before finishing.

Bleaching oil stains

Bleaching oil stains may be used to produce a permanent, uniform gray color on wood in a much shorter time than through natural weathering.

Apply one or two coats of bleaching oil stain with a brush or roller according to the manufacturer's directions. Since the chemical action is aided by sunlight and water, spraying the bleached surface with water is helpful. The bleaching oil stain should contain a chemical to retard mildew growth. Reapply a bleach only if the wood begins to darken.

Pigmented stains

Exterior stains may be oil-base or latex-base. Oil-base stains may be semitransparent or solid color; latex stains are typically solid color. A variety of colors are available.

Semitransparent, penetrating, oil-base stains are suitable for any wood surface exposed to the outdoors. They are especially appropriate for rough-sawn and weathered wood, textured surface plywood, and woods that do not hold paint very well.

Pigmented stains obscure the grain and texture of wood but do not completely conceal the surface characteristics. The finish penetrates into the wood without forming a continuous film on the surface. The treated surface appears flat or dull. Darker stains containing more pigment are usually more durable than lighter colored stains.

Solid color stains, also called heavy bodied stains, are opaque finishes. These stains are made with a much higher concentration of pigment than the semitransparent penetrating stains and will obscure the natural wood color and grain. Oil-base solid color stains tend to form a film much like paint and, as a result, can also peel loose from the substrate.

Semitransparent penetrating stains may be brushed or rolled on. Brushing will give better penetration and performance. These 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 one time. This method prevents the front edge of the stained area from drying out before a logical stopping place is reached. One gallon will usually cover about 300 to 400 square feet of smooth surface and from 150 to 200 square feet of rough surface.

For long life with penetrating oil-base stain on rough-sawn or weathered lumber, use two coats and apply the second coat before the first is dry. About an hour after applying the second coat, use a cloth or sponge to wipe off the excess stain that has not penetrated into the wood.

Solid color stains may be applied to a smooth surface by brush or roller application, but brush application is best. One coat of solid color stain is adequate, but two coats will provide better protection and longer service.

Lap marks may also form with a solid color stain. Latex-base stains are more likely to show lap marks than the oil-base ones.

Semitransparent penetrating stains are relatively easy to refinish. Excessive scraping and sanding are not required. Simply use a stiff bristle brush to remove all surface dirt, dust, and loose wood fibers, and then apply a new coat of stain. The second coat of penetrating stain often lasts longer since it penetrates into small surface checks that open up as wood weathers.

Exterior paints

Of all the finishes, paints provide the most protection against weathering and offer the widest selection of colors. An adequate paint film will retard penetration of moisture and reduce checking and warping. Paint, however, is not a preservative and will not prevent decay if conditions are suitable for fungi attack.

The durability of paint coatings on exterior wood is affected by several factors. The species, density, texture, moisture content, orientation of annual rings, type and amount of extractive, and number of defects are characteristics important in determining paint life.

Almost all native softwoods can be painted satisfactorily, but species differ in regard to ease of finishing and expected durability. Common species are classified according to their finishing performance in Table 1. Woods classified as *fair* or *poor* for exterior painting require extra care in the selection of primers and topcoats, while higher rated woods can be expected to perform well when a broad range of paints are used.

Table 1. Grouping of woods for exterior painting based upon finishing ease and durability.

Excellent: Baldcypress, cedars, redwood
Good: White and sugar pines
Fair: Hemlocks, spruces, ponderosa pine, lodgepole pine
Poor: Douglas fir, red pine, southern pine, western larch

Hardwoods generally are more difficult to finish than softwoods. The best hardwoods for painting are those of lower density with small pores such as aspen, basswood, cottonwood, or yellow poplar. However, these species require care in the selection of primer and finish paints for good finish life.

Vertical-grain boards of any species are best for painting. If flat-grain lumber is used, paint durability will be improved by exposing the bark side rather than the pith side.

Only well-dried wood should be painted. Properly seasoned material should be kept clean and dry. Place it under cover or store it indoors until it is installed.

High-grade, clear lumber is best for painting. Knots, pitch pockets, cross-grain, and other defects increase the risk of paint failure. Apply a knot sealer over resinous knots in species such as pine before priming to avoid discoloration and early failure of the paint film.

Paint wood surfaces within 2 weeks after installation if weather permits. Weathering for longer periods of time results in significant reduction of adhesion. To achieve maximum paint life, follow these steps.

1. Wood siding and trim should be treated with a paintable water-repellent preservative or water repellent. Water repellents can be applied by brushing or dipping. Lap and butt joints and the ends of panel products should be especially well-treated. Allow **at least** 2 warm, sunny days for adequate drying before painting the treated surface. If the wood has been dip-treated, allow at least 1 week of favorable weather.

2. After the water-repellent preservative or water repellent has dried, the bare wood must be primed. For woods with water-soluble extractives such as redwood and cedar, the best primers are high-quality oil-base and alkyd-base paints. Some latex-base primer paints also are designed for use over these woods. The primer seals in the extractives so they will not bleed through the top coat. A primer should be used, whether the top coat is an oil-base or latex-base paint. For species that are predominantly sapwood and free of extractives, such as pine, a high-quality acrylic latex paint may be used as both a primer and top coat. Enough primer should be applied to obscure the wood grain. Follow the spreading rates recommended by the manufacturer.

3. Two coats of a high-quality acrylic latex house paint should be applied over the primer. One coat of a good house paint over a properly applied primer should last 4 to 5 years, but two topcoats over a prime coat can last 10 years or more.

4. One gallon of paint will usually cover about 400 square feet of surface area. Optimum thickness for the total paint coat (primer and two top coats) is 4 to 6 mils or about the thickness of a sheet of newspaper. The quality of paint is usually, but not always, related to the price. Brush application is always superior to any other application method.

To avoid future separation between paint coats, the first top coat should be applied within 2 weeks after the primer and the second coat within 2 weeks of the first. If more than 2 weeks elapse before applying another paint coat, scrub the old surface with water using a bristle brush or sponge. Then rinse well with water and allow the surface to dry before painting.

To avoid temperature blistering, oil-base paints should not be applied on a cool surface that will be heated by the sun within a few hours.

Oil-base paint may be applied when the temperature is 40°F or above. A minimum of 50°F is desired for applying latex-based paints. For proper curing, the temperature should not drop below 50°F for at least 2 hours after painting.

To avoid wrinkling, fading, or loss of gloss of oil-base paints and streaking of latex paints, the paint should not be applied in the evenings of cool spring and fall days when heavy dews form before the surface of the paint has thoroughly dried.

Refinishing

If you are refinishing an old paint coat, proper surface preparation is essential if the new coat is to give the expected performance. First, scrap away all loose paint. Use sandpaper on any remaining paint to "feather" the edges smooth with the bare wood. Then scrub any remaining old paint with a brush or sponge and water. Rinse the scrubbed surface with clean water. Wipe the surface with your hand. If the surface is still dirty or chalky, scrub it again using a detergent. Mildew should be removed with a dilute household bleach solution. Rinse the cleaned surface thoroughly with fresh water and allow it to dry before repainting. Areas of exposed wood should be treated with a water-repellent preservative, or water repellent, and allowed to dry for **at least** 2 days, and then primed. High quality top coats can then be applied.

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