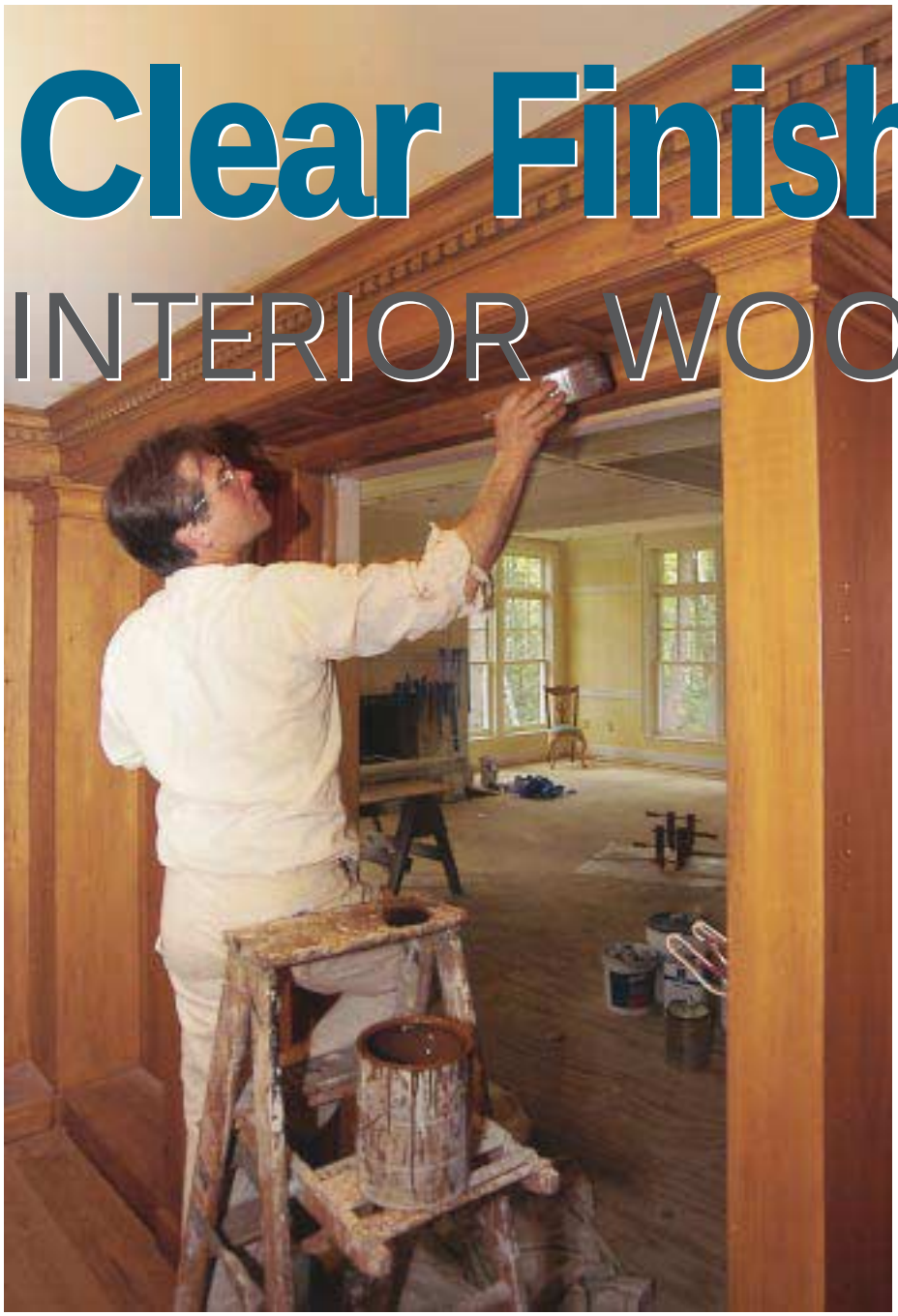
Clear Finishes for INTERIOR WOODWORK



C. BATES

by James Benney, Dan Greenough, and Doug Kelly

The success of a clear finish depends on careful prep work and matching the finish to the application

Antonio Stradivari crafted violins that are remembered as much for their finish as they are for their sound. But while Antonio never revealed the recipe for his varnish, applying a memorable finish to your own woodwork is no big mystery.

Whether it's on cabinets, floors, or casings, a truly excellent clear finish is one that looks good viewed from any angle, feels nice to the touch, cleans easily, and gives lasting protection to the wood.

Applying a clear coating to any substrate is usually an aesthetic decision, because the finish improves the appearance of the surface. But a clear finish will also highlight any imperfections in the woodwork, such as milling marks, so proper sanding before application is critical (see "Prep Work for Clear Finishes," 5/97).

A clear finish can also form a cleanable surface that seals out contamination — an important benefit in kitchens and other areas where sanitation is a consideration. But perhaps the most vital function of any finish is to isolate the wood from seasonal humidity swings, which cause undesirable wood movement and result in cracking and warping of the wood substrate. Also, by sealing out moisture and reducing wood movement, the coating itself will last longer.

Choosing a Clear Finish

There are a lot of clear coatings available, and believe it or not, they're all different. Not only is there an infinite variety of sheens (flat, eggshell, satin, semi-gloss, high gloss, and everything in between), but the quality of the sheens

can vary according to the components of the product used. A pure satin varnish, for instance, will look different from a satin polyurethane.

It's important to know what kind of wear and tear a surface is likely to receive before choosing the clear finish, since durability varies from product to product. Different formulations are used for different applications, with a sinktop needing one product, a gymnasium floor another, and a piece of fine furniture something else still. Since the quality of the underlying surface also affects durability, again, careful surface preparation is mandatory.

Federal, state, and local environmental factors may also change how everyone works with protective coatings, whether we like it or not. However, there is still much turmoil and uncertainty over what really is the best way to go. In California, mandated product reformulations have resulted in lesser-quality products being made available; in some cases it has been shown that these reformulations must be frequently reapplied, which undermines any hoped-for gains in pollution control. In the current climate, product selection is more critical than ever to ensure a durable and lasting finish.

Types of Clear Finishes

Clear coatings fall into three categories, based on how their resin cures: *evaporative*, *reactive*, and *coalescing*.

Evaporative finishes (lacquer and shellac) are a mixture of solvent and microscopic resin solids. As the solvent evaporates, the solids randomly interlock, leaving a protective film after the solvent is gone. The resin components can be redissolved by the reintroduction of the same solvent.

Reactive finishes, like varnishes and polyurethanes, consist of dissolved molecules that combine to form spaghetti-like strands. As the solvent evaporates, the spaghetti intertwines and chemically bonds to adjacent strands, in a process known as *crosslinking*. Once the solvent is completely evaporated, the chemical crosslinking continues for days (or even weeks) until fully cured. The solvent won't redissolve the cured film, making this a tough product suited for harsh service conditions.

Coalescing finishes are composed of precatalyzed particles surrounded by film-forming solids stirred into a water base. As the water evaporates, these solids fuse at their edges and create a film. Water won't redissolve this film, but it may cause softening; thus, water-based products aren't usually suitable for harsh conditions.

The Right Stuff

Within our group of painters at PaintCraft Associates, we've used a multitude of clear-coat finishes, in residential, commercial, and industrial settings, and with varying results. Each of us has individual preferences, and varying job requirements make it impossible to give a "one size fits all" recommendation.

Whatever product you choose, read the label before you open the can. You'll learn what the product is, what its limitations are ("interior use only," for example), and how long it takes to dry — both to the touch and before recoating. The label also gives directions for thinning and cleanup, and lists health and safety precautions.

Oil finishes. Primarily linseed or tung oil, these finishes are liberally applied to wood surfaces and wiped "dry" in two or more coats. The resulting finish provides only moderate protection and longevity. Other mixtures of wiping finishes are also classified as the "oil" type. Danish oil is actually a mixture of oils and varnish, with most of the protection provided by the varnish in the mix. Another popular oil type finish is wiping varnish, a varnish thinned with mineral spirits that is applied like other oil-based finishes. The resulting layer of protective finish is quite thin.

Oil finishes may be wiped or brushed on a clean, well-sanded surface. Additional coats can be added as needed, and touch-ups are simple. These finishes are popular for furniture and cabinetry.

Shellac. Shellac is a clear coating that starts out as a resinous excretion of the lac beetle. After refining, shellac resin is dissolved in alcohol, which leaves the hardened shellac behind as it evaporates. We sometimes use Zinsser's Bull's Eye, which is available in amber (orange) type or in its bleached form (labeled clear or white). Shellac dries quickly and is compatible with many other types of finishes, making it ideal as a base coat.

Choosing the Right Finish

Application	Finish Requirements	Product Choices	Comments
Floor	Provides protection from impact, abrasion, & moisture; durable; cleanable	1.Oil-based polyurethane varnish 2. Water-based polyurethane varnish	1. Hard, scuff-resistant, durable 2. Quick-drying, requires more coats to achieve same build as with oil-based varnish, raises wood grain
Wet Countertop	Provides moisture protection, cleanable	Oil-based polyurethane varnish	Inspect coating regularly and maintain as needed
Dry Countertop, Cabinets, Handrail, Trim	Cleanable	Oil-based polyurethane varnish, water-based polyurethane varnish, conventional varnish, lacquer	Inspect coating regularly and maintain as needed

DAN GREENOUGH

Though popular for furniture, wiping oil finishes provide only a thin protective layer and are not adequate for household woodwork such as counters, trim, and kitchen cabinets.

Although shellac can be used as a finish, it has low resistance to heat, water, solvents, and other chemicals, so it's not the best choice for tables or countertops.

Shellac is more difficult to apply than oil, but it also offers more protection. Suitable for brush or spray application, shellac has a warm color tone, making it ideal for finely crafted woodwork.

Lacquer. Like shellac, nitrocellulose lacquer is a fast-drying finish that cures through evaporation of the solvent. Its resin is derived from cotton fibers treated with nitric and sulfuric acids. It became popular following World War I, when a large surplus of "gun cotton" was available.

Because the solvents used to make lacquer are highly volatile, lacquer dries quickly. For this reason, it's most often applied by professional painters using spray equipment. But one lacquer that can be brush-applied is Deft Clear Wood Finish. When using this lacquer, you'll have to work quickly and carefully to avoid unsightly brush strokes.

Nitrocellulose lacquer has moderate resistance to heat, mild solvents, and chemicals. Because multiple recoats are possible in the same day, you can build a protective layer fairly fast. The main problems with lacquer are its flammability and the toxic fumes it creates.

Varnish and polyurethane. These are probably the most common clear finishes used today by consumers and professional finishers, though their market share will undoubtedly change as environmental regulations mushroom. These oil-based products cure reactively and are fairly easy to use. The biggest problems in working with these finishes are their slow drying time (which means dust contamination is a problem) and their tendency to yellow over time.

Alkyd resins, which are made by combining vegetable oils and resins with alcohol and acid, are the base of most modern varnishes. Alkyd varnishes, like McCloskey's Heirloom Varnish, have excellent resistance to heat, water and chemicals, and are easy to apply by brush.

The polyurethane products available to both consumers and painters, such as Flecto Varathane, are one-part products containing an alkyd varnish modified with polyurethane resin. They aren't true polyurethanes, which are actually two-part products; like epoxies, true polyurethanes must be intermixed to create a catalyzed finish. Two-part products aren't readily available on the consumer market, and aren't as convenient on the job site.

One-part polyurethanes have the same positive traits that varnish has, plus improved scratch resistance and toughness. Polyurethane products are applied in the same way as standard varnishes, and raise the same concerns about dust contamination.

Water-based varnishes are the fastest growing segment of the clear finish market. With environmental regulation, the government has forced the coatings industry to increase research and development in this area.

Water-based clear finishes are manufactured using the same technology developed for latex paints. The resins incorporate acrylic and/or polyurethane particles suspended in water that coalesce as the water evaporates. Unlike solvent-based products, these varnishes are heavily applied and shouldn't be thinned. Water-based products dry to a colorless film with good clarity and hardness. We've had pretty good results with Elite Diamond Finish, a waterborne finish that Flecto introduced in 1989.

An important step in the development of water-based clear finishes was the addition of *crosslinking* compounds, which cause the resin materials to link together into larger, stronger molecules, improving the toughness and durability of the coating. Flecto's Diamond Floor Finish has crosslinking agents.

Waterborne clear finishes are scuff resistant and dry quickly with relatively little odor. Professionals like them because they clean up with water, but there are some drawbacks. Applying a waterborne finish takes extra work, because it requires more coats than a solventborne product does to achieve the same film thickness. It will also raise the grain more, so you'll have more sanding to do after the first coat dries.

Water-based products are similar to nitrocellulose lacquer in their resistance to heat, water, and chemicals. Like lacquers, a waterborne finish has to be applied quickly and evenly to prevent brush marks.

The jury is still out on many of these new water-based products because they haven't yet stood the test of time. What is clear is that some do not pass this test. Many older floor finishes held up to constant wear for decades, while manufacturers of some waterborne floor finishes are recommending refinishing every five or six years.

Using Stains

Stain applications are integral in most clear wood finishing systems.

BYRON PAPA

A high-gloss oil-based polyurethane varnish provides the highest level of protection for wood countertops. For the cabinet faces, a satin varnish is preferable because it creates less glare.

Staining is the step that provides the color that we associate with "natural" wood finishes. The process is not difficult, but some understanding of the wood and how it receives the stain is helpful. Remember that wood is a dynamic substance with natural irregularities. These irregularities must be accounted for in order to provide an acceptable stained finish. In some cases (for example, with pine and maple), a clear wood conditioner may be needed to even out the absorption of the stain and avoid a blotchy appearance. Other woods, such as oak and mahogany, accept stain more evenly and do not require this preliminary seal coat.

Stain can be applied to wood by any means necessary. Brush, rag, roller, and spray systems all work. Apply and distribute a coat of stain evenly to the surface and let it sit for a while. Follow by wiping the excess material with a dust-free, absorptive rag. (Caution: Oil-based stain residue on rags can result in spontaneous combustion. Discard used rags into a water bath and dispose of them carefully!) Allow the stain to dry *thoroughly* and the surface is ready to receive the clear finish of choice.

Stains, like clear finishes, are available in a variety of solvent bases, including water, oil, and alcohol. They are also available in two viscosities, liquid and gel. To complicate matters further, stains are made with two different types of colorant, pigments and dyes. But in general, compatibility of the stain with the top clear coat is not an issue as long as you remember to read the label and follow the instructions.

Surface Prep

Regardless of the finish chosen, it's not going to hide a flawed surface. We don't usually have to provide a furniture-grade finish, but we do sand all bare work up through 220-grit sandpaper. Work that will receive a solvent-type coating can be cleaned with a tack cloth, but the varnish in this cloth isn't compatible with waterborne finishes and could cause the film to come loose (or "lift"). Use a dust brush and an air nozzle to clean work that will be coated with water-based products. (Make sure, though, that you're not spraying compressor oil onto the surface to be finished.)

Don't try to fill nail holes before applying the first coat of finish, because you'll smear filler into the surrounding wood and create a blemish. Shoot or brush the first coat and then apply filler; you'll use less of it and the patch will be less noticeable. We prefer colored putties, which are widely available in solvent-based formulas. If there's a concern about compatibility with waterborne coatings, we'll use Crawford's Putty.

Application Tips

Almost all clear finishes are applied by brushing, spraying, or wiping on. When using polyurethanes and varnishes on natural woods, the first coat should be thinned by with about a third of its volume in solvent. This enhances penetration and helps to fill pores in the wood. Subsequent coats can be applied at package consistency. Waterborne products shouldn't be cut at all.

For cabinets and trim such as door casings and baseboards, a minimum of four coats of clear finish is the norm. For wood paneling and tongue-and-groove ceilings, three coats may be sufficient. Small jobs can usually be done with a high-quality brush; use bristle brushes for traditional products and a nylon bristle brush for water-based coatings. At PaintCraft, we like Purdy brushes, which pick up the finish easily and lay it down without a lot of brush marks. Larger jobs are easier to spray, a task you might want to sub out to a painting contractor.

After each coat has completely dried, the work should be sanded with 220- or finer-grit paper, or #00 steel wool. (Avoid steel wool with water-based finishes, however: You'll get rust discoloration from the steel residue.) Then dust, vacuum, and wipe the surface with a tack rag to remove all dust particles before applying the next coat.

James Benney, Dan Greenough, and Doug Kelly *are members of PaintCraft Associates, a San Francisco Bay-area guild of professional finishers. Visit their Web site at www.paintcraft.com.*

Sources of Supply

Crawford's Products Co.
P.O. Box 4339
Whittier, CA 90607
213/721-6429
Crawford's Putty

Deft, Inc.
10061 Talbert Ave., Suite 200
Fountain Valley, CA 92708
714/963-7115
Deft Clear Wood Finish

Flecto Coatings Ltd.
1000 45th St.
Oakland, CA 94608
800/635-3286
Flecto Varathane

Purdy Corp.
P.O. Box 83097
Portland, OR 97283
800/547-0780
Brushes

Valspar Corp.
1191 S. Wheeling Road
Wheeling, IL 60090
847/541-9000
McCloskey's Heirloom Varnish

William Zinsser & Co., Inc.
173 Belmont Drive
Somerset, NJ 08875
732/469-4367
Zinsser's Bull's Eye