

Overview of Interior Wood Finishing

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The following was originally written for design professionals in order to give them a basic understanding of the steps involved in the selection and application of interior wood finishes. It is presented in the Wood Kote Product Catalog as a service to our customers.

Reasons for wood finishes:

Various products are applied to wood for the following reasons:

1. Enhancement of appearance
2. Preservation of the appearance
3. Protection of the wood and appearance
4. Provide an easy to clean surface

Quality of wood finishes:

The value of a wood finish can be judged by the following factors:

1. Beauty of the appearance (subjective)
2. Durability of the finish
3. Stability of the finish

Wood finish systems:

The steps required to create a durable wood finish are called a "finish system," (also referred to as a "cycle" or "formula") and can comprise the following:

- 1) Preparatory steps:
 - i) Stripping away of old finish
 - ii) Bleaching
 - iii) Patching (if necessary)
 - iv) Sanding
 - v) Priming or sealing
- 2) Staining
- 3) Grain filling
- 4) Glazing
- 5) Top coating:
 - i) Filling nail holes
 - ii) Final top coating
- 6) Maintenance

Preparatory steps:

Stripping:

If the wood surface has previously been finished with paint or any type of wood finish system, it will be necessary to remove all the old finish. This can be achieved using one or both of the following two methods:

1. Mechanical stripping:

This involves using sharp blades or scrapers to physically lift the old finish from the wood surface. Depending on the material, the application of a stream of hot air from a heat gun as the surface is scraped may facilitate the removal of the existing finish. The other mechanical method for removing an existing finish is to use abrasive materials commonly referred to a "sand paper."

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2. Chemical stripping:

There are many chemical compounds sold as paint strippers or finish removers. Most of these contain Methylene Chloride or N-Methyl-2-Pyrrolidone (“NMP”) as an active ingredient. These compounds are generously applied, usually by brush, over the existing finish and the adhesion between the wood and the finish will be broken. If the existing finish consists of several coats, multiple applications may be required. The old finish should be taken away from the wood while it is still moist and soft using a scraper and/or scour pad.

Bleaching:

If the wood surface requires the removal of an existing finish as above, all traces of paint, varnish and stain must be removed and the complete surface given a uniform sanding with medium coarse paper (120 – 180 grit). If, after sanding, the wood is colored by any remaining penetrating stain that will in any way detract from the new finish, a bleaching agent made with oxalic acid can be applied to lighten the color. If such an agent is used, all residues must be removed because it may affect the properties of subsequent coatings.

If a new or “blond” look is desired for the wood, it should be treated with one or more applications of a hydrogen peroxide wood bleach solution. This product will lighten the appearance of wood by bleaching its natural tannin. Hydrogen peroxide bleach can also remove certain unwanted stains, such as those caused by water but this type of product is not meant to remove prepared wood stains that have previously been applied.

After the final application of hydrogen peroxide bleach, the wood must be allowed to dry thoroughly before any stain or coating is applied. Under ideal conditions, 68-70°F (20-22°C) 40-50% relative humidity, dry time will be at least 72 hours.

Patching:

If portions of the wood surface are missing, because of chips, nicks, etc. these may be filled using a wood filler. Wood fillers are available in solvent and water based forms. Both are available in a range of colors to closely match the surrounding wood. Solvent-based fillers generally dry faster. All applications of wood filler should be applied in an amount that allows the filler when dry to be sanded down to the wood surface. A word of caution is necessary here. Most wood fillers contain resins that seep into and help create a bond with the surrounding wood. The resins can affect the penetration of subsequent stains. Therefore, when sanding the wood filler, it is recommended that the immediate surface of the surrounding wood be sanded away to remove traces of the resins. This is especially true if wood filler has been used to fill brad or nail holes. The remaining resins surrounding the filled holes, if not sanded away, can create a “donut” appearance at each hole after stain is applied. It is therefore recommended that nail holes be filled with putty tinted to match the final wood color only after the first transparent coat is applied. Most fillers can be tinted with addition of pigments, stains or colorants. There are water-based fillers that do not contain resin. These fillers can be reconstituted with water. PLEASE NOTE, wood grain fillers (see below) are not formulated to fill holes, chips, nicks or cracks and should not be used for such purposes.

Sanding:

The purpose of sanding is to remove any dirt, glue and old finish from the wood and provide a smooth uniform surface suitable for staining and varnishing. There is no procedure that

affects the appearance of the final finish more than the sanding. The sanding can be done by hand or machine but care must be taken to follow the grain of the wood. It is recommended that the entire surface be sanded uniformly with abrasive paper no more coarse than 60 grit or no finer than 220 grit. More coarse grit will result in more pigment being retained in the wood and therefore a deeper color will appear. To avoid a blotchy appearance it is imperative that the sanding be uniform.

Priming:

It is possible to stain many non-wood surfaces to appear like wood using a stainable primer. If a painted or previously finished surface is in good condition and is compatible with the stainable primer, it is possible to create a stained-wood appearance. Such application can avoid the cost of having to remove the existing finish. Stainable primer can also be applied to paint-grade (finger-jointed) wood in a manner that allows some natural grain to show yet conceals the union between woods.

Sealing:

Because of the characteristics of certain woods and certain stains it is necessary to apply a sealer or stain controller to prevent the stain from blotching or "wild graining." A sealer will collect in the more porous portions of the wood and thus limit the amount of stain penetration on those areas and give a more uniform appearance.

Other types of sealers can be applied after staining. Sanding sealers are used because they contain compounds that create a microscopically uneven surface that is easy to sand prior to subsequent coatings. Vinyl sealers provide a moisture barrier and are recommended where surfaces may be exposed to water such as restaurants.

Staining:

This is the process whereby architectural wood (and in some cases primed synthetic) surfaces can be made more valuable because their appearance is changed and enhanced. The purpose of staining may be to bring definition to the wood grain, to match the appearance of a different species of wood, to unite other surfaces or to compliment other architectural features.

Simply stated, all wood stains are all variations or combinations of two types of stains:

1. Dye stains which actually dye the fiber of wood.
2. Pigment stains which deposit pigment between the fibers and into the pores of wood.

Dye stains such as aniline dye stains allow more "depth" to a finish and are often used for fine furniture. They are, however, photosensitive and will fade with exposure to natural or even artificial light. Today, NGR (Non Grain Raising) dye stains are available. NGR dye stains provide depth and clarity but have UV (Ultra Violet) resistance and are therefore much more stable (lightfast) than aniline dye. NGR stains are available in alcohol and acetone bases.

Pigmented stains are stable and are most often recommended for architectural application. Pigment stains are available in liquid or gelled forms. Generally the quality of stain application is judged by the following factors:

1. Stability of the color
2. Uniformity of appearance

Dye stains can be difficult to apply. They are usually best applied in a proper spray booth by an experienced applicator. Extreme caution should be used to achieve an even application. Dye stains are very difficult to remove from wood and subsequent applications will change the color.

Dye stains are made from 6 base colors. An infinite array of colors can be produced by intermixing the colors. Adding solvent can reduce intensity.

For on-site application it is difficult to surpass the best quality solvent-based gelled or liquid stains. There are stains of questionable quality on the market. The best stains hold an ample amount of pigment in a vehicle (resin). Gelled stains have an advantage in that the pigment will not settle to the bottom of the container and the stain color will, therefore, be uniform throughout the application process. Gelled stains and heavy body liquid stains are recognized as semi-transparent surface stains that are simple to apply and deliver stable and uniform color over a wide variety of wood species.

An infinite number of colors can be created with gelled and liquid stains by the addition of colorants to factory colors or to a clear base. Pigment stains can be applied to wood with various methods such as cloth, brush or spray. After application, excess product should be removed by wiping in the direction of the wood grain. Intensity of color can be controlled to some extent by the amount of stain that is wiped away.

Grain filling:

Properly filled wood grain will allow for a mirror smooth finish with fewer coats of transparent finish and should, in fact, reduce total time labor and materials. This process is often disregarded, even by professional painters because they are either not familiar with the products or find the application process difficult. For a quality finish on open grain woods such as oak, walnut and mahogany, however, this process is strongly recommended.

Please note: grain fillers contain a certain amount of oil and resin that will partially seal the wood surface. Grain fillers should, therefore, be applied after previously applied stain has completely dried. Grain fillers are available in natural and in colors. Pigmented grain filler can, at the same time, serve as a wood stain and filler or used over stains to provide interesting variations to the surface.

It is important to recognize that grain fillers are not formulated to fill holes or cracks in wood. This process should be completed using a wood patch before the wood sanding process is completed or after the first application of transparent finish if using putty.

Glazing:

The change in appearance by the application of a glaze is difficult to describe but it can provide a profound enhancement to the final appearance. A glaze can be defined as a type of stain used to soften or blend the original color of the surface without obscuring it. A glaze can be defined as a coating that is used to highlight and enhance the grain pattern of wood. In fact, glazes can be used to create artistic effects, including but not limited to, dirt, old age, smoke damage, simulated marble and wood grain. The unique quality of a glaze is derived from the way its pigments reflect and refract light. Because the qualities of a glaze work synergistically with clear topcoats the final optical effect will not be apparent until after the subsequent application of the final transparent coating. Glazes can be applied directly over stains or can be applied between transparent coats. The technique used to apply a glaze and its position in the finish system will affect its ultimate appearance.

Top Coating:

The application of the transparent (or semi-transparent) finish is the final step which gives the surface the protection and appearance desired. This step is often generically referred to as "varnishing." The choice of topcoat material should be determined by the following factors:

1. Compatibility with products previously applied
2. Final appearance desired
3. Stability of the final appearance
4. Longevity of the top coating
5. Types of exposure to light and wear
6. Frequency of cleaning
7. Reparability

In very broad terms, top coatings, also referred to as varnishes, are divided into shellacs, lacquers and polyurethanes. Each category of topcoat and all the variations within each category have distinctive characteristics, advantages and disadvantages. The ideal finish might be described as; easy to apply by a number of methods (brush, roller or spray), fast drying, high build (thickness),

excellent adhesion, hard, durable, chemical resistant, colorless, non-photosensitive, non-polluting, odorless, available in a wide range of sheens (gloss, satin or matte) and inexpensive. We are not aware of any topcoat that possesses all of these qualities. It is the job of the design professional to specify the topcoat system that best fulfills the requirements of the particular circumstances.

Below is a list of some common transparent coatings and a brief outline of their uses, characteristics, advantages and disadvantages.

COATING	USES	CHARACTERISTICS	ADVANTAGES	DISADVANTAGES
Lacquer (nitrocellulose-based)	Interior, paneling, casework	Spray or brush, medium build, moderate yellowing	Quick drying, easy to touch-up, economical	High odor, flammable, low resistance to wear or abrasion
Catalyzed Lacquer	Interior, paneling, casework, cabinets, doors	Spray, medium build, very low yellowing	Quick drying, hard, chemical resistant	High odor, flammable
Polyurethane (water-based)	Interior, exterior (with sufficient build not exposed to direct weather), furniture, paneling cabinets, doors, trim, floors	Spray or brush, medium build, low yellowing, hard finish, easy to apply	Low odor, quick drying, easy to apply and sand, soap & water clean up	Not as durable as solvent-based polyurethane, 72 hr wait if applied over solvent-based stain, high cost
Catalyzed Polyurethane (water-based)	Interior, surfaces that require very durable finish, trim, floors	Spray or brush, medium build, low yellowing, very hard finish	Low odor, quick drying, soap & water clean up	Short "pot life," 72 hr wait if applied over solvent-based stain, high cost
Polyurethane (solvent-based)	Interior, food surfaces, table tops, doors (interior), trim, floors	Spray or brush, high build, high yellowing, hard finish	Very durable finish, high resistance to wear, common compounds & cleaning agents	Slow drying, yellowing
Polyurethane UV (solvent-based with ultra violet inhibitors)	Interior & exterior, outdoor furniture, doors & windows (interior & exterior)	Spray or brush, high build, high yellowing, hard finish, UV resistance can be renewed with periodic applications	Very durable finish, high resistance to wear and light	Slow drying, Yellowing, direct sun will reduce UV resistance
Gelled Polyurethane (solvent-based wipe-on)	Interior, casework, trim	Cloth application, very low build, low yellowing, low odor	Very easy to apply, fast drying, self-leveling, perfect for overhead work, no masking or clean up	Requires many coats

Maintenance:

When an interior wood finish is complete, i.e. when the final transparent coat has cured, the entire surface should be wiped with a wood polish containing a cleaning agent. This will remove traces of dust, dirt and grime. Wood polish will bring out the maximum beauty of the finish. Periodic applications of wood polish will keep the finish looking its best and increase its longevity. CAUTION: Use the least amount of polish necessary to clean the finish. Over-application can create an oily surface.

For exterior surfaces exposed to direct sunlight, the life of polyurethane UV can be extended indefinitely with annual re-applications. Even a light aerosol application will rejuvenate the ultraviolet inhibitors.