C. BATES

PREFINISHED HARDWOOD FLOORING

by Don Bollinger

These products install quickly and take the guesswork out of floor finishing

Wood floors are usually a simple matter. You nail 3/4-inch-thick planks or hardwood strips to a sound, dry, level subfloor, then hire a reputable sub to sand and finish them to perfection. When circumstances permit, this is the best option. That's because a solid wood floor is more than a covering. It adds strength to the floor system, and can be repeatedly refinished.

But solid floors have limitations. For instance, what do you do if you've got a below-grade or concrete subfloor that might subject the hardwood to high humidity? Or a floor height that doesn't permit underlayment? Or a project that's too small to interest a sanding sub? Or a job where you don't want the mess or scheduling delays caused by sanding?

There are a growing number of prefinished wood flooring systems that solve these problems. Prefinished floors can be installed close to the project's completion date with minimal fuss and mess. They're available in a number of wood species, and with nearly any type of stain or finish. Many prefinished floors perform as well as conventional wood floors under more demanding conditions, yet don't require wood subflooring, sanding, finishing, or special skills to install.

Prefinished flooring can be classified by whether it's solid or laminated, and by whether it's nailed, glued, screwed, or "floated" in place. If the floor has to endure years of hard service and repeated refinishings, solid wood is probably your best choice. Solid prefinished flooring comes in thicknesses ranging from 1/4 to 3/4 inch. To permit even a single refinishing, the boards should have a minimum 1/8-inch-thick sanding surface (the amount of stock between the top of the tongue and the surface of the board); 3/4-inch boards should have a 1/4- to 5/16-inch sanding surface. Solid wood floors should be nailed, screwed, or glued to a structurally sound and dry wood subfloor.

Laminated Floors

If refinishing isn't an issue or if there's a concrete subfloor, consider using a laminated product. Laminated wood floors are available in strip, plank, and parquet styles (see Figure 1). They already dominate the market in many parts of the world. Laminated products are less demanding on our

Figure 1. *The 1/8-inch-thick top veneer of this Robbins laminated floor is guaranteed for three sandings.*

C. BATES

Figure 2. *One advantage of a floating floor is that it can be installed over a continuous moisture barrier that doesn't get punctured by fasteners. A foam or felt pad must also be used as a gasket.*

natural resources than solid wood and, given time, will no doubt become more plentiful and less expensive. For now, however, their cost varies from slightly less to a great deal more than solid wood. But just as there are times when a solid wood floor is best, there are other times where a laminated product is more appropriate. Laminated products are more stable and less prone to dimensional expansion and contraction, so they're my first choice for below-grade floors. In my opinion, a laminated product is also the best option for glue-down floors. (More on glue-down floors later.)

Here are some things to consider when comparing laminated flooring products:

- ***The number of plies.*** More plies generally means a stronger and more stable floor (three plies is typical).
- ***The species of the face veneer.*** Dense woods like jatoba or merbau will take a lot more punishment than softwoods like pine. A teak-faced product will be more dimensionally stable than an oak-faced one (see "Wood Flooring Species").
- ***The cut of the face veneer.*** Rotary-cut veneers (like those on a sheet of plywood) dent easily because they expose much of a board's early growth — its soft underbelly — to the ravages of floor traffic. Sliced veneers are much more durable. Rotary cuts are more common in American-made products, while sliced veneers are more common in European products.
- ***The species of the core veneers.*** The core and face laminates should be made from the same species, or at least from species that expand and contract at the same rate. Manufacturers use any of hundreds of species for the core veneers. If the face and core expand and contract at different rates, they could eventually delaminate. The use of different species is more common with imported than with American-made flooring.
- ***The installation method — nailing, gluing, or floating.*** How good a floor feels to the homeowner depends on how it's installed. Floating floors seldom feel as solid as nail-down or glue-down floors. I usually have customers walk on both types to see if they like them.
- ***The type of finish.*** A top-quality finish will last a long time but may also be quite expensive — more on finishes below.

You should also be aware of special techniques used by the manufacturer. Bruce, for example, makes the only wide-plank prefinished floor on the market, while Hartco makes a five-ply laminated flooring that's exceptionally stable. Hartco also has a product called Pattern Plus that consists of strips of acrylic-impregnated red oak veneer glued over thin, noticeably spaced strips. The product fits the contours of uneven substrates remarkably well. Robbins Traditional Strip oak flooring features a 1/6-inch-thick sanding sur-

C. BATES

Figure 3. *Instead of being fastened to the subfloor, most floating floors are installed by gluing adjacent boards to one another. The floor acts as a monolithic panel that's free to expand and contract.*

BOB GRANT/MAINE COAST LUMBER

Figure 4. *The only nonglued floating floor is made by Junckers. The boards are held in place with special metal clips.*

face — guaranteed for three complete refinishings. Junckers has developed a process for condensing the cells of even fairly dense woods like beech. Its flooring can withstand extraordinary punishment without denting, yet is remarkably stable.

While most laminated products are colored with regular oil- or water-based stain, a few manufacturers offer something better. Hartco, PermaGrain, Applied Radiant Energy (Gammapar), and Bruce use a process called acrylic impregnation on the face veneer of some of their laminated flooring. They oven-dry 1/4- to 5/16-inch layers of wood in a vacuum, then saturate them with a pigmented liquid acrylic. Acrylic impregnation has some decided advantages. The acrylic penetrates the entire wood thickness, coloring it permanently and uniformly, and making scratches less obvious and easier to repair. It also stabilizes the wood fibers and enhances the wood's dimensional stability. Applied Radiant and PermaGrain take the process a step further by exposing the impregnated product to gamma radiation. This causes near complete cross-linking of the acrylic molecules, making a more abrasion-resistant surface.

The downside to acrylic impregnation is that it's expensive — which is why only four manufacturers do it. In addition, it can only be done with very porous woods — red oak is the most common but some manufacturers also use ash. Acrylic-impregnated boards are also subject to oxidation. If a metal table leg sits long enough on a damp, acrylic-impregnated floor, the wood beneath it can turn green.

Nail-Down and Glue-Down Floors

Nailable products may be solid or laminated and come in a range of thicknesses. They include 1/4-inch parquet and 3/8- to 3/4-inch strip flooring. Though 3/4-inch-thick solid prefinished floors can be nailed in place just like standard strip flooring, there are some complications. If you're not careful, you can scratch the finish with the base of the metal nailer. One way to guard against this is to create a cushion by wrapping the bottom of the nailer with duct tape. Thinner panels — 3/8 and 1/4 inch — can also be nailed, but a wedge adapter must be attached to the flooring nailer. All nailable products must be installed over a wood subfloor.

Figure 5. *To prevent cracks from opening up between floor boards, the edges of a floating floor must have room to move freely with changes in temperature and moisture. A standard baseboard will cover the gap along the walls (left). At thresholds, some installers notch the ends into a tongue-and-groove header board that's fastened to the floor (right), but even this can restrain movement enough to cause problems.*

Glue-down products can be installed over nearly any flat, dry subfloor, including concrete. Only laminated strip or plank products (with a few notable exceptions) can be successfully glued without nailing. Solid parquet is glued all the time. A laminated strip or plank floor glues down faster and easier than a nailed floor. (Solid wood flooring can't be counted on to install snugly or to lay flat in a bed of mastic, much less to stay that way over time.) Glue-down solid boards must also be less than 2 feet long — anything longer would be too hard to straighten out without nailing.

If you're installing a glue-down floor, you can get an excellent moisture barrier by using a mastic to glue two layers of 4- or 6-mil poly to the substrate. Lay the poly layers in opposite directions and overlap the seams at least 6 inches. Then glue a layer of plywood to the poly. No fasteners should be allowed to penetrate the moisture barrier.

Floating Floors

In a floating floor, the tongue-and-groove boards are fastened to each other rather than to the subfloor. Floating floors are fitted together without nails and are installed over a foam or felt pad and a continuous vapor barrier (Figure 2). Because the pad acts as a gasket, a floating floor can be installed over smooth tile or low-pile carpet. Although not altogether recommended by manufacturers, floating floors can in some cases perform well even over exposed aggregate (that is, concrete with a rough surface), an option that requires a 1/8-inch-thick layer of foam. If the job calls for it, you can even lay the flooring over a soundproof underlayment like homasote. Floating floors are perfect for use over radiant heat, in areas with above-average shifts in moisture levels, or over concrete.

Most floating floor products are installed by gluing the tongue to the groove (Figure 3). The exception is Junckers, which makes a floating floor system that's held together with slightly bent metal clips that slide into slots cut in the underside of each plank (Figure 4). The clips exert enough tension to hold the boards together, yet permit seasonal expansion and contraction.

Though the edges of a floating floor are covered by a standard baseboard (Figure 5), door openings must be finished with a threshold (called a header board) that's attached to the subfloor and has a lip that permits the flooring to slide freely beneath it. To eliminate this threshold, some contractors glue down the ends of the flooring. But gluing down a floating floor voids the warranty. Because the ends are restrained while the rest of the floor is free to move with changes in temperature and humidity, gaps tend to radiate out from the glued end to the center of the floor. Many installers restrain the ends by notching them into a tongue-and-groove header board that's set perpendicular to the flooring and that's

screwed or glued to the subfloor. The intent is to let the ends of the boards move as freely as the centers. But while this is better than gluing the ends, I've found that the tightness of the joint will inhibit movement enough that some gaps will still appear in the floor.

Comparing floating-floor products. Before choosing a floating floor, ask your supplier for samples of the styles you're considering. Lay them out on a flat surface. Boards should be flat and straight, with little or no curvature along their length. Minor irregularities should disappear once the tongues are fitted into the grooves. If it's hard to keep the pieces flat, you'd do well to ask why or to make another selection. Longer pieces almost always have more bows than shorter ones, so if you see a lot of bowing in the shorter pieces, strike that product from your list of choices.

Next, slip the pieces together side by side on a smooth surface. If they go together easily yet snugly, and display minimal fissures along the sides and ends, you've got a winner. Unfortunately, samples are almost always better than the real thing, and radical changes in humidity can cause even the most superbly milled product to look and perform like waste.

Finally, look for any thickness variations between the strips, as these will leave ridges where the pieces come together — a condition called overwood. An uneven substrate can also cause overwood. Overwood is easily sanded out on a site-finished floor, but with a prefinished floor you're stuck with it. How much overwood is acceptable depends on the homeowner; I've found that the most dissatisfied homeowners are the ones who start with unreasonable expectations. You can lessen the chance that clients will be unhappy by telling them just how much overwood to expect. Many manufacturers lessen the effects of overwood by easing or V-grooving the edges, and sometimes the ends, of their floor boards (Figure 6).

Understanding Finishes

After narrowing your choices by flooring type, you should compare the finishes that manufacturers use. At one time, all prefinished flooring was finished with a coat of wax, but that's less common every year. As much as I personally love wax (my home office glows with hand-rubbed waxed hardwood floors), it's hard to maintain. It's slick when wet, and water will remove the wax or leave stains. For this reason you can't use a damp or wet mop to clean a waxed floor — only dry mops are permissible.

Today's factory-applied coatings rival, and in some cases surpass, practically anything a professional floor finisher can apply on site. Literally hundreds of floor finishes are available, from oil-based finishes to acid-curing Swedish finishes. But urethanes are rapidly emerging as

Wood Flooring Species

Species	Color of Heartwood	Hardness (relative to Red Oak)	Dimensional Stability (relative to Red Oak)	Durability
Ash	Light tan	+2%	+26%	Excellent shock resistance, remains smooth under friction
Birch	Reddish brown	–2%	+8%	Stiff and very strong, excellent shock resistance
Douglas Fir	Tan to light brown	–49%	+28%	Easily dented, somewhat brittle, splinters easily
Hickory	Tan or reddish	+41%	–11%	Strong, very shock resistant
Pecan	Reddish brown with dark brown stripes	+40%	+15%	Strong, very shock resistant
Hard Maple	Pale to creamy white	+12%	+4%	Dense, excellent shock resistance, resists wear
Mesquite	Light brown to dark reddish brown	+82%	+65%	Dense, very strong
Red Oak	Reddish brown	—	—	Dense, resists wear, high shock resistance, less durable than white oak
White Oak	Light Brown	+5%	+1%	More durable than red oak, resistant to insects and fungi
American Black Walnut	Dark brown to purplish black	–22%	+26%	Moderately dense, very strong, good shock resistance, not as dent resistant as oak
Brazilian Cherry	Red to orange-brown	+82%	+19%	Dense and very strong
Jarrah	Pinkish to dark red	+48%	–7%	Dense and very strong, highly resistant to wear
Santos Mahogany	Dark reddish brown	+71%	+36%	Extremely durable
Padauk	Reddish or purple-brown or black	+34%	+51%	Average to high durability

the standard for factory-applied finishes on wood flooring.

UV-urethanes. Most people have heard of oil-modified and aliphatic urethanes, but the lesser-known "UV-urethanes" are by far the most durable. These factory-applied coatings are made from 100% solids (though they go on wet), and are cured with ultraviolet light right after application. (Oil-modified urethanes can take months to fully cure.) A fully-cured finish holds up better to abuse, a quality that's crucial during the final phase of construction, when seemingly every trade on a project runs roughshod over its freshly painted face.

Some manufacturers advertise the fact that they apply two or three coats of UV-urethane. However, long-term durability hinges not on the number of coats but on total film build. I wouldn't buy a flooring product with a film build of less than 1.5 to 2 mils. Film build should be noted on the product's sales literature.

As good as UV-urethanes are, they have their drawbacks. Their performance is greatly affected by the underlying wood. Porous, early growth wood grain soaks up more of the finish than does the more dense, late-growth wood. Since the ultraviolet light can't penetrate the wood grain, the urethane never fully cures. This can lead to a cracked surface and will give off toxic fumes. An uncured UV-urethane will give off a sickening solventlike odor that can be very unpleasant in an enclosed area. (Fully-cured UV-urethanes have no odor.)

Some manufacturers compensate by using grain fillers that prevent the urethane from soaking too deeply into the wood. This permits greater film build with the same amount of urethane or less. It also gives you a better-looking, better-performing product at less cost to both the purchaser and the environment.

UV-urethanes are also quite expensive, so not every manufacturer offers them. (It can cost several million dollars to set up a UV-urethane manufacturing line.) However, most of the big manufacturers offer at least one UV-urethane-finished product in their "top of the line" category.

Other urethane products. If you can't afford a UV-urethane, consider using some other type of urethane coating, such as an oil-modified or waterborne urethane. This will more than likely provide an easy-to-clean, slip-resistant surface that holds up well in heavy wear areas like bathrooms, kitchens, and entries, where occasional but inescapable water can quickly ruin wax or oil finishes.

Beware the urethane with wax topping. Manufacturers that produce a lot of flooring may run their finish lines at speeds that retard proper drying and curing of many urethane finishes. To keep the uncured boards from sticking together in the package, they apply a thin coat of wax to the surface. In my opinion this defeats much of the purpose of applying a urethane, as such boards have all the maintenance problems of a waxed floor. Though the package should say that the flooring has a wax topping, it may not — you have to ask. ■

Figure 6. *Many manufacturers reduce height discrepancies between adjacent floor boards by easing or V-grooving the edges.*

Don Bollinger, of Seattle, Wash., has been a flooring installer for more than two decades. He is currently chairman of the Technical and Education Committee for the National Wood Flooring Association.

For More Information

The National Wood Flooring Association (NWFA) represents wood manufacturers, distributors, dealers, and contractors. Its publications and video tapes show how to choose, install, and maintain all types of hardwood flooring, including prefinished products. The association's *Specifiers Guide* is a compilation of about 50 technical reports that explain which products work best under various site conditions. For more information, contact: National Wood Flooring Association, 233 Old Meramec Station Rd., Manchester, MO 63021; 800/422-4556.

Sources of Supply

Applied Radiant Energy Corp.
(Gammapar)
P.O. Box 289
Forest, VA 24551
804/525-5252

Bruce Hardwood Floors
16803 Dallas Pkwy.
Dallas, TX 75248
214/931-3000

Harris/Tarkett Inc.
P.O. Box 300
Johnson City, TN 37605
615/928-3122

Hartco/Tibbals Flooring Co.
300 S. Main St.
Oneida, TN 37841
615/569-8526

Junckers Hardwood Inc.
4920 E. Landon Dr.
Anaheim, CA 92807
800/878-9663

PermaGrain Products Inc.
13 W. 3rd St.
Media, PA 19063
215/565-1575

Robbins Inc.
4785 Eastern Ave.
Cincinnati, OH 45226
513/871-8510