

# American Hardwoods Stand Up to High Use

Durable wood flooring adds warmth and character in commercial settings.

**N**oted for their warmth and character, American hardwoods often grace interiors where natural materials and a distinctive look are desired. However, architects and interior designers are also increasingly specifying hardwoods for high-traffic settings in commercial and institutional settings—finding that in addition to beauty, hardwoods score high marks in terms of durability, ease of maintenance, and other benefits. This article will cover design considerations when decorating with hardwoods, as well as techniques for finishing and maintenance.

## THE CHARACTER OF HARDWOODS

Unlike factory-made, artificial materials, each hardwood board has a unique life story. During the approximately 60 years it takes for a hardwood to mature, each tree develops a one-of-a-kind grain pattern and texture. Like



## Learning OBJECTIVES

*Interiors & Sources' Continuing Education Series articles allow design practitioners to earn continuing education unit credits through the pages of the magazine. Use the following learning objectives to focus your study while reading this issue's article. To receive credit, read the article and turn to page 50 and follow the instructions.*

After reading this article, you should be able to:

- ▶ Identify which types of hardwoods are specified for high-traffic settings.
- ▶ Explain why factory-finished floors are more durable and consistent than on-site finished floors.
- ▶ Determine how a floor's abrasion-resistant qualities can be enhanced.

The  
Hardwood  
Council

**LEFT** The atrium staircase in this LEED Silver science complex at Albion College was made from wood harvested from maple and cherry trees that were removed from the site prior to construction.

PHOTO BY JUSTIN MACONCHIE

silks, leather and precious stones, hardwoods are shaped by natural forces and they may display a variety of character markings. Even boards from the same hardwood tree will show significant variation in color. For instance, “younger” wood closer to the bark (sapwood) will be lighter than the wood that comes from the central portion (heartwood). Also visible are the effects of the minerals and other essential elements that the tree absorbed as it grew. The following terms are important to know:

- ▶ **Knots:** Hard, cylindrical regions marking locations of branches that have been encased by later growth of the tree.
- ▶ **Mineral streaks:** Olive or grayish markings caused by such environmental factors as trace elements in water or soil.
- ▶ **Grain:** The direction, size, appearance and quality of wood fibers.
- ▶ **Growth ring:** Layer of wood added to a tree during a single growing season ... made up of early wood and late wood.

The appearance of hardwoods and their durability vary by species. For use in high-traffic settings, four hardwood species are commonly specified: red oak, white oak, cherry and hard maple.

Red oak, which has a white to light brown sapwood and a pinkish, reddish-brown heartwood, was used at Princeton University's Lewis Thomas Laboratory—one of the most cutting-edge, sophisticated facilities in the world. Wide corridors, glass walls between labs, and informal gathering alcoves encourage interaction among scientists, and the warmth of red oak doors,

rails, wainscoting, ceilings and casework adds a richness and character that quietly “humanizes” this highly technical laboratory environment.

Researchers, who routinely spend 18 hours a day within its walls, report that the presence of hardwoods and natural light gives the laboratory a home-like feeling. “The thing we hear most often is how comfortable it is to work in,” says James Collins, Jr., AIA, principal at Payette Associates of Boston, who designed the building's interior. “Buildings have to support the people inside them. Natural hardwood is very effective at humanizing a space. Wood creates that psychological connection.”

At the Museum of Modern Art (MoMA) in New York, which averages 2.5 million visitors a year, the choice for flooring was 120,000 feet of American white oak, which blends with the glass and granite in the gallery. “With museums in general, the floor should be a backdrop, not call attention to itself. The less active the grain, the better,” notes Roger Berk of Haywood-Berk Floor Co., who worked with MoMA on the floors. The oak was FAS (“first and second”) grade—the National Hardwood Lumber Association's clearest grade, which bears few, if any, knots or other natural marks.

The flooring used at MoMA consists of planks with a 4-inch face, random 3-foot to 16-foot lengths, and ¾-inch thickness, conventionally tongue-and-grooved. “Length was a major issue, because the gallery sizes are so large that, without the length, it would look very choppy and full of joints—very unattractive,” says Berk, noting that one of the galleries is 17,000 square feet.

While hardwoods are often associated with a formal, elegant design aesthetic, certain species and cuts can work to achieve a more untailored look. Mainstream retailer American Eagle Outfitters, for example, uses hardwoods

## ADD INSTANT HISTORY to a Room

Adding History



**N**atural wear is a growing trend, so much so that designers are specifying it into a hardwood floor. “Distressed” flooring, where the boards have been made to look worn either by hand or machine, has the look of flooring that has been aged and lived on for years. Distressed hardwood floors add a distinctive look and a sense of “instant history” to a room, with any minor character marks adding to the overall beauty.

These floors, often cut into 5-inch-wide planks, can be found in solid hardwoods or engineered, and can be distressed and finished in a factory or on site. Factory-distressed hardwood floors are often run underneath a large metal roller that distresses the floor before the stain and finish are applied. Some manufacturers will dent the wood or sand it unevenly to achieve a worn look; and light, medium or heavy levels of distressing can be applied to the flooring. Although it is less expensive than hand-scraping, machine-distressing can result in floors that

have repeating scraping patterns, which detracts from the wood floor's natural look.

Before the advent of electric sanders, rough flooring planks were hand-scraped to make them look flat. Modern hand-scraping adds character and authenticity to a wood floor—resulting in a more undulated and textured surface with character marks, such as wormholes and splits. When done properly by skilled artisans using traditional hand tools, hand-scraping can create a unique floor; however, with hand-scraped floors the results are as good as the artisans doing the scraping, and can vary widely in quality, with lack of skill leading to uneven or poor results.

Lori Anderson of Lori Anderson Interiors in Omaha, NE, selected hand-scraped, prefinished, 5-inch, white oak planks with a brown sable finish for her design showroom. Going after a distressed loft look, Anderson preferred white oak to red oak because it takes a cleaner stain and has a tighter, more uniform grain. The unevenness of the wood planks has resulted in nicks and scrapes that Anderson appreciates. “It could have been the flooring in an old warehouse,” she says. “We’re looking forward to getting it even more scuffed up to enhance the distressed look.” Anderson notes that any significant scrapes can be easily spot-sanded or touched up.

LEFT Lori Anderson Interiors' showroom in Omaha features “distressed” white oak plank flooring.



in its 949 stores. “We have used oak, ash and maple,” explains John Bezek, vice president of construction. “We typically are looking for a ‘casual’ feel in our stores and the rustic or lesser grades of these species seem to fit the bill.”

#### BEAUTY THAT AGES WELL

Unlike other materials such as stone, wood has elasticity, which allows it to absorb shocks much better. Although it does tend to scratch, the scratches are less visible than on other materials and can be removed by sanding. Over the years, wood mellows and takes on a richer, smoother appearance, with some species taking on a prized antique look.

Architect Craig Kimmel of Reese, Lower, Patrick & Scott of Lancaster, PA, uses hardwoods because they age well. “I prefer a floor that shows a little patina,” he says. “Hardwood gets that patina with long-term wear. There is a richness in hardwood that you simply can’t get out of synthetics. They don’t have the same longevity of character that wood has.”

Kimmel specified Pennsylvania-grown hard maple wood for the 120-seat

● **ABOVE** For the floor of this 120-seat performance hall, Lycoming College wanted a durable material that could withstand significant chair and foot traffic—and a moveable grand piano—yet would enhance the character of the 19th-century building.

PHOTO BY MUTMANSKY PHOTOGRAPHY

Shangraw Performance Hall at Lycoming College in Pennsylvania. As the college’s premier performance venue, the hall is used, on average, three times a week.

“The hall sees a lot of chair traffic, and has a grand piano that moves. I wanted something durable that would take that kind of imprint but has character,” explains Kimmel, noting that solid hardwood also has the benefit of imparting sound quality. “Wood works very well in a recital hall. There’s a great acoustical quality to it ... a reverberation ... an ability to project sound.”

Because of hardwoods’ inherent long-term appeal, Kimmel is increasingly specifying it for clients who have tried less expensive alternatives. “People recognize the quality of hardwood because of the experiences they have had with knockoffs. They dimple and don’t hold up well,” he adds.

**ON-SITE VERSUS FACTORY FINISH**

A key concern in hardwood flooring is whether to use on-site finishing or a factory-finished application. Flooring is subject to minute inspection and must withstand substantial wear and tear, so a thorough consideration of all factors involved is advised in that decision.

A high-quality, site-applied finish requires planning, adequate time and careful attention to detail. That deep, glossy, finished look involves repeated sanding, proper cleaning and multiple finish coats. Finishing floors on site requires more time and skill than installing factory-finished materials. Finishing a hardwood floor in the field can tie up a work site for five days or more and requires extensive preparation. Other work that could jeopardize the quality of the finish will have to stop, adding time to any construction schedule.

At MoMA, the wood flooring was finished on site. "That involved the standard Museum of Modern Art practice, which is to put on two coats of linseed oil and then wax the floor. No urethane," notes Berk. "Many museums—the ones that have a lot of wood floors—have something like that. They use traditional finishes like oil and wax—this is partially because the offgassing of certain chemicals is a problem."

"We have done both finished in-place and pre-finished over the years," says Terry Jackovic, senior manager, facilities and real estate development at American Eagle Outfitters. "Depending on the look, costs, durability, installation time, etc., we think there is no substitute for the authentic feel of a finished-in-place floor. But quality control and installation time can be a challenge. Although the finish-in-place products are excellent these days, pre-finished allows us to move a little quicker, control the finished product better, and maybe gain a little in durability. We typically use pre-finished except on rare occasions."

Factory finish is a trend that is gaining in popularity. With factory-finished flooring, the manufacturer applies a finish at the factory, typically at least four coats of ultraviolet-cured urethane resin. Manufacturers say these finishes are more consistent and durable because they are applied under strict controls. Factory-finished floors can be installed straight out of the box, which can make the job easier. Factory-finished hardwood products can offer consistent quality and quick installation due to the following factors:

- ▶ **Controlled Environment** – Manufacturing takes place in a controlled environment without the need to contend with the effects of other building trades working nearby. Dust, traffic, temperature and humidity are out of the picture.

- ▶ **Consistency** – Factory-finishing operations work with low-pressure, high-volume spray guns and spray booths, and roll-coating techniques—so a uniformly good appearance from piece to piece comes much more easily. Maintaining consistency across a whole installation is another matter—when cutting and mitering expose fresh wood, a factory finish is difficult to match, and touch-ups are tricky if there's damage on a busy job site. Finish-matching is easier, however, if you ask the supplier for a touch-up kit. Most manufacturers will supply stains and coatings from the same batch used on your materials, with instructions. A factory-finished floor will not be as flat as a site-finished floor. Some "over-wood/underwood" should be expected.
- ▶ **Additional Steps** – On-site finishing is generally a process consisting of three steps: stain, seal and finish coat. A manufacturer can go through four, seven, even 13 or more steps with additional sanding and extra finish coats to add richness and depth. However, if both processes are completed professionally, a site-applied or factory finish can be the same.
- ▶ **Cost** – Per linear foot, factory-finished hardwoods can cost substantially more than unfinished products. Despite these high upfront costs, installation is quicker and less expensive, without the need to be concerned about stain or finishing material disposal regulations.

**HARDWOOD FINISHES**

Manufacturers offer a wide selection of finishes designed to enhance and protect the wood floor, each with its own distinct benefits and appearances.

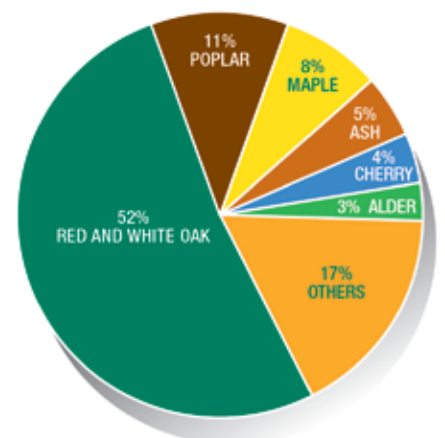
**SURFACE FINISHING**

Surface finishes involve applying a stain to achieve a particular color, followed by a top coat of polyurethane or varnish to give a protective coat. Surface finishes are durable, resist moisture, and are easy to maintain. There are four options for the top coat, and each has its own benefits:

- ▶ **Oil-based urethane** is a commonly used floor finish. Available in gloss, semi-gloss, and satin sheens, oil-based urethane is generally applied in two or three coats, with a drying time of up to eight hours for each coat. This type of finish dries by evaporation of petroleum-based solvents, so adequate ventilation is important. The finish will amber as it ages.



**Which Hardwoods are Most Abundant?**





● **ABOVE** The Penn State University's Forest Resources Building is a LEED Silver, 96,000-square-foot building. Exposed structural elements of the building such as beams, trusses and columns demonstrate the uses of wood and the beauty of natural elements. Ash, cherry, red oak panel and trim are used throughout.

- ▶ **Water-based urethane**, another commonly used finish, provides a clear, non-yellowing finish and produces fewer odors than other choices. This product dries quickly and there are a number of choices of water-based finishes, including different blends of acrylic and urethane resins.
- ▶ **Moisture-cured urethane** is a solvent-based polyurethane that is more durable and more moisture-resistant than other surface finishes, and is ideal in commercial, high-traffic settings. This finish is available in a satin or gloss non-yellowing formula, as well as one that will take on an amber hue with age. The finish relies on humidity to cure and is generally unsuitable for use in very dry areas. It should only be used by a professional familiar with the product.
- ▶ **Conversion varnish** is a product that resists yellowing. It produces a rich, pleasing patina. It is flammable and, like moisture-cured urethane, produces a very strong odor and should only be applied by a skilled wood flooring professional.

Knowing the species is a prerequisite to choosing the surface finish.

#### PENETRATING FINISHES

These finishes actually penetrate the wood to form a protective seal. The stains soak in to provide color, and a wax coating gives a low-gloss satin sheen that can be maintained with additional thin applications. These finishes require special care. Water-based products should never be used to clean or maintain the floor—only solvent-based waxes, buffing pastes, or cleaning liquids specifically made for wax-finished wood floors.

Particularly in high-traffic settings, the latest trends in finishes include products designed to further extend the life of hardwood floors.

Factory-finished and site-finished floors can be equally durable in high-traffic areas. Some factory-applied finishes contain aluminum oxide to enhance the abrasion-resistant qualities of the floor.

Acrylic-impregnated finishes provide an extremely hard, durable barrier to dirt, moisture, and wear and tear because the finish is actually forced into the pores of the wood at the factory.

#### BEAUTY WITH LITTLE UPKEEP

For the most part, hardwood floors can be maintained with simple, routine cleaning measures. The main damage to a wood floor comes from debris. Dirt, dust and grit can dull a floor's finish and cause scratches that can only be repaired by refinishing. Regular sweeping is recommended, using a broom that features exploded tips to trap dust and dirt, not simply spread it around.

Another concern is ultraviolet radiation in sunlight, which can cause discoloration over time. Ultraviolet rays, which can burn and age skin, will affect any organic material, including wood. Prolonged exposure to sunlight will change the color of virtually any wood floor, regardless of the stain or finish. Some woods lighten when exposed to sunlight. Others, like cherry and oak, tend to darken. Some finishes feature sunscreens to help block the penetration of ultraviolet rays, extending the time it will take the wood to change.

Regardless of its finish, a hardwood floor can quickly lose its luster if exposed to excessive water, and may even warp. But that hasn't kept designers from specifying hardwood flooring in dining halls. Middlebury College in Vermont was concerned about using wood flooring in its oval-shaped pavilion. The 6,500-square-foot floor was made of certified hard maple, entirely harvested from campus-owned forests, and was sawn, dried and milled in Vermont. However, despite repeated exposure to water and daily damp mopping, the floor continues to hold up well, confirms the college's construction project manager Mark Gleason. "The hall serves anywhere from 700 to 900 kids for dinner each day, so it gets a great deal of use. It still looks great." Once a year, the floor is buffed down to the bare wood and a low-VOC, water-based sealer is applied.

Pennsylvania's Grove City College also went with wood flooring—oak parquet—for its main dining/sitting area. The building features a two-story arched window showcasing a soaring cathedral ceiling framed in heavy wood timbers and bolstered by glulam beams. Its interior walls on both floors are paneled in Pennsylvania red oak, with extensive oak trim around oak doors and windows. "The red oak paneling adds warmth and character, and dresses up the interior," says Tom Gregg, vice president of operations at the college. The main dining/sitting room endures the foot traffic of more than 400 students daily. "We chose the oak parquet floor because it was attractive, durable and cleanable," adds Gregg, noting that maintenance on the oak floor is minimal. The impregnated finish has a low-VOC coating for easy care and durability. The oak paneling gets a wipe-down with an earth-friendly cleaner once a year.

"We don't do a lot in the way of exotic maintenance," says American Eagle's Bezek, explaining that quarterly cleanings and application of a low-sheen maintenance coating are standard. "We are not averse to some natural wear that goes with the casual feel. This is one point we feel 'finished-in-place' wins out. The wear is more natural," he adds.

Today, designers can choose from a broad array of colors and styles in durable hardwood flooring and easy-care finishes that bring beauty and practicality to any setting. ●

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1. A hardwood matures in:

- 10 years
- 25 years
- 60 years
- 100 years

2. Younger wood closer to the bark is called:

- heartwood
- sapwood
- grain
- growth ring

3. The direction, size, appearance and quality of wood fibers is called:

- a mineral streak
- grain
- a knot
- character mark

4. Which of the following is not typically specified for flooring in high-traffic settings:

- oak
- hard maple
- hickory
- cherry

5. Red oak sapwood is:

- white to light brown
- pinkish red
- gray
- cream to beige

6. FAS grade is the National Hardwood Lumber Association's:

- intermediate grade
- clearest grade
- most economical grade
- lumber that has numerous character marks

7. Over the years, wood:

- scratches badly
- warps
- dries out
- takes on a richer appearance

8. A benefit of solid hardwood is that it:

- never scratches
- absorbs water
- imparts sound quality
- doesn't fade with exposure to sunlight

9. What is not necessary for a glossy on-site finished floor:

- repeated sanding
- buffing
- multiple finish coats
- proper cleaning

10. With factory-finished flooring, the manufacturer typically applies:

- wax
- two coats of acrylic
- one coat of ultraviolet-cured urethane resin
- at least four coats of ultra violet-cured urethane resin

11. Factory-finished floors are more consistent and durable than on-site finished floors because they:

- have more coats
- are applied under strict controls
- are installed out of the box
- eliminate "human error"

12. Which step is not generally included in on-site finishing?

- stain
- seal
- sanding
- finish coat

13. Which is not an advantage of surface finishing:

- resists moisture
- durability
- easy to maintain
- finish penetrates the wood to make it extra hard

14. The surface finish ideal for high-traffic commercial settings is:

- oil-based urethane
- water-based urethane
- moisture-cured urethane
- conversion varnish

15. A type of finish that resists yellowing is:

- oil-based urethane
- water-based urethane
- acrylic-impregnated finish
- conversion varnish

16. This product should never be used to care for floors with penetrating finishes:

- solvent-based waxes
- water-based cleansers
- buffing paste
- brooms with exploded tips

17. A floor's abrasion-resistant qualities can be enhanced by finishes containing:

- aluminum oxide
- urethane
- wax
- conversion varnish

18. Hardwood floors can generally be maintained by:

- repeated coats of wax
- simple cleaning techniques
- high-powered buffing machines
- soap and water

19. The main damage to a wood floor comes from:

- water
- scratches
- heel marks
- debris

20. When exposed to sunlight, hardwood floors:

- will darken
- will lighten
- will darken or lighten depending on the species
- will remain the same

21. Regardless of its finish, a hardwood floor can lose its luster if exposed to:

- sunlight
- excessive water
- the wrong cleaning products
- excessive scrapes and scratches

22. In distressed flooring, the boards have been made to look old by:

- hand
- machine
- hand or machine
- burning

23. Distressed floors can often be found in:

- 10-inch planks
- 12-inch planks
- 5-inch planks
- 2-inch planks

24. A disadvantage of floors distressed by machine is:

- cost
- dents
- smoothness
- repeated patterns

25. A hand-scraped floor will be as good as:

- its finish
- the species of wood
- the skill of the artisan
- state-of-the-art tools used