



A number of bamboo flooring products are now available in North America, but most are manufactured in a very similar manner.

When we first learned about tongue-and-groove strip flooring made from bamboo several years ago, we found only a couple of suppliers in North America. A lot of people must think this is a product with a future, however, as now there are at least eight companies importing it. Botanically, bamboo is not a wood at all, but rather a grass. Bamboo is attractive as a building material because it is very hard, strong, and dimensionally stable. Environmentally, it's hard to argue with a wood-substitute that matures in three years, regenerates without need for replanting, and requires minimal fertilization or pesticides. In fact, these larger species of bamboo have been used in construction for thousands of years, and even in modern Asian cities it's not uncommon to see a large concrete building being constructed from a bamboo scaffolding.



This floor was laid by EBN editor and erstwhile builder Nadav Malin using  $\frac{3}{8}$ " strip flooring from Bamboo Hardwoods, the only product not from China.

To make bamboo flooring, the hollow round shoots are sliced into strips, which are boiled to remove the starch. The strips are dried and laminated into solid boards, which are then milled into standard strip flooring profiles. The bamboo is treated with preservative, either before it is laminated, after, or both. Several manufacturers report using the relatively nontoxic boric acid as a preservative—others didn't say. Most manufacturers offer both a light, natural color flooring and a darker, amber variety. This amber color is achieved by pressure steaming the bamboo, which darkens it by carbonization.

All the products are laminated using urea-formaldehyde (UF) adhesive. Bamboo Hardwood's Doug Lewis experimented with a non-formaldehyde isocyanate resin but found it made the product too expensive. Plyboo's Ron Caso reports that they are experimenting with a less toxic "white glue." UF resin tends to offgas formaldehyde for quite a long time after production, but the amount of resin in a laminated product is much less than in a particleboard-type product. Caso reports that emissions from Plyboo's product created a formaldehyde concentration of 60 micrograms/m<sup>3</sup>—half the allowable level under Dutch regulations.



Bamboo floors provide a very rich visual texture, with thin strips of varying color interrupted by the bamboo nodes.

All the manufacturers tout the hardness and dimensional stability of their bamboo flooring, though the actual data cited vary somewhat. For hardness, specs quoted range from slightly lower than red oak to significantly harder—1130 PSI (7.8 MPa) to 1640 PSI (11.3 MPa) as measured by the standard “Janka Ball Hardness Test” (ASTM D1037). The dimensional change with moisture content is also significantly less than that for most common hardwoods.

Nearly all bamboo flooring sold in North America is produced in the southern Chinese province of Hunan, in an area known as “the bamboo sea” for its extensive bamboo forests. These forests are owned by the government, and individuals or companies can obtain contracts to harvest from them. Lewis of Bamboo Hardwoods explains that the shoots reach full size in one to two years, but it takes a third year for them to mature to the point where they are no longer feeding the plant. If the shoots are cut before that time, the plant suffers, while after the third year the shoot becomes “dead weight,” and the plant benefits from its removal. Contrary to the concerns of some, the harvesting in these forests is not a threat to Pandas, as they live at much higher elevations and eat a different species of bamboo.

## BAMBOO FLOORING SUPPLIERS

After exploring options in China, Lewis opted to set up his own factory in Vietnam, in part because the farmers supplying him with bamboo own their own land and thus have an incentive not to harvest the shoots prematurely. Lewis also wanted control over conditions in the factory, so he could address environmental and worker safety concerns effectively.

The company that has sold the most bamboo in the U.S. is flooring distributor Smith & Fong Company of San Francisco. Their bamboo flooring business has been doubling annually, according to Dan Smith, who says: “It’s making up a [noticeable] percentage of our business now.” They are continually expanding and diversifying their product line and now offer flooring accessories not available from the other companies, including stair nosing, reducer strips, thresholds, and beautiful grills. Smith acknowledges that, in a joint venture with the Chinese manufacturer, they have little control over environmental and worker safety issues. He looks forward to a time when they might own their own factory in order to be able to control these factors—an option that was not available in China when they started the joint venture. Smith & Fong and Plyboo America both claim rights to the “Plyboo” name—an issue that is now being taken up in court.

Both Smith & Fong and Bamboo Hardwoods are introducing longstrip or floating floor products in addition to the standard strip flooring. Lewis reports that Bamboo Hardwood’s product consists of a bamboo veneer over a rubberwood core, using melamine glue. Rubberwood is produced from trees that are no longer productive in rubber plantations, so it is not an ecologically sensitive wood species. Lewis is also experimenting with a flooring consisting of a bamboo veneer over a substrate of rubber from old tires.

We installed a floor of Bamboo Hardwood’s material and found that it installs just like standard hardwood flooring. The  $\frac{3}{8}$ ” thick strip flooring is not nailable with a standard flooring nailer, so we used a pneumatic finish nailer. Not having the flooring nailer made it harder to ensure tight joints between the strips. After sanding, we used a water-based urethane, which raised the grain substantially and required substantial resanding between coats. There were a few irregularities in the material we received, which Lewis attributes to the fact that they’re still adjusting manufacturing systems. Bamboo Hardwoods is also not well set up as a company, which made communications and logistics unnecessarily difficult.

Prices for bamboo flooring products range from \$4 to \$8 per square foot (\$40-\$80/m<sup>2</sup>), making them a bit more expensive than flooring from domestic hardwoods. The pre-finished products all use UV-cured finishes, which have low-VOC emissions. Any of these products should make an attractive, durable floor, so take your pick!