

BASIC KNOWLEDGE OF BAMBOO FLOORING

To start, I'd like to emphasize three points. First, the most important thing you have to remember about bamboo is that it is not wood. Second, when you're dealing with bamboo, leave all of your wood habits and assumptions at the door. The only things it really has in common with wood are that it grows from the ground, and that it's hygroscopic. Last but not least, not all bamboo is the same. In general, bamboo flooring is like anything else—you get what you pay for and it's not really fair to blame the species for all of these problems, except insofar as it truly is a bit trickier to produce a quality flooring product out of bamboo than it is out of wood. Let's look at why.

Bamboo's Biology

Bamboo differs from wood in some of its basic biological structures. Lignins are the natural resins that concentrate in the tissues of wood and bamboo that give them strength and density. In bamboo, those lignins are heavily concentrated in the vascular bundles. The strength of the fibers in these vascular bundles is incredible—it actually rivals steel. But the tissue between the vascular bundles, called the parenchyma, is much weaker than the tissues in most hardwood species.

In bamboo, the strong fibers are clustered more densely at the outer wall of the stalk and get less dense as you move inward. This is very different from wood, where the strong fibers are distributed more evenly throughout the log. In bamboo, the average density of the outer half of the wall may be twice that of the inner half.

To make bamboo flooring, rectangular strips are cut from the wall of the stalk, so each strip has a dense side and a less-dense side. The inner portion of the wall is more stable than the outer portion, so one side of the strip expands and contracts more than the other. So, every strip of bamboo is inherently imbalanced, and this is one of the biggest challenges manufacturers have to overcome.

Bamboo is different from wood in another crucial way: It expands and contracts along its length (longitudinally). In most woods, longitudinal shrinkage doesn't really affect flooring installations, but in bamboo it is 2-3 tenths of a percent—enough to start being noticeable.

Another challenge is that the density and dimensional stability of bamboo change as you move up the stalk. Material taken from the base of the stalk will be less dense and more stable than material taken from higher up.

Now, in case things weren't complicated enough, here's a twist—along the length of the stalk, we have the same type of stability imbalance that we do through the thickness, but it's reversed! The soft inner wall is more stable than the outer wall when it comes to expansion and contraction across the grain, but it is actually less stable than the outer wall in the longitudinal direction. When a strip of bamboo goes into the mill, it will shrink more across its width on the dense side, while at the same time it shrinks more along its length on the soft

side. One side wants to cup while the other side wants to bow in the opposite direction. You can imagine the tension this creates.

The Newest Version: Strand

While traditional bamboo flooring may not be quite as tough as it's cracked up to be, its newer cousin, strand bamboo, is extremely hard and holds up well in high-traffic settings.

Strandwoven bamboo is made of small strands of bamboo that have been soaked in phenolic glue, re-dried, and then compressed into a composite. The result is a product similar to OSB except that the strands of bamboo run the full length of the plank, making it look more like natural wood. As a composite, it is much harder and, in most cases, more dimensionally stable than traditional bamboo flooring.

Some may doubt the statement that strand bamboo is more stable because many people have seen problems with it, but it's important to not confuse dimensional stability with reliability. Dimensional stability tells us how much the material will expand and contract, but it does not necessarily predict how well it will stay flat.

Other Job-Site Problems

There are some other common issues people encounter with bamboo on the job site. Most installers are in the habit of leaving expansion space along the sides of the planks but not where the boards end by the wall. With solid hardwood, you generally don't have to worry about it. With bamboo, because of its greater longitudinal instability, you do. You might also see the opposite problem when things get too dry, where the ends will pull away from each other. Gapping at the butt joints can happen with both traditional and strand bamboo.

The growth in the popularity of strandwoven bamboo has been a big boost to the inspections industry; cupping claims on installations over concrete are a huge problem. Many strand jobs have mystified claims inspectors and glue manufacturers because the slab was within allowable limits and the vapor retarder was properly applied, yet still the floor cupped. It has led people to believe that strand bamboo is highly sensitive to moisture, but from what I've seen, strand bamboo has done just as well as similarly dense species of hardwood when installed over a crawlspace. The problem is that when it is installed on a slab, the density and the resin in strandwoven bamboo make it hard for the vapor to escape, causing moisture to slowly accumulate and condense on the surface of the slab. The strandwoven bamboo is itself a vapor barrier, but one that will absorb water slowly over time. This explains why some of these cupping claims over concrete are very slow to develop. The condensation of water under the strand bamboo also may account for the relatively large number of so-called "glue failures" that we've seen in these installations.

To prevent cupping, the perm rating of the vapor retarder would have to be equal to or lower than the perm rating of the strand bamboo itself, which is apparently extremely low, so you need an excellent vapor retarder. So, with strandwoven bamboo, it's even more

important than with other materials to thoroughly test and seal the concrete, and to avoid installations where there is any sign of a moisture problem.

Another problem you may see with strandwoven flooring is a phenomenon I call “rippling,” where you get tiny ripples or wrinkles in the face. Many strand installations have this problem, but it’s often so subtle that the end-user hasn’t noticed it. There are a couple of factors likely contributing to this. First, inconsistent or inadequate drying of raw material means that when the product acclimates at the job site, some strands are lifting or sinking relative to others. Second, there is a rebound effect—strands that have been compressed together have a tendency to want to bounce back against the direction of the press, especially with moisture.

The cracking problems that happen with engineered traditional and strand bamboo also show up with some solid strand products. Like with wood, drier conditions seem to bring this out more, but I’ve seen cracking develop in samples from lesser-quality manufacturers even at sea level in San Francisco. The causes of these cracks are often related to the same factors that cause the rippling—the rebound effect and inconsistent drying. But cracking can also sometimes be a symptom of a poor quality resin and/or improper curing.

Two other problems that you’ll sometimes encounter in strandwoven installations are dimpling and edge crushing, which may look the same but are caused by different things. Dimpling usually occurs when the installer is using cleats that are too thick—strandwoven manufacturers recommend 18-gauge cleats, but many installers are in the habit of using 15.5-gauge cleats. Because this material is so dense, the fasteners will push it up and create a lump at the surface.

Edge crushing is a trickier problem. Strandwoven bamboo is very strong but brittle, and if the installer bangs his nailer too hard, he can create fractures in the side of the plank that may not be visible right away. If the planks later expand and pressure is exerted at that seam, the fractures get worse and can travel up through the face. You should be able to tell the difference between dimpling and edge crushing by the fact that on a dimpled floor, many of the lumps won’t have cracks, and they will be visible right away.

The Takeaway Highlights

The truth is that if bamboo is properly made and installed, it can make a great floor. We have been involved in countless commercial and residential jobs that have gone off without a hitch and left the customer very satisfied. The strand bamboo floor that our customers put in my kitchen in 2006 still looks brand-new today.

To summarize, remember a few key pieces of advice:

- 1) Avoid using traditional bamboo in demanding settings where you have high traffic, big dogs, etc. It’s really just not as hard as the Janka test results indicate.
- 2) Be sure to thoroughly acclimate and carefully measure the moisture content of strand bamboo before installation. You might be surprised how long it takes to acclimate properly.

3) If you plan to install strand bamboo on a slab on-grade, do careful testing to make sure there are no moisture issues, use the best vapor retarder possible, and be extra cautious with carbonized material.