

SUSTAINABLE LIVING GUIDE: 75. WHAT IS ENGINEERED WOOD?¹

Chaya©

Engineered wood is a buzzword among green builders and conservationists, but a mystery to many homeowners. What is engineered wood, how do you apply it properly in construction, and what makes it a renewable building material? I consulted with some experts in the field of engineered wood composites and asked them about everything from new developments in technology to classic problems with application. What follows is a pretty thorough overview, which I suggest you read if you are considering building with wood products.

What Are Engineered Wood Composites?

There are two primary types of engineered wood composites commonly used in residential construction: oriented strand board and laminated strand lumber, known as OSB and LSL, respectively. Oriented strand board is a panel; laminated strand lumber is a structural lumber substitute. Both of these products are made of particles of wood that are bound together with an adhesive.

Performance Comparison

How do engineered wood composite beams with fiber reinforcement compare to milled lumber? According to Professor Douglas Gardner of the Wood Science and Technology School of Forest Resources at the University of Maine, engineered wood has a higher load-bearing capacity. Gardner said, “If you test it to failure, typically [milled] wood will break in the tension zone and propagate. Usually what happens in the tension zone with reinforced wood is the failure tends to become more of a shear failure, and the beam actually becomes more ductile because the fiber reinforced plate creates a much stronger composite. “Thus, the failure mechanisms for these beams are different. And that could be a good thing, because that basically means that the failure might not be as catastrophic if you test to failure: The beam doesn’t fly apart. It basically crushes and it holds together because of the fiber reinforced plate on the bottom.”

In areas that are prone to natural disasters, beams that hold together rather than shattering are invaluable. It’s not just engineered structural lumber that makes a difference. According to APA – The Engineered Wood Association, sheathing your house with oriented strand board makes your house “two to three times more able to withstand high winds and earthquakes.” Professor Chip Frazier is a professor in the Department of Wood Science and Forest Products at Virginia Tech. He also vouches for the superior durability of engineered wood. Frazier said, “If it is applied properly, it’s going to perform the way you want it to, and it’s probably going to outperform solid wood.”

So why is that? Frazier explained, “Generally, structural composite materials are stronger and more dimensionally stable and more true — that is, there’s less warp and less dimensional variation, because in the process of making wood-based composites, defects like knots are reduced and distributed and homogenized. What you have in wood-based composites is that

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their properties vary much less. The fact that wood-based composites are more uniform means that on average, their design properties are greater than natural wood.

Proper Application of Engineered Wood Products

While structural composites are stronger than milled wood, they come with one big caveat: “Be sure that your contractors are applying the material properly,” warned Frazier. Essentially, engineered structural lumber is not applied in the same way as milled lumber. Frazier continued, “In certain instances, if the material is either not protected properly at the site, or if it’s not installed properly such that it doesn’t get any moisture, that’s an issue.”

Dr. Fred Kamke is a professor and JELD-WEN Chair of Wood-based Composites Science at Oregon State University. He’s an expert on proper applications of engineered wood. Kamke said, “Moisture is the biggest threat to the durability and aesthetics of engineered wood products. If we’re talking about the construction phase, then all wood products, whether they’re engineered wood products or solid lumber products, should be protected from water.” Kamke discussed the structural ramifications of getting engineered wood wet. He said, “Wood shrinks and swells when it gets wet. Once it becomes part of the home, you want to make sure the home is constructed with an adequate roof structure to direct the water away from these products. You have to ensure that the building foundation or slab that it’s built on is following the code requirements that would elevate this product up off the finished grade. You need to ensure that if there is a crawl space or a basement under this structure that it is adequately vented, again, to minimize moisture content.”

What Makes It “Green”?

Although wood has been around for thousands of years as a building material, researchers in the field of wood engineering are actually improving on it, and not just in terms of durability. Ecological production of wood products is another plus of engineered wood. According to Frazier, “A very low percentage of fossil fuels are consumed in the manufacture of forest products in general. The manufacture of the material has a very low carbon footprint because the energy is supplied by the combustion of waste wood, and combustion of wood is a carbon neutral energy source. And of course, the wood itself, the structural components of our houses, is renewable. It may take 15, 20, 30, 40 years to re-grow, depending on the tree and the location, but when you talk about petroleum taking 500 million years to form, it’s clear that trees are renewable. “A lot of folks, I believe, are not well-informed on renewability. If they see that it takes a stand of trees 20 years to grow back, or 30 years to grow back, they think it is not renewable because it is perhaps not in their lifetime. That’s a very narrow perspective.”

Gardner praised the efficiency of engineered wood production. He said, “What I’ve seen in the past few years is they’ve gone to different types of dryers. I know a lot of plants that have gone from a 3 pass dryer to a 1 pass dryer, and they are using much less natural gas or fuel to process the fibers so that there’s a big energy savings there. They’re going to faster curing resins, resins that might tolerate more moisture so you don’t have to dry the flakes as much. They’re using the same types of resins, but the resin manufacturers are always making modifications to improve those resin systems.”

The only considerable drawback of engineered wood composites is the price. Glue lam I-beams cost more than milled lumber I-beams, but the difference in cost varies by manufacturer and distributor. My take on the cost is that price is not the only factor in determining the efficiency of a building product. According to professor Gardner, “Typically when you make oriented strand lumber or oriented strand board, the amount of waste in processing the tree is much less

than sawing up lumber to make 2 x 4s or dimension lumber. So your yield for, say, making OSB might be 90 percent, whereas when making lumber out of a tree, your yield might be 50 or 60 percent and the rest is going to be sawdust.” Considering durability, load-bearing capacity and the green factor, engineered wood composites appear to be a good choice for the forward-thinking builder.