Floor Framing with Wood I-Joists

The first time I used wood I-joists was in a floor system set into a shelf in the foundation wall. We wanted to avoid using sawn lumber, which might shrink and cause problems, and engineered lumber fit the bill. We learned a lot about wood I-joists on that job — and spent a lot of unbudgeted time doing it. But in the end, the dimensional stability of wood I-joists and their resistance to deflection convinced us to keep using them.

Wood I-joists take some getting used to. While they perform better than sawn lumber in most cases, wood I-joists require special attention in handling, cutting, fastening, and bracing. Here are some of the things we've learned in five years of working with them.

CAROLYN BATES

Storage and Handling

You need to handle wood I-joists carefully, beginning with the way they're loaded at the yard. The availability of long lengths is one of the attractions of using wood I-joists, but not every supplier is equipped to handle them properly. This can result in damaged or weakened members.

Most lumberyards follow the manufacturers' recommendations to keep wood I-joists on edge while moving or storing them. But if they're handled while lying flat — both individually and in bundles — they can bow several feet at each end. This is especially true when long I-joists are lifted at the center with a standard forklift. Severe bowing, even for a short time, can cause splits in the flanges and webs that weaken the joist. Unfortunately, these defects are difficult to detect after the joists have been delivered to the site. Until you're sure the joists are being handled correctly at the lumberyard, plan to be on hand while they're loaded and unloaded. If your supplier doesn't have a wide-spread forklift or a boom truck with a two-point sling, ask to have the I-joists loaded by hand.

At the site, keep the stack of joists off the ground with a 2x4 every 8 feet or so. Stack the joists on edge (one next to the other or nested) and nail a 2x4 or a piece of strapping across the tops to keep the whole row from falling over). Finally, be sure to cover the stack to protect the joists from the weather: Wood I-joists (especially those with an OSB web) are more susceptible to water damage than sawn lumber.

Most of the time, we work with joists no longer than 24 feet. Individually, wood I-joists of this size don't bow enough to make much difference, so we lay them out on the walls just as we do with sawn joists. But long lengths can bow several feet if left unsupported at midspan. One solution is to use the interior partitions for support by framing them before laying the joists for the floor above. Another possibility, although we've never tried it, is to build a simple header or erect pipe staging to temporarily support the I-joists in the middle.

Cutting

Crosscutting a wood I-joist is tricky because the surface isn't flat. We use scrap plywood to make a two-layer template that

Handled, installed, and blocked properly, wood I-joists can produce flat, strong floors — even over long spans

by Ned Murphy

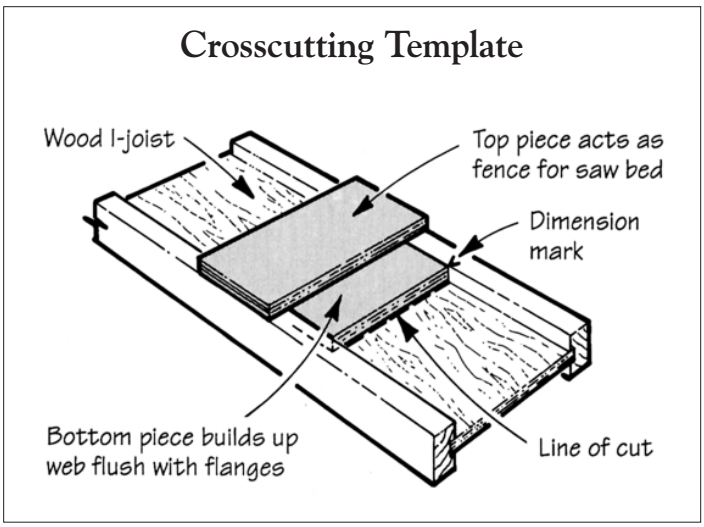

Figure 1. *A two-layer plywood template makes crosscutting wood I-joists a breeze. The bottom piece builds up the web flush with the flanges, and the top piece acts as a fence for the bed of the saw.*

fits between the flanges (Figure 1). The bottom layer lies in the web flush with the flanges, and the top layer acts as a fence for the circular saw to ride against. The template also allows us to mark the cut along only one edge of the joist. A single template built for the narrowest I-joists should work for larger standard widths as well, but you should build a separate template for each circular saw used for crosscutting or else designate one saw for all crosscutting. (Rafter templates work the same way, but must be built to the angle of the plumb cut.)

Don't assume that one end of a wood I-joist is a factory end. Many suppliers stock wood I-joists in 60-foot or longer lengths, and fill orders for shorter lengths by cutting down the full-length pieces. Often this is done by gang cutting a bundle of joists with a chain saw. If your order is the first to be taken out of longer lengths, then one end is probably square. But the second piece cut out of longer lengths is likely to have two wild ends. We make it a practice to check both ends for square before pulling dimensions for crosscutting.

Blocking

The installation instructions that come with wood I-joists show which joist intersections require extra blocking. Since blocking is time-consuming, however, we try to use details that don't require it. We use wood I-joists for rim joists, for example, even though thinner, less expensive material will do, because, according to the manufacturer, this detail usually needs no blocking. This also avoids any dimensional mismatches between the wood I-joists and sawn or composite rim joist material, like Parallam, Micro-Lam, or Timberstrand.

At stair openings, we use Parallam or Micro-Lam beams for the headers. The extra cost of the material makes up for not having to do all of the blocking required when engineered joists are doubled up or intersect. Parallam and Micro-Lam sizes, however, do not always match the joist sizes, so we sometimes have to rip the header material down to size. It's still easier and cheaper than blocking out the joists.

There are certain situations, however, where blocking is necessary. We install "squash" blocks, for example, on either side of wood I-joists at point loads and under bearing walls (Figure 2). A load-bearing wall that doesn't align perfectly with a wall below must be treated as a cantilever, which requires extensive blocking. And at joist hangers that don't support the top flange, you usually have to pad out the I-joist web (Figure 3, page 32).

Sometimes we screw blocks and filler strips to the joists ahead of time. But it's just as easy to fasten them after the joists are in place. We've used nail guns for this, but we switched to screws because we didn't like the way the nail points poked through the web.

Nailing

When fastening to beams or plates, wood I-joists will split if you nail closer than 1 1/2 inches from the ends, just like sawn lumber. But even at midspan, a nail that is started too close or angled

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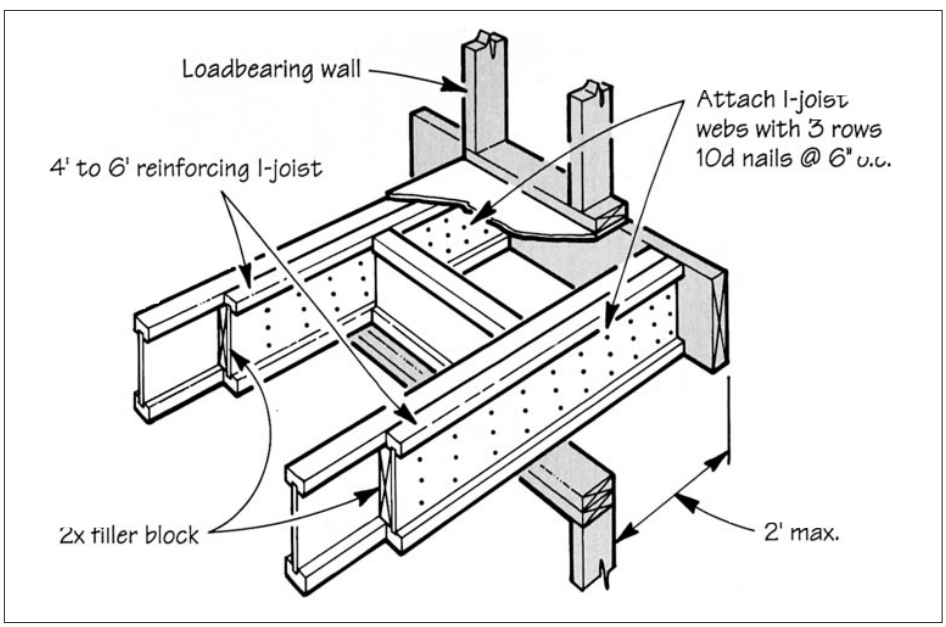

Figure 2. *Wood I-joists need "squash blocks" to support point loads or bearing walls (left). Extensive blocking is also necessary at cantilevers and where bearing walls are offset (right).*

My First Time Out With TJIs

by Carl Hagstrom

It's no secret that the quality of framing lumber has taken a nose dive in recent years. The percentage of 2x10s and 2x12s with excessive crowns, cups, twists, and bows is on the rise, making it difficult to frame a flat, true floor deck.

When lumber prices peaked this past spring, I was bidding a house with a 2x12 floor system. The word was that TJIs were "faster, stronger, straighter, and easier" than sawn lumber. And since TJIs priced out only slightly higher than dimensional lumber, I decided to give them a try. As with most new products, some of the hype was true, some wasn't.

Figure A. *The prepunched knockouts in wood I-joists don't always line up and often aren't where you need them. But the 1/2-inch web is easier to drill than sawn lumber.*

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Figure B. *Wood I-joists are light enough for one man to carry, but they're so flexible — especially long ones — that handling them is two-man work.*

The Good News

Make no mistake: TJIs will produce the flattest deck you've ever framed. Crowns are nonexistent — each joist is absolutely straight and uniform in dimension. There simply is no need to "work the pile."

With no crowned joists, it's also much easier to install T&G plywood. You can tap the plywood into place with a sledge and block — a real treat after years of beating on T&G plywood over uneven floor joists.

Finally, your subs will prefer the 1/2-inch web to full-thickness lumber when they start drilling holes. And don't forget the inherent resource efficiency of TJIs. A TJI requires less than half the wood to perform the same task as a conventional 2x12. Engineered joists also waste less of the log and don't deplete old growth forests.

What Price Perfection?

Wood I-joists aren't all sugar and spice. For one thing, they cost a little more. How much more depends on current market pricing. When I compared TJIs to 2x12s back in April 1993, TJIs added about $600 to the cost of a 2,200-square-foot floor deck — about 27¢ per square foot.

No mix and match. In my opinion, you should avoid combining conventional lumber with TJIs. If one section of your floor system shrinks at a different rate from other sections, you're headed for trouble.

Structural surprises. TJIs resist loads differently from sawn lumber. They're much stiffer at midspan, but they're weak at shear points. The rules of thumb that apply to standard framing may not work with TJIs. Make sure your supplier can provide qualified design support.

Less than a knockout. The manufacturer's literature describes the advantages of prepunched knockouts that eliminate the need to drill holes for wiring and pipes. In my case, the knockouts were there all right, but there was no way to get the darned things to line up (Figure A). Unless you like crooked wires and snaky pipes, don't plan on any time savings from the knockouts.

First-Time Tips

Start with a simple deck. My first try was a straightforward floor deck, and the learning curve was minimal. But it was easy to see that a lot of head scratching would be required with a more complex floor system.

Also, be prepared to give your supplier complete drawings. Concentrated loads and offsets are tricky with TJIs, and whoever designs your floor system should have a complete picture of the structure.

Finally, handling long TJIs is two-man work (Figure B). They're light enough so that one person can pick up a 36-footer at midpoint and lift it waist high, but both ends will still be on the ground. I also learned to unload TJIs so that they were pointing in the direction of their final position. One person can easily pick up one end of a 40-footer and drag it in a straight path, but it takes two to turn it around.

What about next time? First, I'd check the budget. If comparative costs were close, I'd use TJIs: They're just too straight to ignore. If cost were an issue, I'd still offer TJIs as an option to my customers, and let them choose.

My guess is that ten years from now, the majority of floor systems will be framed with TJIs. You might as well get used to them early.

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TRUS JOIST MACMILLAN

Figure 3. *The web of the wood I-joist must be padded out when joist hangers don't support the top flange.*

too sharply toward where the web meets the flange will split off the corner of the dado. Nailing at a slight angle out near the corner of the flange seems to work best. We use 8d or 10d box nails, and we can usually get only two nails in without splitting the flange.

The joist hangers made for use with wood I-joists have fluted holes that start the nail at the ideal angle for nailing through the flanges. But if you're not careful, the action of nailing can lift the joist up slightly so it isn't resting on the stirrup of the hanger. This creates squeaks later. Make sure you put some weight on the joist while nailing the hanger.

When nailing deck plywood into wood I-joists with a pneumatic nailer, if you happen to shoot the nail straight through the flange into the web, the head won't always set and will need to be finished off by hand. This is not a serious time waster, but it's a nuisance.

But there are much more troublesome aspects to wood I-joists when laying deck plywood. First, wood I-joists are more flexible laterally than sawn joists. This makes them wobbly, so you can't walk on them at all until you brace them. In fact, you shouldn't even stack materials on unbraced joists because there's a chance the joists will roll over under the load.

Second, the flexibility of wood I-joists can give you trouble when aligning the plywood decking. With a sawn joist, you can usually straighten a bow with the first piece of plywood you lay, and the joist is stiff enough to hold position until all of the plywood courses are nailed off. Wood I-joists, however, are not stiff enough to hold position until almost the entire length is nailed off. If you pull one over to align it with the first course of plywood, you may still have to pull it over for the next course. In fact, if you're careless with your layout marks, it's fairly easy to pull first in one direction and then the other, creating an S-shape in the joist (Figure 4).

Our solution is to mark the joist centers on the plywood before laying it in place, using a drywall square to extend the lines across the whole sheet. Then we're careful not to force the joist too much.

Shrinkage

If they are kept dry to begin with, wood I-joists don't change much in their height dimension. I have had I-joists expand about 1/8 inch in height from moisture, and then return to their original dimension when they dried. (This kind of movement is more noticeable in joists with OSB webs than in joists with plywood webs.) I have also had wood I-joists shrink in length as much as 3/8 inch over 60 feet. It may not seem like much, but in one case it was enough to bow the flush-framed Parallam beam that supported the joists at one end.

I've also had some difficulty matching wood I-joist sizes to Micro-Lams and Parallams. The joists are usually accurate and uniform, but the other engineered products sometimes vary in size and have to be ripped down to get a flush fit. Still, it's better than mixing in dimensional lumber, which will eventually shrink at a different rate. ■

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CAROLYN BATES

Figure 4. *Wood I-joists tend to bow — if you aren't careful, you can push and pull an I-joist into an S-shape when nailing decking.*

Manufacturers of Wood I-Joists

Alpine Structures
317 Providence Rd.
Oxford, NC 27565
800/672-2326

Boise Cascade
P.O. Box 50
Boise, ID 83728
208/384-6161

Georgia Pacific Corp.
1201 S.W. 17th St.
Ocala, FL 34474
800/423-2408

Louisiana-Pacific
111 S.W. Fifth Ave.
Portland, OR 97204
800/547-6331

Snavely Forest Products Corp.
P.O. Box 310
Freehold, NJ 07728
908/462-2323

Tecton Laminates Corp.
Hwy. 20
Burns, OR 93778
800/825-8120

Trus Joist MacMillan
9777 W. Chinden Blvd.
P.O. Box 60
Boise, ID 83707
208/375-4450

Weyerhaeuser Company
Tacoma, WA 98477
206/924-2345