## Attaching Deck Ledgers to Engineered Rim Joists

**Q Are ledger lag-bolting schedules that were developed for 2-by rim joists adequate for engineered rims? It seems that lag bolts would be more likely to pull out of a thinner engineered rim than out of a thicker 2-by Doug fir rim joist.**

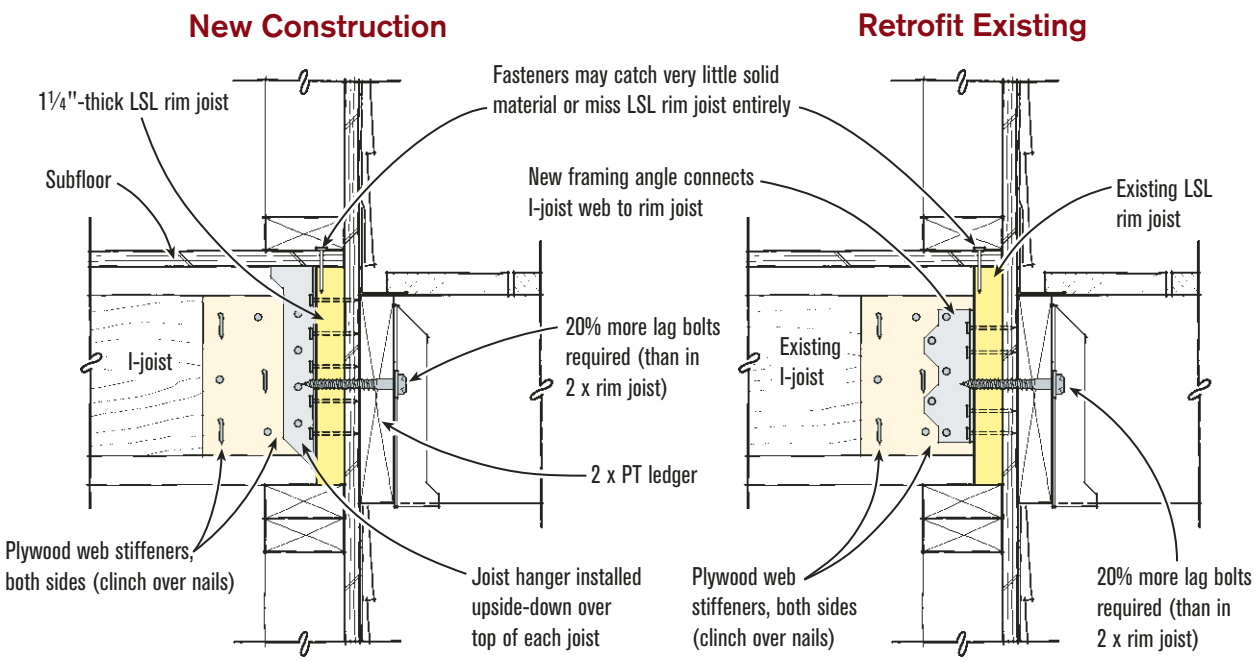
A Christopher DeBlois, a structural engineer with Palmer Engineering in Tucker, Ga., responds: You're right. Lag bolts don't get the same purchase in a 1¼-inch-thick engineered LSL (laminated strand lumber) rim joist as they do in 1½-inch-thick framing lumber. If a lag bolt is properly installed, with its tip well through the rim joist and only the threads engaged in the band, its capacity relative to pull-out forces depends on the thickness of the band and the density of the wood. Because LSL rim joists are typically built up of the same wood species used for framing material (and thus have the same approximate density), the big variable is the thickness. A 1¼-inch-thick LSL is five-sixths as thick as 1½-inch-thick 2-by stock, and thus has 16 percent less holding capacity. To provide the same total pull-out strength, you'd need to provide six-fifths the number of bolts, an increase of 20 percent.

Although there may be other variables, the end result for shear and pull-out strength to carry the weight of a deck or porch will be similar — 20 percent more bolts in a 16 percent thinner band will provide about the same capacity. (See "Ledger-Attachment Code Proposal Survives Committee Review" on page 18 for bolting schedules for 2-by ledgers.)

Instead of using more lag bolts, an alternate approach (if you can plan ahead) would be to use 1¾-inch LVL material for bands or rim joists wherever you will be bolting a deck or porch to the house. That's the method I used for my own house, and the small increase in materials cost was well worth it when I added the deck a few years later.

To me, a bigger concern than pull-out strength is the strength of the connection between the band and the joists and subfloor when an LSL rim joist is used with wood I-joist floor framing. Because I-joist webs are so thin, the connection between each joist to the LSL band is weak; therefore, you must rely on the connection of the subfloor to the top of the band to keep from pulling the rim joist off the house. But since this band is thinner than 2-by material, it's a little bit easier for screws or nails from the subfloor to miss the band entirely, or to catch very little solid material. I've seen a deck literally collapse away from a house, taking the LSL rim joist with it. And if the rim joist is at the end of a cantilever or overhang with no wall below, the potential for this type of failure increases dramatically.

To ensure that the rim joist itself is well secured to the floor framing (at least where joists bear on the outside



wall), I recommend reinforcing the connection from the joists to the band. In new construction, this can be done by adding plywood web stiffeners on both sides of each joist at their outer end so that they finish flush with the I-joist chords, and by nailing from one side through the OSB web into the stiffener on the opposite face (clinching over any nails that poke all the way through). Then install joist hangers upside-down over the top of the end of each joist before you set the subfloor, nailing the hanger off to both the I-joist and the rim joist to complete the connection (**see illustration, page 22**).

For existing framing, install light-gauge framing angles (such as Simpson's L70s) to connect the web of each I-joist to the rim joist.

## Durability of Cedars

**Q** I am pricing cedar for a replacement deck that was formerly built with treated yellow pine. A local supplier is telling me his "northern white" cedar will last far longer than "Alaskan" cedar, which I can purchase for about half the price. Is there really such a dramatic difference?

**A** Paul Fisette, director of Building Materials and Wood Technology at the University of Massachusetts at Amherst, responds: According to all my reference materials and based on my own experience, Alaskan, northern, Atlantic, and Port-Orford cedar are similar in durability. Keep in mind that only the heartwood is resistant to decay. Sapwood is not at all reliably durable. One difference with Alaskan yellow is that the heartwood color — yellow — makes it easier to distinguish the heartwood from the sapwood, which is pale yellow. With the other cedars, there is not a great difference between sapwood and heartwood colors, so it can be more difficult to tell if you have in fact purchased durable heartwood or nondurable sapwood.

## Are Hidden Deck Fasteners Strong Enough?

**Q** I was hoping someone could shed some light on Eb-Ty. I use this product on 80 percent of the decks I build, and many are one or more stories high. I also live in a heavy snow area. The clips in that system hold the decking to the framing with pressure, not with mechanical fasteners, and I'm concerned that the detail may not be strong enough. I have been taking extra steps by letting cross bracing into the joist system. Am I wasting my time?

**A** Frank Woeste, P.E., professor emeritus of wood science at Virginia Tech in Blacksburg, responds: You certainly are not wasting your time to be cautious in building a deck. Like roofs, decks don't experience their full design load (such as a heavy snowfall or a large party) every day or every year. But you must build them to handle that extreme design load when it does occur, because a failure can be catastrophic.

I don't know of any engineering numbers on the type of fasteners you're talking about, but they may not be designed to resist the forces a deck can experience. And we haven't had 40 years of experience with the product to learn from, as we have with traditional 8d or 10d threaded nails that would typically be used with 5/4 decking boards. It's safest in this case to disregard any bracing effect of the decking and fasteners and build the structure to stand up without them.

However, the diagonal let-in bracing you mention, whether it's installed within the floor frame or between the posts and the deck framing, probably is not going to do the job. There are two important issues to consider: twisting of the deck joists and racking of the deck in plane. Even with the joists secured against any rotation at each end, they'll tend to twist within the span when a load is placed on top if they're not restrained somehow. Assuming no help from the decking, you'd be wise to install PT solid blocking at 2 feet on-center. That probably sounds like a lot to most carpenters, but that spacing is borne out by experience with long-span truss chords that are held with 2x4 purlins at 2 feet on-center. If you wanted to space the blocking farther apart, you'd need engineering for the specific span and joist spacing, and lumber size, grade, and species.

As for racking, one solution when earthquake loads aren't involved is to firmly attach the deck to the house and to its carrying posts (which should be minimum 6x6 posts treated for a structural application in ground contact) and to embed the posts firmly into the earth at least $3\frac{1}{2}$ feet deep. Then the supports can hold the deck in place without the need for racking resistance from the deck boards in the plane of the deck itself. However, diagonal bracing of the posts might be required to "stiffen" the system, depending on deck height, post size, and deck size. ❖

*The questions and answers in this article were reprinted with permission of* JLC The Journal of Light Construction.

**GOT A QUESTION FOR OUR EXPERTS?**

Send it to *Professional Deck Builder*, 186 Allen Brook Lane, Williston, VT 05495; or e-mail to prodeck@hanleywood.com.