

Lags vs. Bolts in Ledgers

To the Editor:

I read with interest your article "Attaching Deck Ledgers" (8/03) and have a few comments. The first two details show direct attachment to the rim joist using 1/2-inch lag screws, and attachment through the sheathing using 5/8-inch machine bolts coupled with 16-penny nails.

It appears from the article that there is little difference between the examples other than the use of 16d nails and a fastener 1/8 inch larger in diameter (in the example using machine bolts). Yet the difference in the number and spacing of the bolts or lags is almost a factor of four. The examples for a 16-foot joist span list lag screw spacing at 5.4 inches vs. bolt spacing at 20 inches with nails at 6 inches on-center.

This difference in strength seems disproportionate to the difference in bolt/lag diameter, and while the bolt method includes nails, it's hard to imagine that the addition of the nails could result in the far higher load rating (particularly since the ledger is fastened through 1/2-inch sheathing in the bolted example). Could the authors clarify why the method using bolts achieves such a high load rating compared to the lag method?

Also, in the case of a 16-foot joist, if a builder were to use 5/8 lags 20 inches on-center coupled with 16d nails every 6 inches, wouldn't that nearly match the rating of the method using machine bolts? It's this last question that interests me the most. The difference between using lags and bolts in the field is significant (bolts require access to the interior area of the rim joist, which is often not possible). Having to use four times the number of fasteners is not something I'd look forward to when it's time to build the deck.

Carl Hagstrom
Montrose, Pa.

Frank Woeste, P.E., responds: The reason for the disparity between the two details stems from major differences in the sources of information. In Detail 1, the lag screw rating is based on the National Design Specification for Wood Construction (NDS), the model building code reference for wood design. The lag screw values in the NDS assume that the fastener penetrates the main member (the rim joist) to a depth of eight times the lag screw's diameter, or 4 inches in this case. But because the rim joist is only 1.5 inches thick, the tabulated values cannot be used. Instead, we applied special provisions of the NDS to determine the allowable rating. For the assumed lumber species (SPF), the final design value was 180 pounds. Note that this assumes that the ledger is in direct contact with the rim joist. The NDS contains no design method that accounts for the presence of sheathing in between the two members.

In contrast, the solution given in Detail 2, where the ledger is installed on top of 1/2-inch sheathing, is a "prescriptive" one, based on the consensus of the authors of the North Carolina Residential Code. We are not aware of any tests used to confirm their conclusions, but we are testing ledger connections at Virginia Tech and believe their schedule is reasonable. It is important to note that the 16d nails specified are common nails, which have a larger diameter than many pneumatic nails of the same length. Nail diameter is an important factor for nail strength (see Practical Engineering, 2/98). Also, note that in the N.C. code detail only "1/2-inch structural sheathing" is permitted to be in the connection. Substituting rigid foam insulation board instead of structural sheathing weakens the connection.

Your second question, regarding substituting 5/8-inch lag screws for bolts, raises another issue. The 2000 International Residential Code states, "Where supported by attachment to an exterior wall, decks shall be positively

JLC Information Directory

www.jlconline.com

Mailing Address:

The Journal of Light Construction

186 Allen Brook Lane

Williston, VT 05495

802/879-3335

Editorial: We welcome letters and article submissions from readers. Keep copies of all original materials. Contact us by mail at the address above, Attn: JLC Editorial Dept, or via e-mail at jlc-editorial@hanleywood.com.

Subscriptions: To order a new or renewal subscription, call 800/375-5981 or visit our website at www.jlconline.com. For assistance with your current subscription, e-mail us at jlc-cs@hanleywood.com, call us at 800/375-5981, or write us at The Journal of Light Construction, P.O. Box 420234, Palm Coast, FL 32137. Subscription rates for qualified readers in the construction trades: \$39.95/1 year, \$64.95/2 years. Non-qualified readers: \$59.95 per year. Sales tax required on subscriptions to DC (5.75%), GA (4%), VT (6%). Group rates available on request.

Single back issues and articles: Available for \$4.95 each, plus \$5.00 shipping/handling per order; call 802/879-3335, ext. 143. Articles are also available for purchase online at www.jlconline.com.

Reprints: For custom reprints (quantities of 500 or more), call Carol Urban at Foster Reprints, 866/879-9144, ext. 177, curban@fostereprints.com.

Retailers: To carry JLC for sale in your store, contact Chris Lajoie at 800/381-1288, ext. 650.

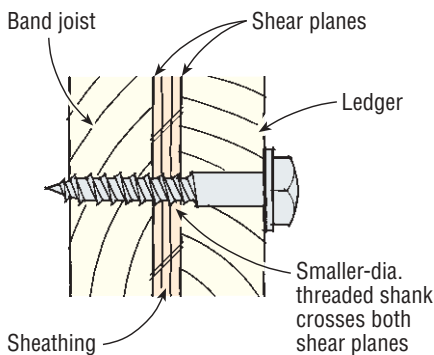
JLC Bookstore: Visit our bookstore online at www.jlcbooks.com. You can order from our secure website, call us at 800/859-3669, or order by mail to Hanley Wood Bookstore, P.O. Box 5000, Forrester Center, WV 25438.

JLC LIVE: For information about attending the JLC LIVE conference or expo, contact us online at www.jlclive.com or call 800/261-7769; for exhibitor or sponsor information, call Tami Svarfvar at 802/479-9526 (ext. 184). To request a press pass, call Kevin Spaulding at 802/879-3335 (ext. 133).

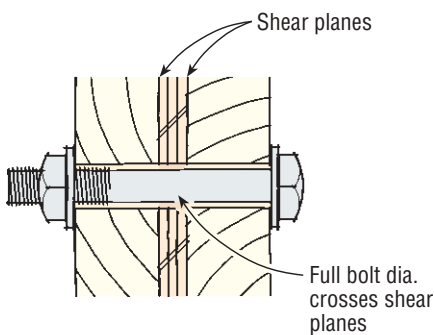
JLC-Update: Subscribe to our monthly e-mail newsletter for residential and light commercial contractors. It's free to JLC readers, and each issue contains industry news and the latest tips on materials, techniques, tools, and technology. Subscribe online at www.jlc-update.com/subscribe.

anchored to the primary structure and designed to support both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal." I was not involved with the N.C. code process that produced Detail 2, but my speculation is that the specification of bolts with washers on both sides was very deliberate, as bolts will resist lateral separation of the ledger from the wall.

Lag Screw



Bolt



It is true that a 5/8-inch lag screw has good withdrawal strength when properly installed, but it's foreseeable that the lead hole in the house band joist could be too large or that localized decay around the screw could render the connection nearly worthless in withdrawal strength after years of service. Finally, the bending strength of a 5/8-inch lag screw is less than that of a 5/8-inch bolt. This is because the threaded portion of

the lag screw, which has a smaller root diameter than the unthreaded shank, would end up in the two shear planes on each side of the sheathing (see illustration, right). With a bolt, the full 1/2-inch diameter would pass through these shear planes, making the bolt stronger in this particular connection.

Therefore, switching to 5/8-inch screws instead of bolts is not an automatic or simple substitution — one limitation of a prescriptive provision.

Supported Ledger Question

To the Editor:

The article "Attaching Deck Ledgers" raises an important yet somewhat overlooked aspect of deck construction. In my area we have had more than a few decks fall due to improper ledger attachment.

However, Detail 4 shows a drainage gap between the decking and the sidewall, but where is the water supposed to go? The detail basically creates a gutter that would allow water to seep into the siding, sheathing, framing, and insulation. Shouldn't this area be flashed, or weep holes be drilled through the double 2x ledger to drain the water?

Mike Keadle
Apex, N.C.

Editor Don Jackson responds: The problem is not the detail, it's the drawing, which shows a section through one of the PT posts supporting the ledger. Because the posts would be at intervals of, say, 8 feet (depending on loading), the water would be free to drain. (Though not strictly required with PT lumber, it might not be a bad idea to flash the tops of the posts.)

Hard-Hat Reminder

To the Editor:

I'm a relatively new subscriber and really enjoy your magazine. I'm always amazed at the lack of hard-hats in

trade magazine photos. I realize that unless they're staged, it is probably representative of a significant number of the tradesmen on residential sites, but it is still a missed opportunity to correct bad habits. The cover of the September issue is a perfect example. The gentleman is obviously standing on scaffolding with planks and stored materials overhead. He is clearly in a compromised position from overhead debris, not to mention the danger of banging his head on the way up the scaffold (which, as anyone who has done it knows, can knock you silly for a few seconds — not a very comfortable feeling 20 feet up in the air). My father-in-law was permanently disabled by a scaffold board that fell as he worked a few feet below. Fortunately, he was wearing a hard-hat. Who knows what the result would have been had he not.

Alan McIlvried
Director of Construction
Sunburst Hospitality

Corrosive Lumber Clarification

To the Editor:

Regarding the article "New Wood Treatments May Be More Corrosive" (*In the News*, 9/03), though I am very happy to see *JLC* raising this issue with such a balanced perspective, I would like to clarify Simpson Strong-Tie's position, including remarks attributed to me.

The article stated that we will not predict life expectancy of galvanized steel connectors. Actually, we would very much like to be able to make specific life expectancy recommendations but cannot. The E-12 test protocol developed by the AWPA has no provision for life expectancy correlation, and many variables affect service life. These include wood species, retention levels, chemical mixes during treatment, treated wood curing after treating, and, the

most critical variable, the application and local environment. The same piece of metal could last centuries in a cool arid environment but only a few years in a hot humid environment. We can only make correlations relative to decades of experience with CCA.

I would like to clarify a quote attributed to me: "The treating companies are upset with me for even bringing it up." My comment referred to the reaction by certain chemical producers — not treating companies — to the warnings in our 1999 and 2000 catalogs. We added the warnings when installations of our products became unserviceable a short time after being installed in contact with certain types of preservative-treated wood. Preservative wood treaters have

been very supportive of efforts to define this issue.

Simpson Strong-Tie Co. is continuously developing information relative to this issue, which is available on our website, www.strongtie.com/info.

Mike Bugbee
Vice president, Sales
Simpson Strong-Tie Co.
Silver Spring, Md.

Source for Humidity Sensor

To the Editor:

In the article "Building a Sealed Crawlspace" (10/03), the author mentions a humidity unit with a digital readout, alarm, and remote sensor. Where can I find this unit?

Wayne Sammons
Sammons Construction
Rehoboth Beach, Del.

Jeff Tooley responds: Go to RadioShack and ask for a relative humidity alarm. If they tell you they don't have one, ask to see their catalog; they can order it for you. It's a two-piece unit: One part plugs in inside the house; the other uses batteries and goes underneath the house. It senses high crawlspace moisture and sounds an alarm in the house. I've used more expensive sensors in the past, but I prefer this one. It's so simple that the homeowners can buy it and install it themselves.

KEEP 'EM COMING!

Letters must be signed and include the writer's address. *The Journal of Light Construction* reserves the right to edit for grammar, length, and clarity. Mail letters to JLC, 186 Allen Brook Ln., Williston, VT 05495; or e-mail to jlc-editorial@hanleywood.com.

