Using LVL to Reinforce Existing Beams

Q. *Can laminated veneer lumber (LVL) be used to strengthen existing wood beams? I'll soon be working on a remodeling project where the existing floor system is supported by an undersized built-up wood beam, and I would like to stiffen the existing beam by bolting LVL material to it.*

A. *Phil Westover responds:* LVL can be used to strengthen or stiffen existing beams, but the manufacturer's load tables will generally not apply, and engineering analysis will likely be required to assess the member and connection capacities. The final design will depend on the geometry of the structural assembly, the design properties for the LVL, and the design properties of the existing framing.

In the case of a typical "top-loaded, "simple-span" beam (see Figure 1), the manufacturer's tables and installation guidelines may be used to size the LVL if the following conditions are met: The supported members will bear on the top of the LVL, positive and adequate bearing supports are provided to support the beam-end reactions, and the LVL is sized to carry the total load on the assembly. In these situations, the bolts used to fasten the LVL to the existing beam generally have little structural demand and are only required to provide lateral support to the LVL members.

If any of the assumptions mentioned above are not true, as in side-loaded beams (Figure 2), then the bolted connections must be engineered based on the structural geometry and the design properties of the LVL and the existing framing. The bolts must be sized and spaced to direct the loads into the LVL along its length, ultimately reaching the end supports. Bolted connections (and the new and existing wood members) must be engineered according to the *National Design Specification for Wood Construction* (available from the American Wood Council; 800/890-7732).

When the existing framing shares

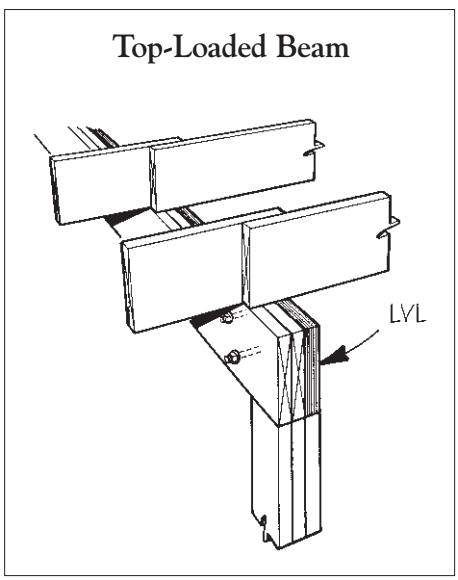

Figure 1. *In some instances, the manufacturer's span tables and installation guidelines can be used to size a retrofit LVL installation. The beam must be top-loaded, the LVL must be sized to carry the total load, and adequate bearing supports must be provided.*

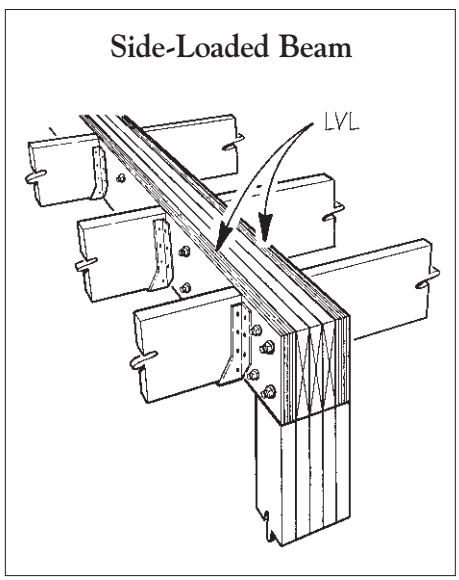

Figure 2. *When supported members are framed into the side of the beam and/or the support reactions are provided by bolts rather than bearing, an engineer should size the LVL members and the bolt connections.*

in the load-carrying capacity, then the relative stiffness of the existing framing and the new LVL members must be evaluated to assess the proportion of the loads carried by each member. The design of the members and bolted connections for this situation can become very complicated and should only be done by an engineer.

Phil Westover, P.E., is a consulting engineer in Winchester, Mass.

Cathedral Ceiling Vapor Barrier

Q. *The house I'm building has a cathedral ceiling framed with wood I-joists, continuous ventilation at the soffit, and a continuous ridge vent. The ceiling inside will be T&G pine. I plan to use R-38 Kraft-faced fiberglass batts (which will allow a 1 1/2-inch air space between the roof sheathing and the batts), and would like to apply Tyvek housewrap over the Kraft-faced batts. However, I'm concerned that moisture will accumulate between the batts and the Tyvek. If moisture accumulation isn't a problem, does it matter which face of the Tyvek is exposed to the room?*

A. *Henri de Marne responds:* Since Tyvek is permeable to moisture, I wouldn't use it as you propose. In this situation, I recommend you use unfaced fiberglass batt insulation instead of Kraft-faced batts, then install a 6-mil plastic vapor retarder over the unfaced batts. Unfaced batts allow for better quality control during installation (you can see how snugly they fit against the flanges of the I-joists), and 6-mil plastic is a more effective vapor retarder because it eliminates the joints created when Kraft-faced batts are used.

The vapor retarder must be installed as carefully as possible. The T&G pine ceiling provides little or no protection against moisture migration. If poor installation techniques are used, condensation will occur on the underside of the roof sheathing and on the top of the insulation.

Henri de Marne is a building consultant in Waitsfield, Vt., specializing in moisture-related construction problems.

Is Romex Getting Smaller?

Q. *After my electrician finished rough wiring the last house I built, I noticed that the Romex (NM) wire he used seemed to have a thinner profile, and the individual wires seemed smaller in diameter than what I was used to. Is the copper wire (or the insulation) getting smaller, or is it just my imagination?*

A. *Eric Lewis responds:* No, your imagination is not getting the best of you — the nonmetallic sheathed cable (NM) used in most residential construction has become smaller.

NM wire is made up of four basic components: the copper conductor, the conductor insulation, the cable filler, and the outside jacket. The diameters of the different-gauge conductors has remained the same for years, and is unlikely to change.

But recent improvements in the plastics used to produce the three remaining components have resulted in a more compact NM cable with better insulating characteristics, and a higher abrasive resistance.

The most common conductor insulation today is THHN, which measures 15 mils on a #14 conductor, whereas the older THW conductor insulation measures 30 mils. The cable filler separating the conductor insulation from the outside casing is now made from plastic and is thinner than the traditional paper filler found in older NM wire. The thickness of the outside jacket has also been reduced. The result is a NM cable with a smaller circumference, a tougher outside casing, and a smaller conductor area that requires less filler.

How much smaller is the new NM cable? It used to be that only two 14/3 NM cables would fit through a 1-inch-diameter hole — now you can fit three. ■

Eric Lewis owns and operates Spectrum Electrical Services in Montrose, Pa.

Got a question about a building or renovation project? Send it to On the House, *JLC*, RR 2, Box 146, Richmond, VT 05477.