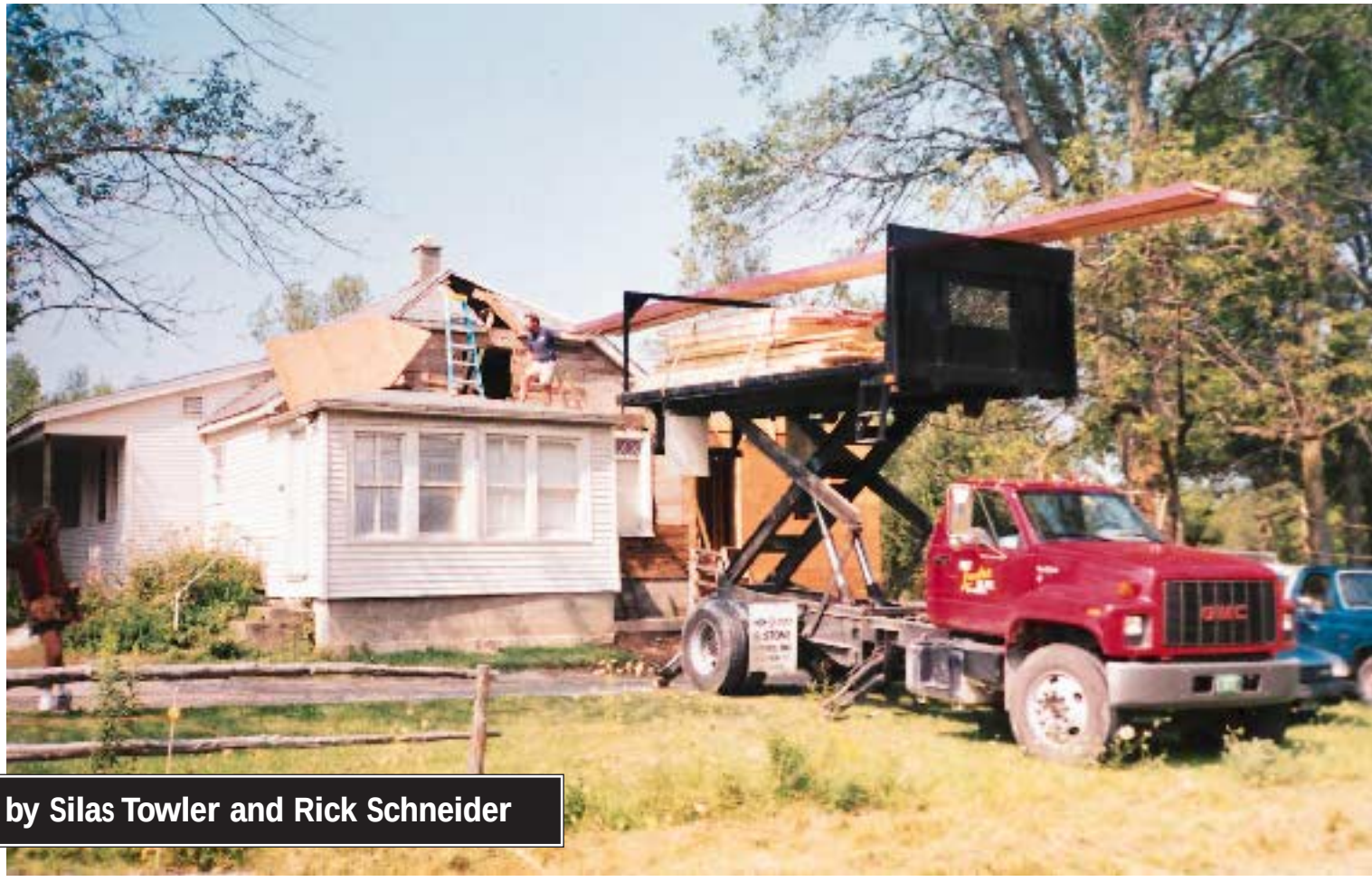
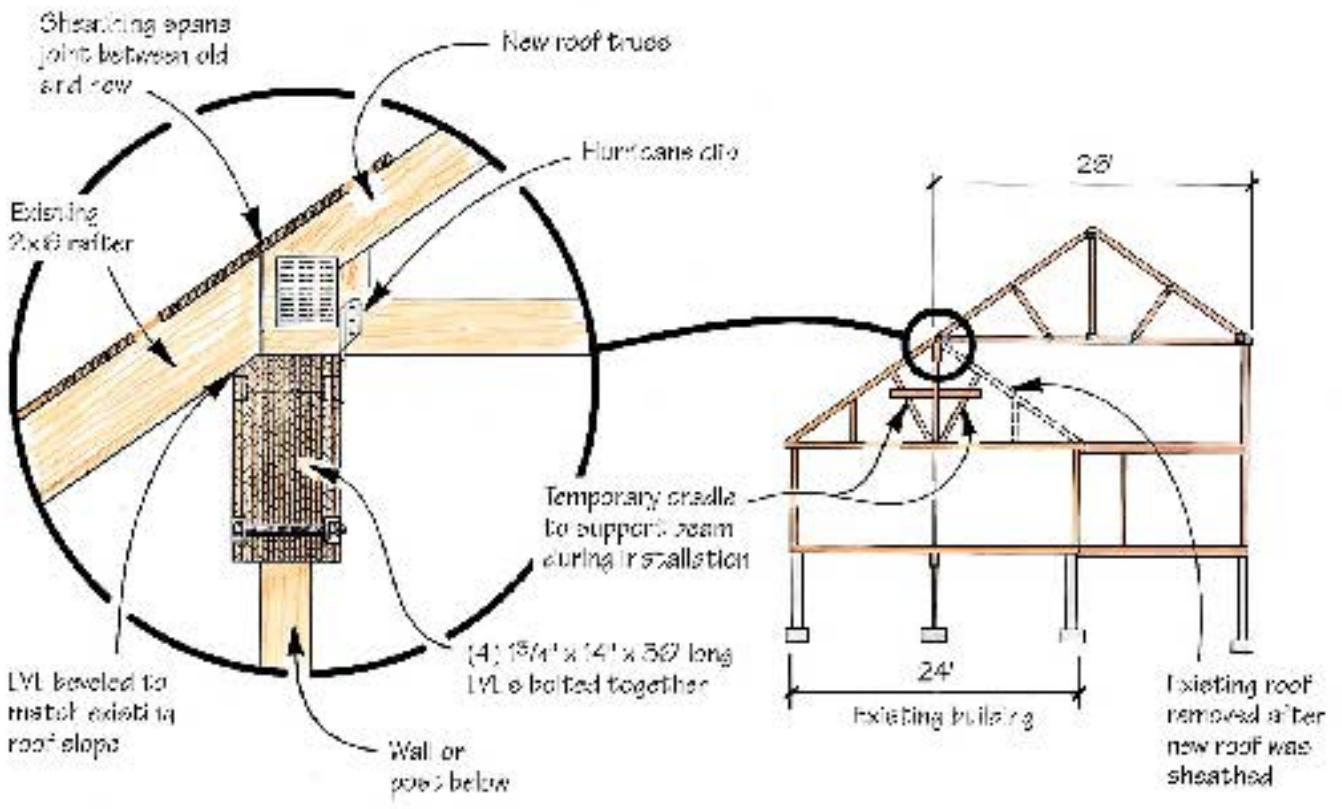
A Retrofit Ridge Beam



by Silas Towler and Rick Schneider

A giant LVL ridge beam solved the roof load problems on this two-story addition



The authors transformed this small single-story Cape (photo, opposite page) into a spacious two-story building by adding a 900-pound, 36-foot-long structural ridge beam to support the new truss roof. Instead of wrestling with the preassembled beam, the crew slid the four LVLs into the attic, then bolted them together.

Our local health center had outgrown the 50-year-old, 1,250-square-foot house they had moved into 15 years ago. The doctors, nurses, and staff needed more exam rooms, more bathrooms, private offices, and improved administrative space. We were asked to work with them in designing and building the new space. Ideas and floor plans went back and forth until we chose a plan that fit their needs and allowed them to remain open for business every day throughout the project.

The existing building was a one-story, 24x36-foot Cape, with the ridge running along the longer east-west axis. The rough 2x6 rafters rested on the top plates of the first floor walls and met without a ridge pole at the peak. With 91 inches beneath the rafters at the peak, there was limited attic space. The concrete foundation was 10 inches thick and 6 feet high, with a poured floor of unknown thickness and a cistern that took up a third of the basement floor area. About nine years ago, the handicapped-accessible entrance and the waiting room had been moved to the back (south side) of the building.

The plan called for a 14x36-foot addition across the front of the building. This would give the center the space it

needed downstairs, as well as keep the construction more or less out of the daily sphere of operation. But for the addition to work upstairs as well, we would have to tie into the existing attic space. This meant removing most of the roof. How to do that without compromising day-to-day operations of the center took some thought.

Providing Support

It seemed that if we could support all of the rafters on the south side of the ridge with a load-bearing wall, those rafters would not have to oppose the rafters on the north side of the ridge, and thus the north-side rafters could be removed. Then, we could put trusses on the load-bearing wall and span the 26 feet to the new front wall of the building.

Before cutting away the peak of the existing roof, the authors built angled kneewalls on each side of the ridge. With horizontal 2x4s nailed across them, the kneewalls also served to support the built-up LVL beam while it was bolted together and lifted.

Whether we design what we build or not, we consistently take any questions as to forces or loads to an engineer, since shifting spaces around inside buildings can present a variety of loading problems. While steel or any of the laminated wood beams available can really open up the possibilities, they must be used correctly.

In this case, the engineer recommended that we abandon our load-bearing wall and instead use a large built-up beam, point-loaded down to the foundation. The point loading meant building posts into the two end walls and at two points in between. This beam would carry the south face of the original roof and support the trusses that we needed for the new roof.

A Monster Beam

The engineer specified a built-up beam of four $1^{3}/_{4}$x14-inch x 36-foot-long LVLs bolted together. Available in up to 60-foot lengths, LVLs were perfect for this job because they can be put into final or near-final location one at a time, then bolted together.

To protect the health center below, we would have to leave the existing roof intact while getting the beam into place. Our plan was to feed the LVLs into the gable end wall from the lumberyard's scissor-lift truck.

We would need to notch out the existing rafters at the peak where the beam would eventually go. To preserve the integrity of the existing roof, we built two temporary kneewalls to carry each side of the roof. We laid a 2x4 plate on the attic floor, centered directly under the peak and over the partition walls beneath. We then built the two kneewalls on this plate, tilting them outwards both to better support the old roof and to keep the center area free for the beam placement. We laid out the kneewall studs so they wouldn't interfere with partitions and posts that would be built later on top of the same plate.

Assembling & Lifting

To support the LVLs, we installed some waist-high horizontal 2x4s across every fourth or fifth pair of kneewall studs. That way, we could slide the individual LVLs off the lift truck right onto this 2x4 cradle, where we could assemble the beam for final lifting.

Assembling the beam was a matter of

clamping the LVLs together, drilling, and bolting. This took two men about three hours. The outermost LVL on the south side had to be beveled to meet the sloping underside of the existing rafters. We did this with a circular saw by crawling along the top of the beam.

We also installed vertical 2x4s between the horizontal ones and the rafters to prevent the beam from rolling as we lifted. This kept the raising of the now 900-pound beam safe, accurate, and calm. We used hydraulic jacks, one on each end, to slowly raise the beam. As the beam went up, we nailed additional temporary horizontal supports right below the beam as an extra precaution.

Once the beam was in its final position, we added posts down through the first-floor walls to the foundation. We had to pour a large pad in the basement for one of the posts, while the cistern wall and perimeter foundation walls supported the other posts.

Bring On the Trusses

At this point, the beam was supporting the south half of the existing roof and was in position to accept the trusses for the roof of the addition. The original roof was still basically intact up to this point, as was always our priority, though the loading had been redirected. In the meantime, business had continued downstairs as usual, albeit with some noise overhead.

In preparation for the trusses, we had to remove only a course or two of slates and about a foot of board sheathing along the ridge, which was easily protected from the weather. We were able to set and brace all the trusses in one day, then apply enough plywood and felt paper to protect the junction of the new and old roofs. That day made all of the work in the attic worthwhile.

Only after the new roof was sheathed and shingled did we dismantle the old roof.

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Plywood sheathing spanned the joint between the old roof and the new, tying the two sides together (above). Only a course or two of slates had to be removed to set the trusses (left), leaving the health center below protected.

Reclaiming half the existing attic added more than 300 square feet to the renovated building's living space.