21st-Century Timber Framing

A mix of modern and traditional methods creates an engineered frame that goes up fast

BY KEN BOUVIER

In 1976 I worked on my first timber frame. We dismantled a prerevolutionary-era house frame, moved it to a new site, and reconstructed it into a new home. That project got me hooked on timber framing—four decades and more than 500 projects later, I still love it.

In the early days, we focused on moving and restoring old frames, but now the majority of our work is building new frames from scratch, using machinery that our timber-framing forbearers couldn't have imagined. The increase in productivity has allowed me to grow our company to 30 employees and build dozens of timber frames every year. Our automated methods also mean that our employees—who often have the bad knees and bad backs that come with a lifetime of construction work—can continue their careers much longer than if they were moving and assembling timbers without machinery.

Our most powerful tool is a Hundegger K2i, a CNC multihead machine that cuts the timbers to length and does the majority of the joinery. After our team designs the joinery and tells the machine how to make the cuts, we can put a timber in one end and a nearly complete piece of the frame comes out the other. But it can't do everything. At a minimum, the joints need to be cleaned up with hand tools; the machine also can't make large curved parts, because they don't fit inside. We make those and the other problem pieces with portable power tools and traditional mallets and chisels. Reclaimed timbers and frames are cut fully by hand.

The photos in this article show a frame we made and assembled for the historic B.F. Clyde's Cider Mill in Mystic, Conn. The 15-ft. by 24-ft. space, which will be covered with board siding to match the existing barn, is a cider storage room that will hold tanks of fermenting cider. The tanks' great weight is why the floor is framed with LVL joists. The building is also close to the coast, so it has additional bracing for wind loads.

We can help engineers and other specifiers, who often have little experience with timber framing, design their timber-frame structures for almost any residential or commercial application. This frame, which has 115 pieces, took about five days to build in our shop. We delivered it to the job site on an equipment trailer early one weekday. With the help of a local crane operator, our three-person crew lifted the first pieces off the trailer around 9:30 a.m., and we finished assembly around 3 o'clock. □

Ken Bouvier is president of South County Post & Beam in West Kingston, R.I. Photos by Patrick McCombe, except where noted.

CUT THE FRAME IN THE SHOP

A 6000-sq.-ft. steel building holds the 90-ft.-long joinery machine, and there's another 13,000 sq. ft. of shop space for hand work, finishing, and dry fitting.

MACHINE-MADE COMPONENTS

Most frame parts are cut to length and the joinery is made with a German-made Hundegger K2i CNC joinery machine, but the machine-cut joints often need corners squared and stray wood fibers trimmed.

To see a video of the joinery machine in action, visit FineHomebuilding.com/magazine.

Photo this page bottom: courtesy of Ethan Biederman

FINE-TUNE THE JOINERY

Joinery and cuts are fine-tuned and chamfered with traditional timber-framing tools, including block planes, chisels, and mallets. The heavy timbers are handled with forklifts to boost efficiency and prevent injury.

DRY-FIT THE PARTS

Once all the components are ready, individual frame sections are assembled and made square with pipe clamps, ratchet straps, and dead-blow hammers. Sturdy sawhorses put the parts at a comfortable working height.

DRILL THE TENONS

Once the pieces are together and square, the framers drill holes through the tenons using the machine-cut holes in the mortises as a guide. The pieces are then taken apart, banded, and placed on pallets for delivery.

ASSEMBLE THE FRAME IN THE FIELD

1 SORT THE COMPONENTS
The frame parts are delivered to the job site on an equipment trailer or on one of the company's truck cranes. The parts are labeled (in an inconspicuous spot) so the frame can be easily assembled using plans with corresponding labels.

2 BUILD THE FIRST BENT
The parts to a single bent are laid out on the floor system on scrapwood spacers so the tapered end of the peg can stick out on the other side of the joint. A 4-lb. dead-blow hammer is the preferred tool for driving the waxed oak pegs.

3 LIFT WITH A CRANE
Bents are lifted and positioned with a crane to save time and prevent injury. Most residential frames can be assembled using a relatively small truck crane, because the parts generally don't weigh more than several hundred pounds.

4 PLAN FOR UPLIFT
Uplift on this frame is partially controlled with U-shaped hold-downs attached to all four corners of the building. The hold-downs are anchored to the concrete foundation with threaded rods set in epoxy.

5 PLUMB THE CORNERS
Corners are plumbed and temporarily braced and then knee braces that connect to the top plate are fastened to the post. This building, which is only a few miles from the coast, has additional bracing to withstand 110-mph winds.

6 FLY-IN THE TOP PLATES
With both gable-end bents in place, the top plates are lifted into position. A tag line prevents the beam from spinning as it's raised. Clean nylon straps are used for lifting because they're less likely to leave marks on the timbers.

7 FASTEN THE CORNERS
Corners are locked together with 8-in. structural screws and metal straps let into the top plate so the board siding will fit tight to the framing. These modern connectors help a traditional-looking frame meet modern code requirements.

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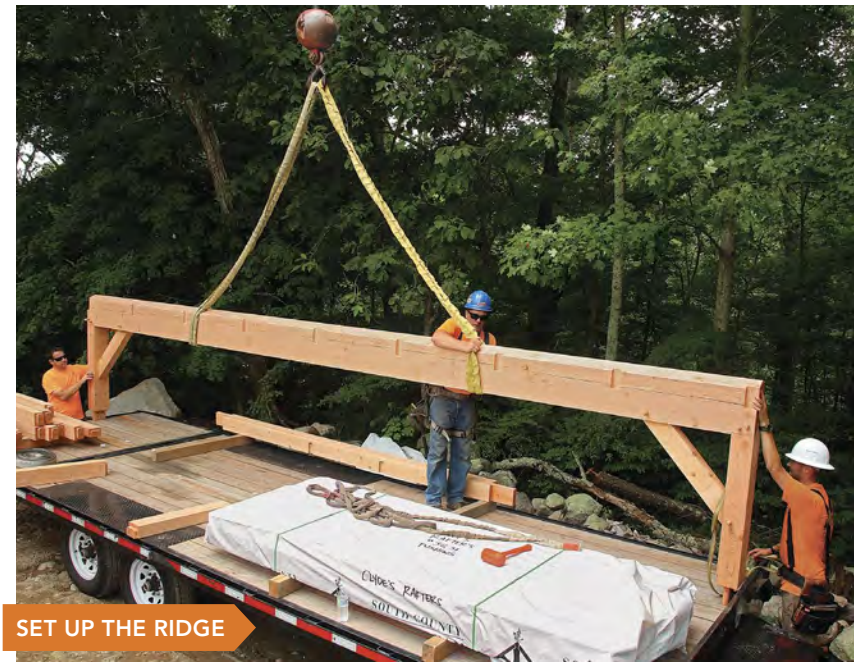

SET UP THE RIDGE

Before lifting the ridge beam into place, the short posts it bears on and reinforcing braces are assembled on the delivery trailer. Whenever possible, roof components are assembled on the ground to minimize working at height.

MAKE IT FIT

The roof of this timber-frame addition tucks under the eave of the existing building. The ridge height was planned to leave enough room to fit 2x6 tongue-and-groove sheathing and shingles under the eave.

FILL IN THE WALLS

Vertical posts form the sides of window and door openings and receive horizontal nailers for the barn's vertical board siding. The posts fit into mortises on the top and bottom, where structural screws hold them in place.

TIE THE FRAME TO THE FLOOR

The final step is to drive structural screws to connect the frame's bottom plate to the LVL band joist. This step helps to control uplift during high winds. Predrilling prevents splitting the LVL.

START THE SCREWS

Pairs of 8-in. structural screws make a sturdy, code-compliant connection between the rafters and the top plate. Starting them while the rafters are on the ground saves time and eliminates the frustration of dropping screws.

SET THE RAFTERS BY HAND

To save an hour of crane time, these relatively lightweight rafters are lifted into place by hand and fastened with structural screws.