

TIMBER FRAMING

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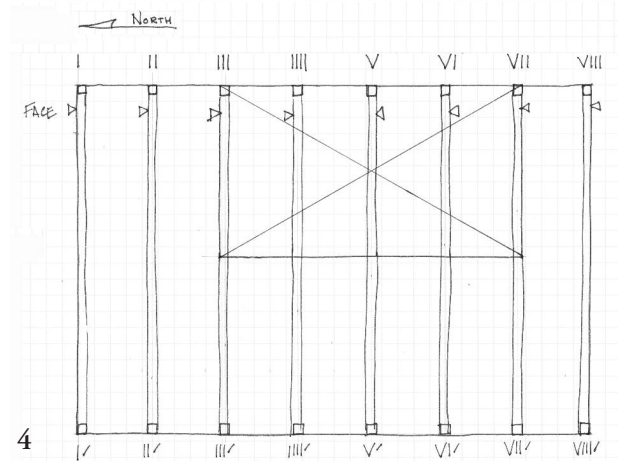


Adaptive Reuse in Massachusetts



Photos James Hess

- 1 Barn frame as it stood in 2014 in Alfred, Me., built ca. 1802.
- 2 Timbers in shop for assessment.
- 3 Extracting core for dendrodating.
- 4 Proportion of frame to be reused.



Adaptive Reuse in Massachusetts

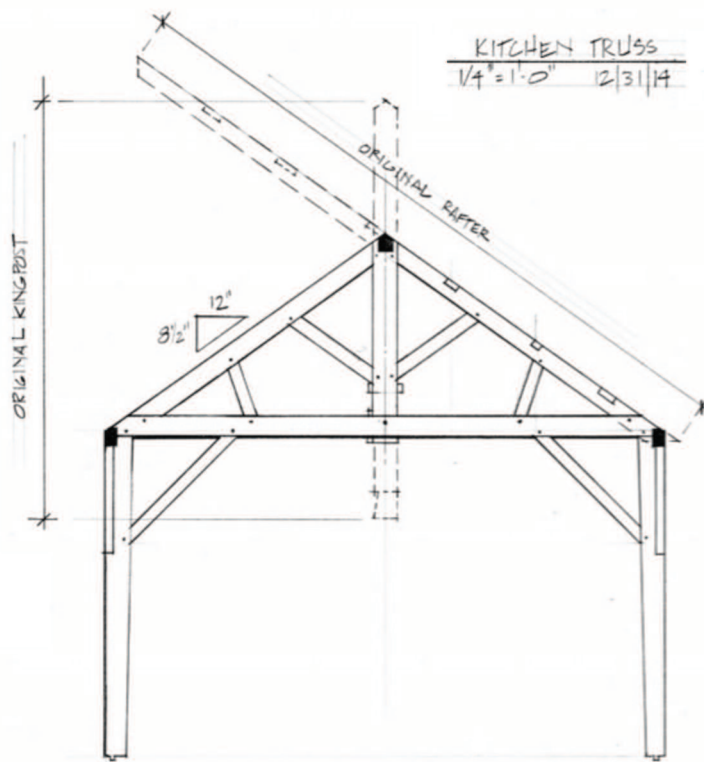
LAST fall, while looking for older framing timbers to assemble into a roof frame for a new structure, we came upon the disassembled timbers of a very early 19th-century barn that stood originally in Alfred, Maine (Fig. 1), and now lay in stacks some 15 miles from our workshop in Stockbridge, Massachusetts. The barn had been taken down by a single person using a Lull lift and, at times, a chainsaw. With a few pictures to look at displaying the barn's form before takedown, we acquired it and brought it to our shop (Fig. 2). While we do new construction, our group also specializes in restoring and repairing historic timber frames, sometimes repurposing them.

With all of the salvaged pieces laid out on the shop floor, the history and pathology studies could begin. Bill Flynt, of Historic Deerfield (Massachusetts), conducted a dendrochronology study of the timbers, identifying white pine, hemlock, spruce, and white oak (Fig. 3). The softwoods mostly dated to 1802, with a handful dating earlier as reused materials and a few dating later, suggesting an addition to the barn. A small number of riven white oak braces dated to the 18th century.

Jack Sobon, David Lanoue and Peter Smith then conducted a careful study of the barn timbers and boarding, to forensic standards. The building parts along with the handful of images provided by the dismantler demonstrated that the barn originally had a 44x63-ft., eight-bent, scribe-rule frame, with English tying joints, kingpost trusses, a ridge beam and common purlins. (At some point in its history, one bent had been removed and the barn resided.) The barn was well braced, each wall post with four longitudinal braces (two of them downbraces to girts), and the ridge braced and counterbraced at each kingpost.

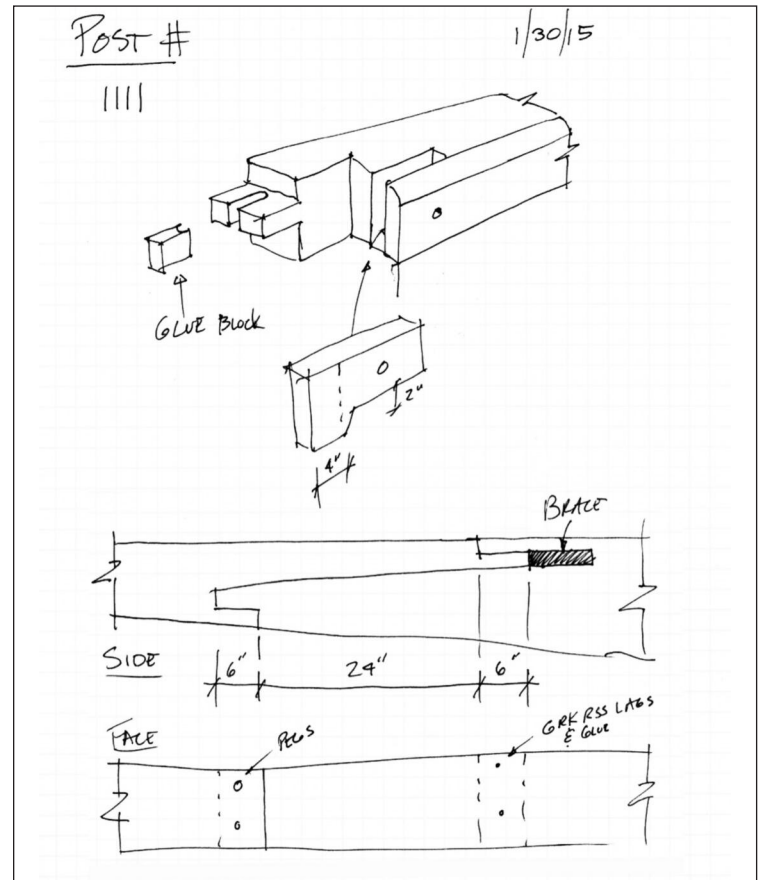
As a scribe rule frame in the English tradition, it displayed plumb and level lines and 2-ft. marks on posts and principal rafters, and even retained a number of joinery reference chalklines running the lengths of timbers about 2 in. from the faces. Carpenter's marks and race knife marriage marks appeared on all of the pieces, indicating their original locations. Once these were catalogued, Jack was able to sketch out the original form of the barn (bent view Fig. 4).

The carpenter's marks suggested the possibility that there had



5 Above, original vs. adapted timber lengths.

6 At right, working drawing for tying joint teazle tenon repair and plate tenon replacement, with scarfed addition to post.



been two teams of carpenters scribing and cutting the frame at once. Since the barn was 44 ft. wide, there was deck space for both long walls to be scribed simultaneously. During layout, each top plate could lie parallel to the other down the center of the framing deck, with posts running out toward the eaves sides. In any case, to signal each longitudinal section of the barn, the pieces were labeled with one, two (for the kingpost line? or for what?), and three flags respectively as one worked across the barn transversely.

In addition, the marks indicated that the carpenters had split the building's "left" and "right" notations laterally at the central bay rather than longitudinally at the ridge. No one in the shop had ever seen a barn labeled this way.

While the frame was studied and documented in the shop, the company also had clients for whom a conceptually similar frame had been planned as a kitchen ell to be built with miscellaneous recycled barn parts. With the acquisition of the Maine barn frame, this space could be framed with recycled material from a single barn in nearly its original configuration, simply by attenuating the frame (Fig. 5). As in any adaptive reuse project, the capability of the old timbers had to be assessed.

The new kitchen ell would have a 2x6 dimension lumber panelized wall system built around it as well as 2x6 rafters with laminated veneer lumber ridge on top of the frame. This would allow easy access for insulation, window and door placement, wiring, and plumbing. With that sorted out, the frame's repairs were then broken down into three categories: aesthetic repairs, minor structural repairs and major structural repairs. Many were patterned after repairs found historically in barns and churches around the country, but with the addition of polyurethane glue.

The design called for an aged, antique frame, not an amalgamation of assemblies that were clearly missing pieces or obviously had been rearranged. Aesthetic repairs were made to address minor rot and empty mortises and peg holes. Minor

structural repairs included filling peg holes in braces, correcting teazle tenon damage, replacing tenons, fitting short new post bottoms, and so on. Major structural repairs were required mostly in posts and tie beams, where 25 percent or more of the timber needed replacing. In these cases, the most important aspect of each timber was to save the portions that retained their original joinery, which would allow rescribing the frame. All the repairs were designed collaboratively with Jack Sobon to use traditional joinery and common historical practices (Fig. 6).

For each visible repair, the goal was to achieve a seamless furniture fit and finish that might be undetectable to the layperson, and even to many professionals. For unseen repairs, the objective was simply to ensure that the timbers would be structurally sound at the end of the process. All the timber was treated with an insecticide to kill any existing bugs as well as to prevent future infestation.

In addition to careful workmanship, one perhaps unique advantage assured this work would be historically and visually consistent. All of the replacement timber—from face patches to filler blocks—came from the same architectural fabric. The original barn frame was so much larger than what we required that all of the repair materials could be obtained from unneeded timbers. One could not have asked for a better scenario when working with historic fabric to build a new space.

Peter Smith and Marc Lanoue performed the vast majority of the work. Peter focused on the repairs while Marc worked on rescribing, cutting and fitting the five kingpost trusses with their new struts. After completing the trusses and reconstituting the posts, Marc and Peter worked together to scribe the longitudinal and transverse sections. Since the new frame would be much smaller, only the tie beams and posts that were in the best shape would be necessary. Bents III–VII would be used in the new arrangement, chosen primarily because they had the least amount of rot.

Empty mortises were covered with face patches carefully selected from timbers with a similarly hewn finish. Once a patch was selected, the mortise would be recut to accept a face patch roughly 1/8-in. larger. First, a line was knifed around the mortise to describe its new size, then roughly cut with a chisel, trimmed plumb with a Fein tool as far as it would reach, and finally finished with a framing chisel.

With a filler block inserted into the mortise with polyurethane glue, a 1-in.-thick patch was then fitted on top to blend in with the existing face. All the timber's irregularities were accounted for in the process. If there was a slight bow or twist in the original hewn surface, saw kerfs were cut in the underside of the patch to within 1/8 in. of the top surface. This allowed the patch to conform to any uneven hewn surface, thus avoiding raised edges. If the timber surface showed historic holes from powderpost beetles, a scratch awl produced similar pock marks in the new face patch. Old chisel marks or scratches on scribed surfaces were replicated with the same tools to ensure a consistent surface.

Completed minor structural repairs were rarely visible. When repairing old joinery in posts and braces, an important first step was to plumb and level the workpiece so that those joints could be used in the new scribing.

All the major structural repairs were determined by existing joinery. The tops of jowled posts were preserved. Kingposts were centered on existing mortises in the tie beams for the new wedged



7 Partial sequence of patch prep after grain-match : a) trimming after knifing and roughing, b) deepening walls with framing chisel, c) setting filler block and glue, d) fitting patch.

8, 9 New **bottom?** scarfed to **post?** (location?)





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10–12 Major repairs, defined by 25 percent or more replacement material, sometimes reached 75 percent replacement material. Left above, **Xxxxx Yyyy** surveys repair work in progress. At left, **Vvvv Ttttt** measures for next timber insert.

13 **Ggggg Wwww** surface-hews timber salvaged elsewhere in barn into purlin for test-assembled roof frame.

14 **Ttttt Rrrrr** scribes shortened rafter to kingpost.

15 Shortened oak brace showing overcut line at original shoulder and remnant arc of original peg hole.

dovetail joint, and so on. In some cases, more than 75 percent of a post would be replaced to preserve the top of the post and all of the joinery for the tying joint (Fig. 10). In one piece, over 6 ft. of rot was removed from a post and replaced with a resawn piece taken from a post elsewhere in the barn (Figs. 11-12). Others required scarf joints and pegs depending on their location and function. Unused tie beams and posts from the rest of the barn provided the stock for repairs or replacements (Fig. 13). As in the minor structural repairs, each piece had to be plumbed and leveled with snapped lines or later scribing (Fig. 14). Viewing even major repairs when completed, it would take a very keen eye to find the seams between the original and the repair material.

One intriguing discovery emerged when examining the riven white oak braces, dendrodated much earlier than the rest of the frame. Outboard of their existing shoulders, the tenons showed the overcut of an earlier sawn shoulder line and the tenon ends retained the arc of an earlier peg hole (Fig. 15), indicating that these braces had been used in a longer length before the building of the barn in Maine. So this is the third time that these oak braces have been used in a frame since the 18th century. —JAMES HESS
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