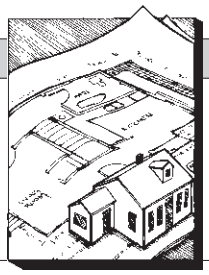
Cathedral Ceiling Solutions



by Gordon Tully

The term "cathedral" ceiling must have been invented during the 1920s by some over-zealous real-estate agent. It has stuck, and now it is applied to any residential space that does not have a flat ceiling.

Cathedral ceilings can be expressive and beautiful; especially when the interior finish follows a complex geometry of intersecting roofs and gables, as in a second floor bedroom under the eaves.

But then the geometry is very simple - just a gable-ended room, for instance - simply plastering over the joists can create a strangely artificial and bland character unless the proportions of the room are perfect. In this case, exposed structure and texture on the ceiling may be called for. On a ceiling with a large structural ridge beam, you'll usually need to leave the ridge beam exposed anyway.

So we then search for visually satisfying and practical ways to express the supporting structure of the roof. This column and my next one will examine this issue. I will concentrate on an easy case: a simple-rectangular room covered by a moderately pitched gabled roof. Refer to Figure 1 for the definition of some common terms used here - just to be sure you and I are thinking about the same thing.

Ridge Beams and Purlins

Suppose the room is not too large, and that it is wider than it is long. The easiest structure is a large-ridge beam supporting ordinary rafters, which themselves can cantilever to form an overhanging eave. The ridge beam can either be exposed to the room with the rafters on top of it, or the ridge beam can be set into the plane of the rafters, with the rafters supported on metal hangers (see Figure 2).

For a large room, the ridge beam might get pretty big. We are doing a small library with a reading room 26-feet wide and 20-feet long, with a ridge beam supporting ordinary rafters. For this room we need an 18-inch deep glulam or small-steel member to carry the load.

A large beam like this must be supported adequately with posts. Remember about cross-grain compression (of wood directly above and below the post), and size the post accordingly. In this example, a wood post at each end would need to have at least 29-square inches in cross section (four 2x6s), assuming a 50 psf strength, and no overhangs (which would add more load).

Suppose there is a big-arched window centered on the gable, or suppose you just don't like the looks of a big single-ridge beam. You might very well want to introduce additional purlins running parallel to the ridge to spread the roof load onto more posts. This reduces the span of the rafters, and - with a reduced span - the rafter can be correspondingly reduced in size. Purlins add visual interest as well.

"But," you plead, "I have already upsized the rafters to 2x12s (or 12-inch plywood web trusses) in order to make room for lots of roof insulation." Waste rears its ugly head: Why add useless beams? A compromise is to use two purlins at the third points and omit the ridge beam altogether (see Figure 3). This cuts the post size in half and avoids a lintel over the centered window. The 2x12 rafters can cantilever to the ridge and they will not be grossly oversized for most spaces.

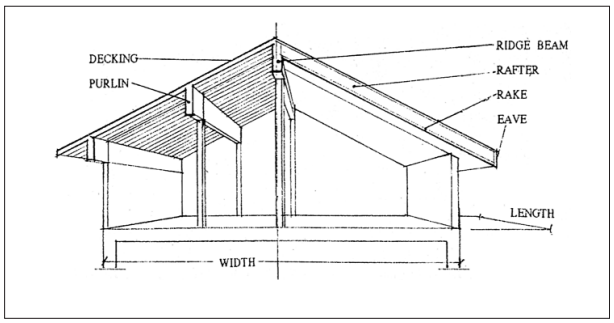


Figure 1. *Nowadays, "cathedral ceiling" is a term used to describe just about anything that doesn't have a flat ceiling. Two framing approaches are shown.*

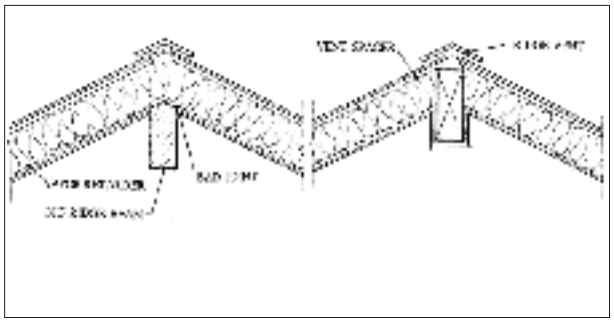


Figure 2. *Exposed ceiling beams can leave you with tricky vapor barrier details. One solution, at right, is to wrap the beam with poly and cover it with drywall.*

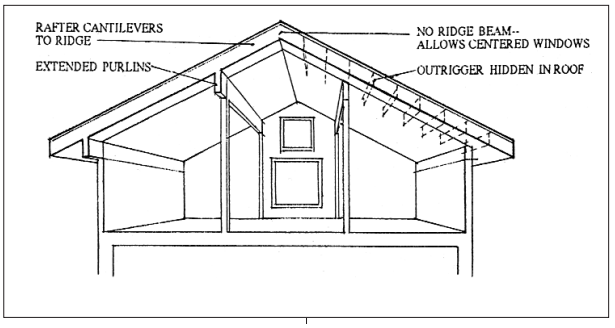
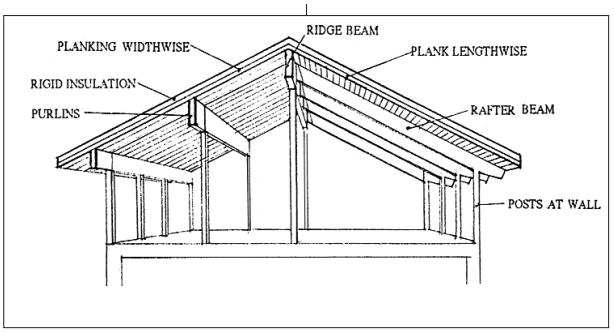


Figure 3. *With 2x12 rafters that make room for roof insulation, you can install two purlins at the third points and omit the ridge beam altogether.*



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Plank and Beam Systems

If saving energy is not a chief concern, or if you're building a seasonal house where energy is not a big problem, you might want to use a plank-and-beam ceiling. My first house in 1968 was exactly this: a wide-gabled space with several purlins and hemlock planking. It still looks great, and since it is basically a summer house, is not a great energy hog.

To add insulation that meets code and still expose the planks, you must use some kind of foam over the planks, and attach the roof to the foam. This house has white-cedar shingles over a couple of inches of Fescoboard (an inedible form of shredded wheat), maybe on strapping (my memory fails me), and the roof has stood up to the Cape Cod seaside for 20 years.

If I were to build such a winterized house today, I would want to use at least 3 inches of foam insulation, though with 3 inches of foam you only get about R-19 after the foam ages. For a well-built roof made of rafters, the R value can be as high as R-30 or R-40. I am not sure how to hold the roofing onto an R-30 or so foam roof, however, so I now avoid using plank roofs altogether.

Instead I would probably build the roof out of rafters deep enough for good insulation. Then I'd add a decorative-wood ceiling of 1-inch boards in place of plaster. I'd probably end up saving money in the process too. So much for exposed, honest structure. High energy costs have put a damper on such cherished Modernist notions.

Several manufacturers of pre-cut homes have based their designs on exposed plank-and-beam ceilings.

One such design has a heavy-ridge beam. Off this ridge beam, large-rafter beams span to wall posts at modular centers and cantilever to form generous eaves. The planking then runs the long way and cantilevers to form a rake overhang (see Figure 4).

Note that the insulation must extend all the way to the ends of the overhangs (unless you want to have an irregular roof surface). This adds cost but it does thicken up the edge of the roof, which helps to avoid the look of a thin-plank roof sitting on the building like a large piece of cardboard.

Watch out for problems where big beams run through the outside walls, or where the beams penetrate up into the rafter space. Big members move around more than small ones, and it is very hard to keep the gaps closed up where interior finishes abut the beams. I try to avoid letting structural members extend through a wall (although it is impossible to build a cantilevered floor without doing this).

If you wish to use large exposed beams, why not follow the lead of the folks at Acorn Structures and forget about heavy timbers? They have switched to glulams because they simply can't find an assured supply of large members that don't check, split, drip, sap, or otherwise misbehave.

Exposed glulam beams look pretty good, as opposed to microlams, which look most utilitarian and should be covered up. Beware of a couple of problems we have noted with microlams: They move around like crazy when you first put them in, and they tend to take an initial set. This initial deflection seems to have nothing to do with loading, and can be pretty disturbing if you are trying to hold close tolerances. As far as we know, once they have set, they stay put as long as you keep them dry - they should be painted immediately upon installation. Any further information on this subject would be welcome. ■

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