

FRAMING A Barrel-Vault Dormer

My design-build company recently completed a residential addition that included a 16-foot-wide

by Thomas Buckborough

dormer with an arched roof. Although the construction was challenging, the finished copper-roofed dormer, complete with a curved plaster ceiling, adds a dramatic element to the addition.

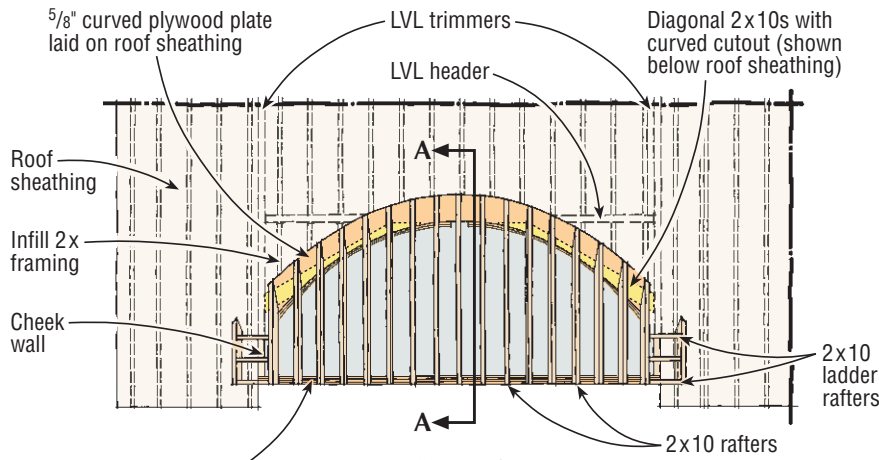
As I planned the dormer framing, I tried to anticipate the best way to create a crisp edge where the curved dormer ceiling intersects the flat sloping ceiling under the main roof. Clearly, it would be difficult to create the curve of the roof and the curve of the ceiling with the same rafters.

The solution was to frame the ceiling separately from the roof. This allowed us to concentrate on getting the proper

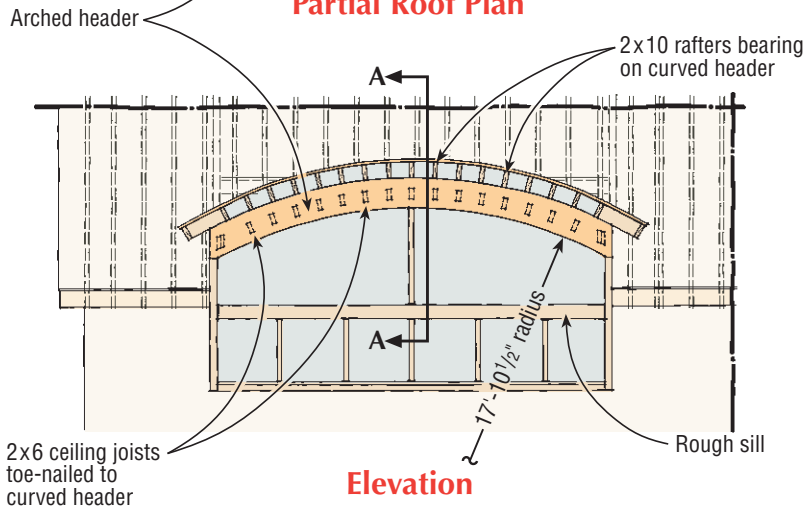


Keeping the ceiling joists independent of the rafters simplified the process

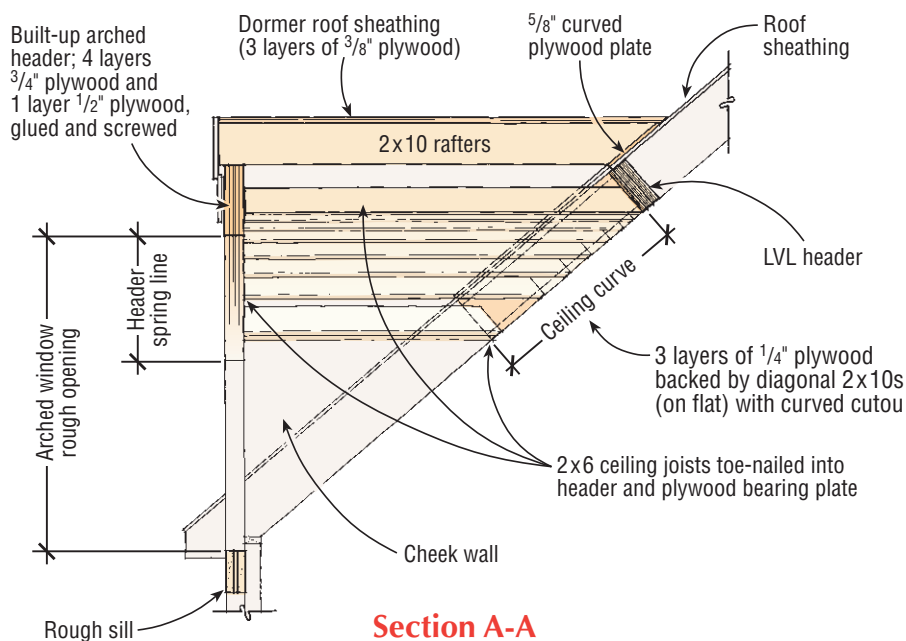
Curved Dormer Details



Partial Roof Plan



Elevation



Section A-A

bearing for the rafters without worrying whether the bottoms of the rafters established the desired ceiling curve. To clarify the design, I drew a section in both directions, as well as a standard framing plan.

Curved Header

Fortunately, my lead carpenter, Kevin St. Onge, had experience building curved structures on previous projects. The first step, just as for any dormer, was to frame a rectangular rough opening in the main roof. The LVL trimmer rafters and the LVL header at the high side of the opening were sized by a structural engineer. When we sheathed the main roof, we allowed the plywood to run wild into the rough dormer opening, to provide a surface for drawing the curve of the dormer roof at the line where it intersected the plane of the main roof.

The dormer design included eight windows, all purchased from Eagle Window and Door (800/453-3633; www.eaglewindow.com). The two largest windows were custom units with radiused tops.

The window header was assembled from five layers of CDX plywood — four layers of 3/4-inch plywood and one of 1/2-inch. Because the 3 1/2 x 15 1/2-inch header has a post at the midpoint of the 16-foot span, I felt confident that it was generously sized.

To draw the curves on the plywood, we made a 19-foot-6-inch trammel from scabbed-together 1-by boards. From the pivot point, we measured two radius lengths — 17 feet 10 1/2 inches and 19 feet 2 inches — corresponding to the inside and outside arcs of the header.

After scribing and cutting the plywood pieces, we assembled the header with plenty of nails and construction adhesive, staggering all the plywood joints. We nailed the header into place, and then we turned our attention to the dormer rafters.

Dormer Rafters

To locate the line of the curved header on the plane of the main roof,



LVL trimmers and header frame the dormer's rectangular opening (above). Short cheek walls at each end support the curved window header (right), which was laminated on site from five layers of plywood.



The rafters run from the top of the curved header to a curved plywood plate on the main roof. Because it provides low-slope protection, soldered copper was the roofing of choice.

we temporarily screwed $\frac{5}{8}$ -inch plywood over the roof sheathing, then used a laser pen to transfer the arc. One carpenter moved the laser pen along the header, using a simple site-built jig to keep it level, while another carpenter transferred the marks onto the $\frac{5}{8}$ -inch plywood. We then removed the plywood and cut out a curved plate to form a bearing surface for the dormer rafters.

Each 2x10 dormer rafter was individually measured and cut to length. We installed the rafters level, with one end resting on top of the window header

and the other end, cut at an acute angle, resting on the main roof.

The dormer ended up with two small cheeks, which we closed in with 2x4 stub walls. The subfascia was made from $\frac{3}{4}$ -inch plywood. First we installed the curved subfascia on the face of the dormer, and then installed the fascia returns back to the main roof. On each side of the dormer, the fascia return was attached to a pair of 2x10 ladder rafters supported by the cheek walls. Later, the subfascia pieces were covered with finger-jointed 1x12 cedar trim.


Since $\frac{5}{8}$ -inch plywood wouldn't easily bend to the roof's curve, we sheathed the roof with three layers of $\frac{3}{8}$ -inch plywood. We protected the roof sheathing with rubberized-asphalt eaves membrane; eventually, the roofing contractor arrived to install a flat-seamed soldered copper roof.

Framing the Curved Ceiling

We drew an arc on the window header 4 inches up from the top of the window heads to mark the bottom of the ceiling joists. We then installed a pair of diagonal 2x10s in each corner of the rectangular rough opening and transferred the arc on the header onto the 2x10s, again using the laser pen.

We cut the curve with a jigsaw and then installed three layers of $\frac{1}{4}$ -inch plywood to create a smooth arc. The 2x6 ceiling joists were toe-nailed to this curved piece of plywood, defining the crisp edge I was looking for.

Finishing

We insulated the dormer, then strapped the ceiling with strips of $\frac{1}{2}$ -inch plywood installed 12 inches on-center. Two layers of $\frac{3}{8}$ -inch blueboard conformed easily to the curve, without the need for moistening. Flexible corner bead installed at the transition between the main sloping ceiling and the curved ceiling established a near perfect curve. 

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To define the ceiling curve, the author installed a pair of angled 2x10s in the upper corners of the rectangular opening (top). The doubled 2x10s were cut to follow the curve of the header, then skinned on the inside with plywood to make a perfectly radiused nail base for the ends of the 2x6 ceiling joists (bottom).