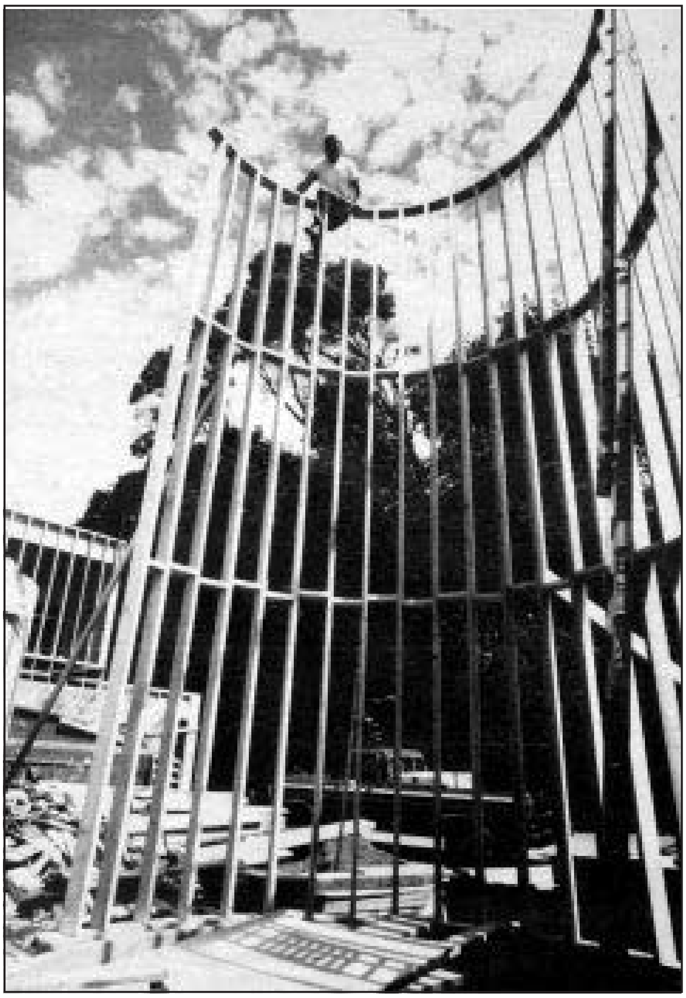


The author sits atop the completed portion of a two-and-a-half-story tower wall. The 22-foot-high wall was tipped up in 8-foot-long sections and the double-layer plywood plates spliced together.

When Walls Go Round

Simple techniques will help builders frame what the designers draw

by Neil Momb

After 40 years of building whatever the architects can draw — from simple circular walls to S-shaped and flared walls — I now think of myself as an accomplished radius wall framer. Still, I remember how easy it is to be intimidated by a set of drawings showing curved walls.

Curved walls are simple once you begin to think "round." A round wall is just a straight wall with curved plates. But details such as window and door openings and fireblocking can get tricky when things go round. This article will describe some of the standard ways I frame radius walls.

First, let's look at the essentials of drawing and cutting curved plates.

Drawing Curves

There are a couple of different ways to draw curves full scale. When the radius is fairly short (under 5 feet or so), I drive an eight-penny nail partway in at the center of the circle and hook the end of my tape measure over the head. Then, holding a pencil on my tape, I draw the curve. This method is fast, but with large-radius curves the tape can get hung up.

For big curves, I cut a piece of strapping to the length of the outside radius of the wall. I then measure back the width of the plates and cut a notch in the side of the strapping for a pencil. With one end of the strapping nailed to the center point, I hold my pencil in the notch to draw the inside plate line, and hold it on the end of the board for the outside line.

I draw the plate sections on plywood. A plate built up out of two layers of 3/4-inch plywood is plenty strong and will match the nominal thickness of 2x plate stock, which allows you the use of a common stud length throughout. Half-wall sections with an outside radius of less than 4 feet can be drawn on one sheet of plywood. Larger radius curves, of course, require more sections. But as you will quickly discover, it takes more material to cut small-radius plates than larger ones.

Cutting Curves

I use a heavy-duty, 3hp plunge router and a pilot-panel bit to get the fastest, cleanest radius cut possible. I use a Makita plunge router; it's proven to be a very tough machine. The panel bit has a sharpened end for plunging into the wood, and either one or two cutters (flutes) along the shaft. With a 3hp router, you can cut through a 3/4-inch piece of plywood in one pass, so you need a bit with at least a 1-inch cutting edge. Carbide cutters are a must because the plywood glue quickly dulls any other. I use 1/2-inch diameter shafts, as 1/4-inch bits tend to chatter with heavy cutting and break easily.

To cut a curved line with a router, I make a jig out of a piece of plywood which is a few inches wider than the base of my router (see Figure 1). The piece is routed out for the base and has a hole for the bit to stick through. I can

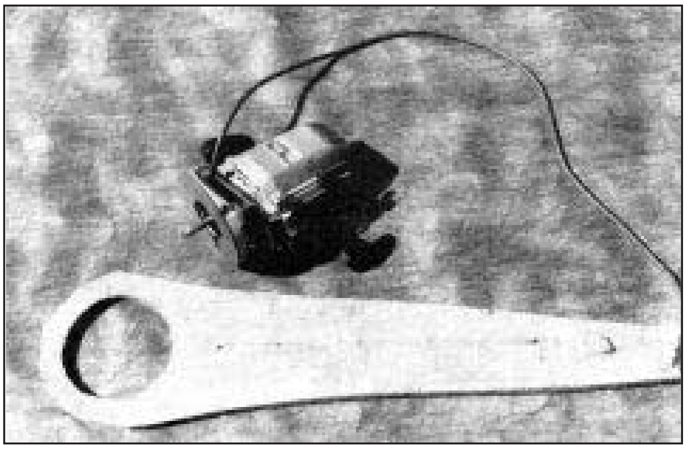


Figure 1. *The author uses a plywood jig to hold a router for cutting curved plates. The radius can be adjusted by screwing on any length of strapping.*

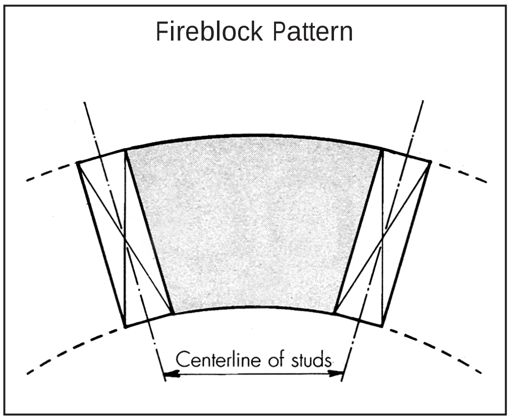


Figure 2. *To find the correct angle and length for fireblocking, mark the centerline for two adjacent studs on a section of curved plate stock and measure in half the stud width from each end.*

screw this jig to any board that gives me the correct length of the radius. When you measure to cut the radius, remember which side of the bit the cut is made on.

When you start cutting, you'll notice that you can only swing through the cut in one direction — that is, against the rotation of the router spindle.

Once you've cut one plate section, you can use it as a template for cutting the rest. I temporarily fasten the finished plate to the remaining uncut plywood with 1$^{1}/_{4}$-inch drywall screws, and then turn the plywood over. The pilot tip of the bit acts as a guide along the original plate.

Layout and Assembly

At this point the plates haven't been cut to length. Lay the rough plates where they actually go, overlapping the ends. I first lay out for stud spacing, and then mark openings, intersecting walls, and special bearing points for loads above.

The rule of thumb for on-center spacing is 1 inch per foot of diameter measured along the outside of the curve. For example, on a 4-foot diameter wall (with a 2-foot radius), the studs should be 4 inches on-center. On curves over 12 feet in diameter, stick with 12 inches on-center. This number of studs is needed to define a smooth curve, more than for carrying loads. When measuring along the outside of the plates, use a flexible nylon or fiberglass measuring tape. It will wrap around the radius much better than a steel tape.

With a straightedge or chalkline stretched along the radius line, I mark the end cuts on the overlapping ends of each plate section, cutting the plate stock so the splices fall on the center of a stud.

I nail together the two layers of plywood for each plate section with 1$^{1}/_{4}$-inch joist-hanger nails (available from Teco, Simpson, Kant-Sag, etc.). The overlap between layers should be at least 16 inches. After assembling the double-layer plates, I turn them curve up to nail in the studs.

Two people working together, one at the top plates and one at the bottom, speeds the task of nailing the studs in place. I prefer to use air nailers for this because they don't knock things out of alignment. It's best to leave the first stud off each section since it falls on the splice.

Curved walls are naturally stable, so depending on the radius, you can get away with a lot less temporary bracing to stand the walls up. The first stud must be braced in two directions. After that, a 2x4 brace between the wall and the floor deck is needed only every 8 feet or so to hold the studs plumb. I plumb the sections as I go, and this alignment telegraphs around. On a completely round tower, the last section just pops right into place.

Pre-cut plate sections are used for the second top plate after the wall sections are lifted into place. Use the standard rules for double-plating — that is, at least 32-inch overlaps at plate joints and header ends.

Fireblocking

In a round wall, only the center of a stud lies on a true radius line, but the angle at each end of a fireblock is slightly different. To find the correct angle, I locate and mark the centerline for two adjacent studs on a section of radius plate stock. I then measure in half of the stud width on each end, as shown in Figure 2. This gives me both the angle and length for fireblocks. I cut a fireblock pattern and duplicate it as many times as needed. To keep the wall straight after the blocks are installed, you have to take a lot of care to ensure that each fireblock is exactly alike.

Most of the round walls I build are linked to straight walls, and dead space is almost always created at the intersections (see Figure 3). To fire-stop the dead space at the ceiling, I substitute scrap pieces of $^{3}/_{4}$-inch plywood for double top-plates. When all the walls are plumbed and braced, I nail an oversized plywood scrap over the intersection, overlapping all the joints to tie the walls together. Then, I trim around the perimeter with a router, and add a second layer (pieces are okay), trimming this the same way.

Skinning the Walls

When sheathing exterior walls, I run the plywood vertically. It

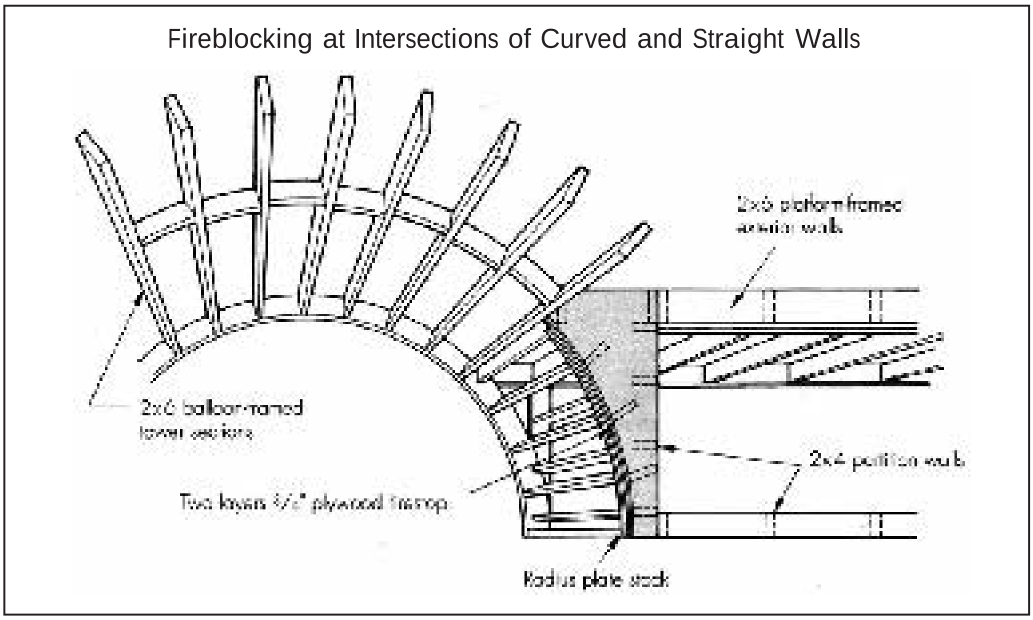


Figure 3. *When a curved wall intersects a straight wall, the dead space must be fireblocked. The author uses scrap pieces of $^{3}/_{4}$-inch plywood (shown in gray) in place of double top-plates. The scraps are nailed over the cavity and then trimmed to the contour of the walls with a router.*

Figure 4. *Narrow windows work best in round walls. In this 12-foot-diameter stair tower, the author installed tall, narrow windows between the 2x6 studs set 12 inches on-center. In the room above, he was able to fit each 20-inch-wide window in two stud-spaces.*

Case Study: An Oval Dining Room

By Lars Larsen

I recently completed the interior renovation of a historic house in Charlotte, Vt. The final stage of the project involved turning a 13x17-foot rectangular room into an oval dining room with horizontal wainscot and chair rail, and two built-in china cabinets.

Getting Started

The first thing we did was to protect the wide-plank floor with rosin paper, overlapping and taping all the edges. This also gave me a clean surface for marking the layout. We then installed the ceiling drywall — to avoid the aggravation of having to fit it to the curved walls later.

The oval shape I was working with was simply a rectangle with a semicircle at each end. To draw the semi-circles I used a site-made compass — a 3-inch strip of lauan with small holes drilled for the center, the inside and outside of the curved plate, and the inside of the finish surface. I spun these circumferences carefully with a sharp red drawing pencil, so my layout would remain visible throughout construction. A brad held the center and left only a scant hole in the finish floor.

Plates

Because we were working to a finished ceiling we had to break the wall height into two sections (a full-height curved wall would get stuck as it was lifted into place). We made the break at the chair rail, where the drywall meets the wainscot. We needed four plates, two for each section.

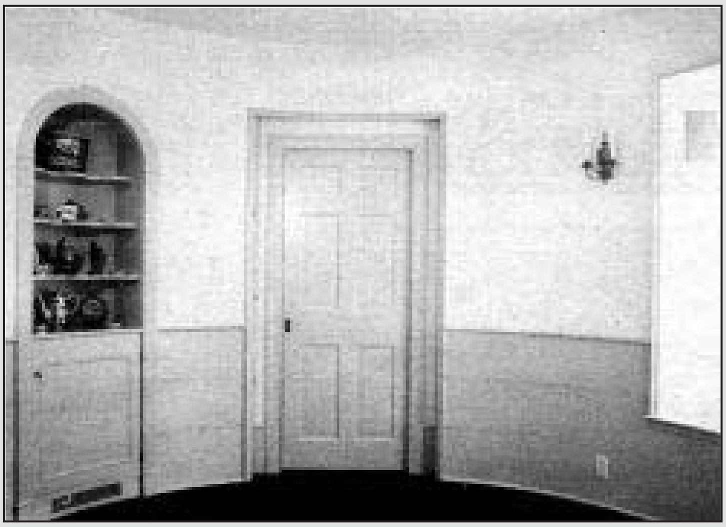
We routed the radiused plates out of 3/4-inch all-poplar plywood, which I like because of its dimensional stability. We used a 3hp Makita plunge router with a 1/2-inch carbide, two-flute plunge bit, set up on a compass jig like the one I used for layout.

Walls

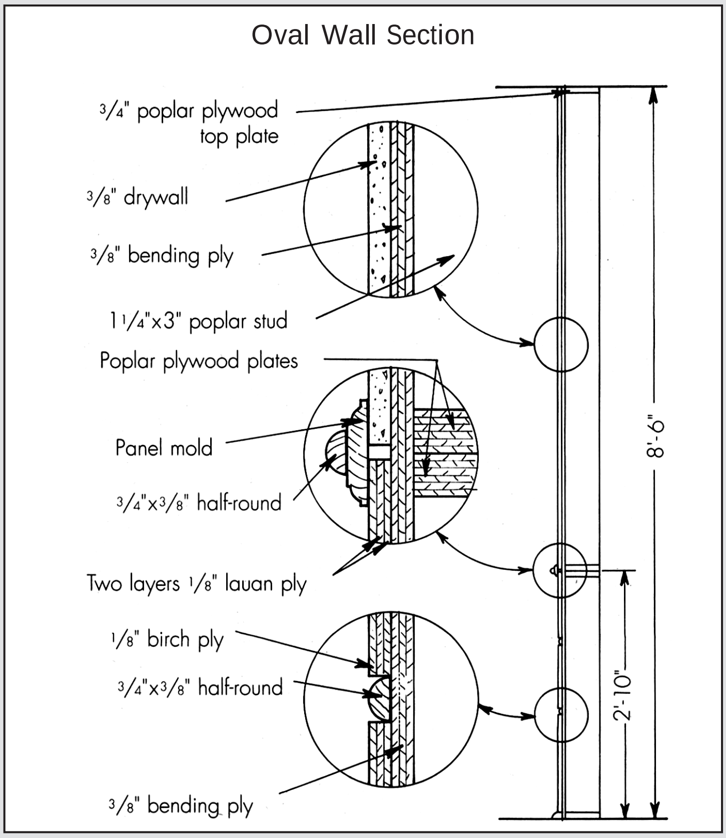
We framed the wall halves with 1 1/4x3-inch studs of kiln-dried poplar, chosen for its natural stability and reasonable cost. After the walls were in place, we brace-framed them back to the original rectangular walls.

Bending ply. We skinned the framing with a base layer of 3/8-inch bending plywood (also known as "flex-ply" or "wiggle-wood," and available through most plywood wholesalers), a three-ply product that conforms to curves with surprising ease. It's available in 4x8 sheets, in two formats: one allowing the sheet to bend along its length, the other along its width. We used the latter for this project.

We glued (with carpenter's glue) and air-nailed the bending ply to the framing, rolling it onto the studs from one direction to avoid any "bubbles." Planing and sanding any irregularities in the joints created a surface smooth to the touch.



Because doorways were pre-existing in the rectangular room, Larsen reduced the radius of the oval so that the doors would each be set back into a small alcove, avoiding the expense of reframing the doorways.



The key to finishing the curved interior was to build up with layers that would bend easily, creating a smooth curve.

Drywall. To prepare the drywall for the upper portion of the walls, we let the sheets droop over a site-made curved form while wetting the back paper with a paint roller. The weight of the drywall hanging over the mold, plus a little gentle coaxing, allowed the sheet to make the bend. The wetting operation took place outdoors.

We installed the drywall horizontally, working from the ceiling down, and holding it in place with a 48-inch-long block screwed one stud ahead of the one being screwed off. We tried to minimize butt seams, as they become a bigger challenge to finish on a curved wall.

Wainscot. To create the beaded horizontal wainscot I determined where the beads would fall and glued and nailed a 5/8x3/8-inch half round at these heights on the bending-ply surface. I then installed two layers of 1/8-inch lauan plywood as a base, and a paint-grade layer of 1/8-inch birch plywood (see section drawing). We glued and brad-nailed the veneers, being careful to roll them out for a smooth curve. To clamp the final layer until the glue dried, we brad-nailed through 2-inch strips of lauan. We then peeled these pieces off and pulled out the brads, leaving smaller holes to be filled. For these gluing operations we used plastic resin, a glue with a slow setting time, to allow us to correct any errors before the glue set.

I built up the chair rail from two 3/8-inch layers that easily made the bend, and so achieved the look of a larger molding.

The key to this project was working carefully at every stage of the way, beginning with layout. Our patience was rewarded by a happy client and a room that is a pleasure to behold.

Lars Larsen is a carpenter and cabinetmaker in Burlington, Vt.

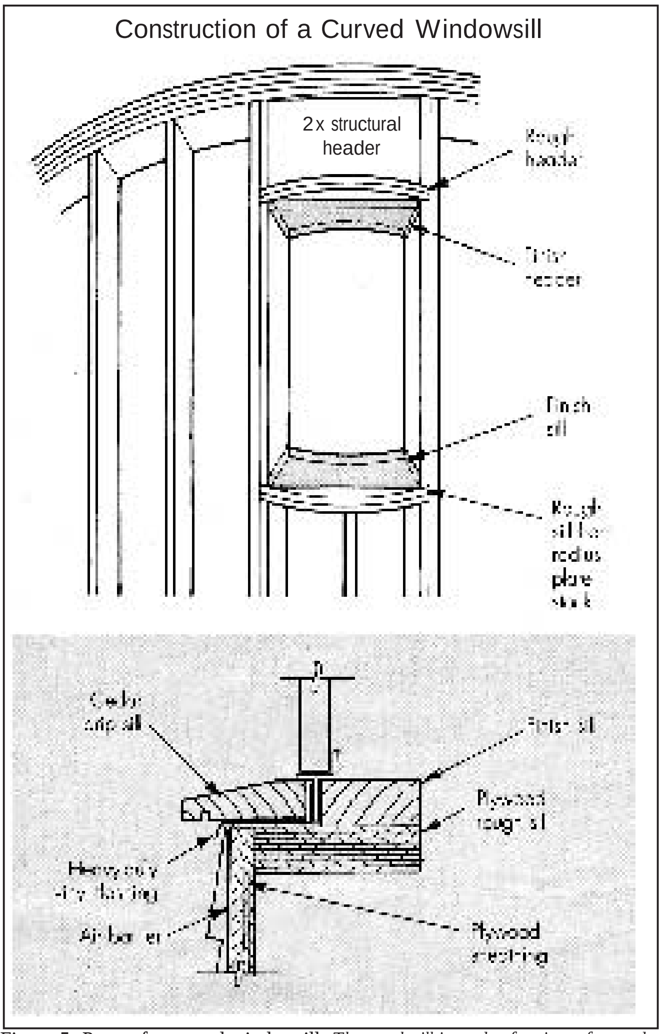


Figure 5. Parts of a curved windowsill. *The rough sill is made of a piece of curved plywood plate stock, with a piece cut from 2x lumber nailed on top. The finish sill is straight on the outside to match the window and curved on the inside to fit the wall (top). A cedar drip sill — cut with a jigsaw and beveled with a power plane — trims out the window (above).*

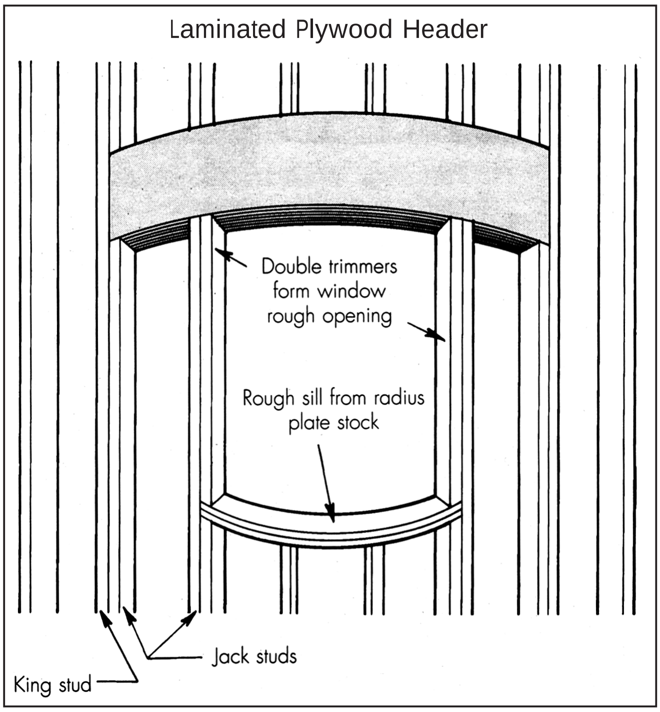


Figure 6. *For wide window openings, the author builds a laminated header from plywood strips (shown in gray). To keep the curved header from tipping outward, it must be cantilevered over the jack stud on either side of the rough opening.*

must be ripped to splice on studs, and all horizontal joints need to be blocked. Half-inch CDX will bend around large curves (8-foot radius and up). For tighter curves I use either one layer of 3/8-inch CDX or two layers of 1/4-inch, staggering the splices between each layer. The double thickness is only needed for holding siding nails. Bent into a curve, one layer of 1/4-inch plywood is remarkably strong.

Be generous when nailing off the skin. I generally use a 3- to 4-inch spacing along the edge of the plywood, and about a 6-inch spacing in the field, to flatten out all the bulges. The way you nail the sheets is important for getting them aligned properly. On the first sheet, always work from the center towards the edges. On the next sheets, nail the edge nearest the first sheet of plywood, starting in the middle of this line, and working your way up and down. Then move over to the next stud, starting in the middle of the line again, and so forth. If you don't follow this pattern, the plywood sheets will tend to wander out of alignment as you wrap them around the frame. By the time you discover this you're really in trouble.

Openings in a Curved Surface

Windows in a round wall are an opportunity for the designer to have some fun, but the builder ought to exert some influence. If the windows are too wide, the corners will protrude inside. And since curved glass units are super expensive, narrow windows are usually the choice. In the stair tower in Figure 4, I installed tall, narrow windows between the studs with very satisfactory results. The studs are 12 inches on-center, and the windows are 10 inches wide by 4 feet high. These fit in nicely above the treads inside.

You don't always have to go so skinny, though. On the top of the same tower, I built an observation room where wider windows were needed. Using two stud-spaces I was able to fit a 20-inch-wide window in the 2x6 wall.

The rough sill for the window opening is cut from radius plate stock. I then add another sill on top of this which is straight on the outside to accommodate the window, and curved on the inside to fit the wall (see Figure 5). This arrangement is reversed for the top of the opening. I can then run a straight structural header between this top sill and the top plates.

The finish sill is cut from a 2-inch-thick cedar plank. I cut the outside curve with a jigsaw and then bevel the top face of the board with a power plane. Before setting the windows and the finish sill, I lay down a heavy-duty flexible vinyl flashing.

For wider windows using curved-glass units, I fashion a laminated header from several 1/2-inch plywood strips, building it to the thickness of the stud width. To build the header, you must first make a curved pattern-frame with an outside radius equal to the inside of the curved wall. The first layer is screwed to the frame so the screws can be removed later on. Then using a resorcinol glue or construction adhesive, I bend the plywood strips together, pulling the pieces in with staples or small nails until the glue sets. At this point, I leave the ends long and I don't nail where the header will be trimmed to length.

If the opening is very wide, I extend the header beyond the rough opening, at least to the next stud. This means that the header cantilevers over an extra jack stud on either side of the rough opening (see Figure 6).

Finishing Up

Siding on exterior walls requires special consideration, and here is another place you can influence the designer if the budget matters. Clearly, the simplest, least expensive siding is stucco. Cedar shingles also work well. Stone and brick do nicely to accent the curve, but can be expensive. If wood is preferred, I try to recommend narrow vertical siding, such as 1x4 T&G. It's beautiful, but be careful to pre-stain so you don't get any unfinished smiles when the wood shrinks. Avoid horizontal clapboards if you can. On one large radius curve (24 feet), I used 1/2x4-inch bevel cedar siding with great success, but I would discourage using anything wider or thicker, or trying it on tight curves.

On interior walls that have a 2-foot or smaller radius, I use one layer of 1/4-inch shop plywood under one layer of 1/4-inch drywall. This gives a truer curve than wetted drywall alone. (For more on finishing the interior of curved walls, see "Case Study," previous page.) On concave surfaces, I sometimes go with a thinner plywood and use 3/8-inch drywall, since it's harder to bend the plywood into the curve.

Round walls add a lot to a design, and are quite fun to build. After a couple of projects, you'll find yourself looking for a place to include them. ■

Neil Momb is a framing contractor in Issaquah, Wash.