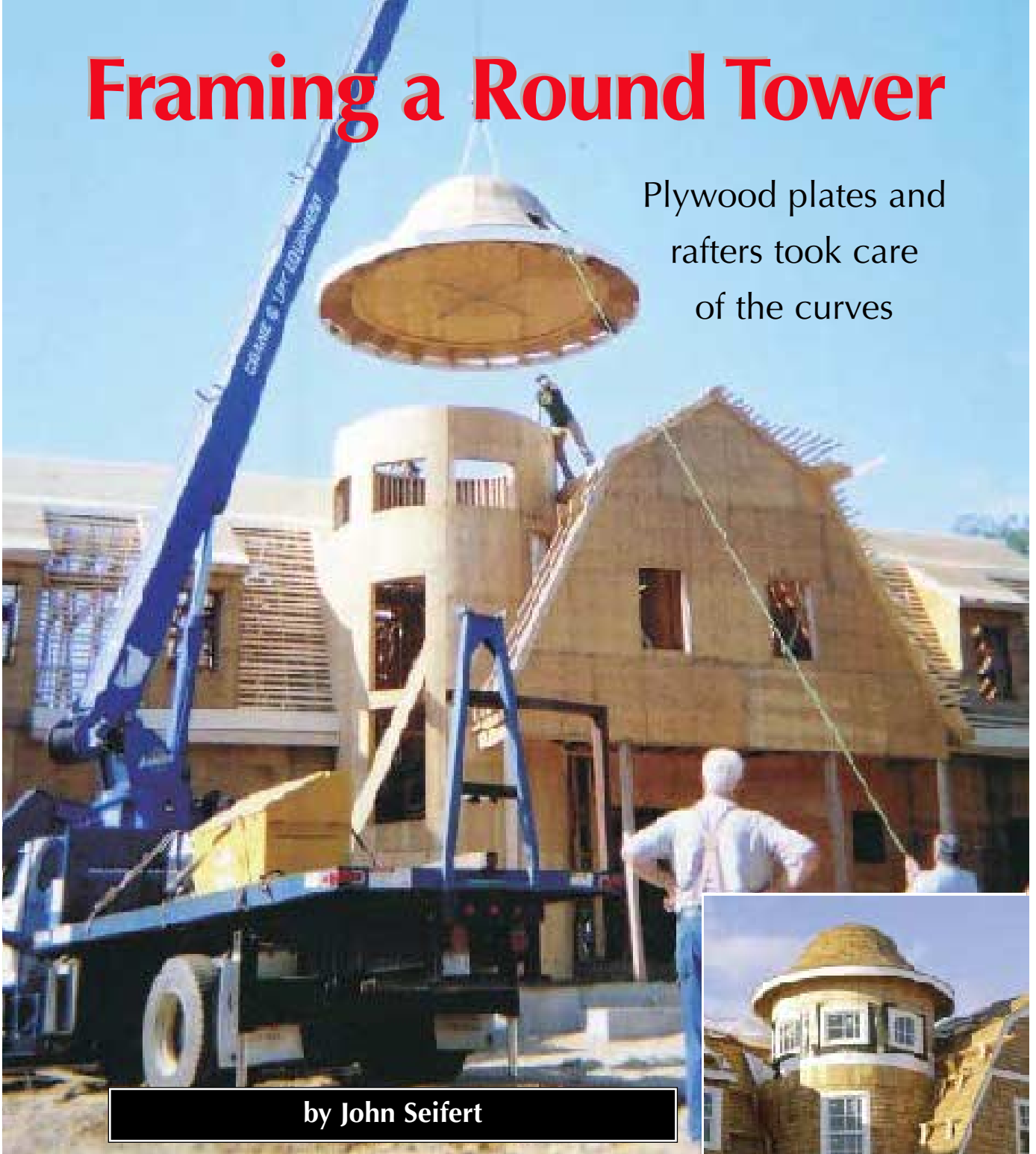


Framing a Round Tower

Plywood plates and
rafters took care
of the curves



by John Seifert

I'm a framer on eastern Long Island. My brother, Fred Jr., and I build a half-dozen custom homes each year, typically 5,000 square feet or larger. While Fred rides herd on the business end of things, I direct the field crew in a hands-on capacity. Last year, we began building a gambrel-roof, shingle-style home that features a two-and-a-half-story turret, 12 feet in diameter and about 32 feet high, not including the rooftop finial. The turret projects from the front elevation and encloses a stairwell with semicircular, mid-level landings between floors. The half-round tower opens into the first



Section Through Tower

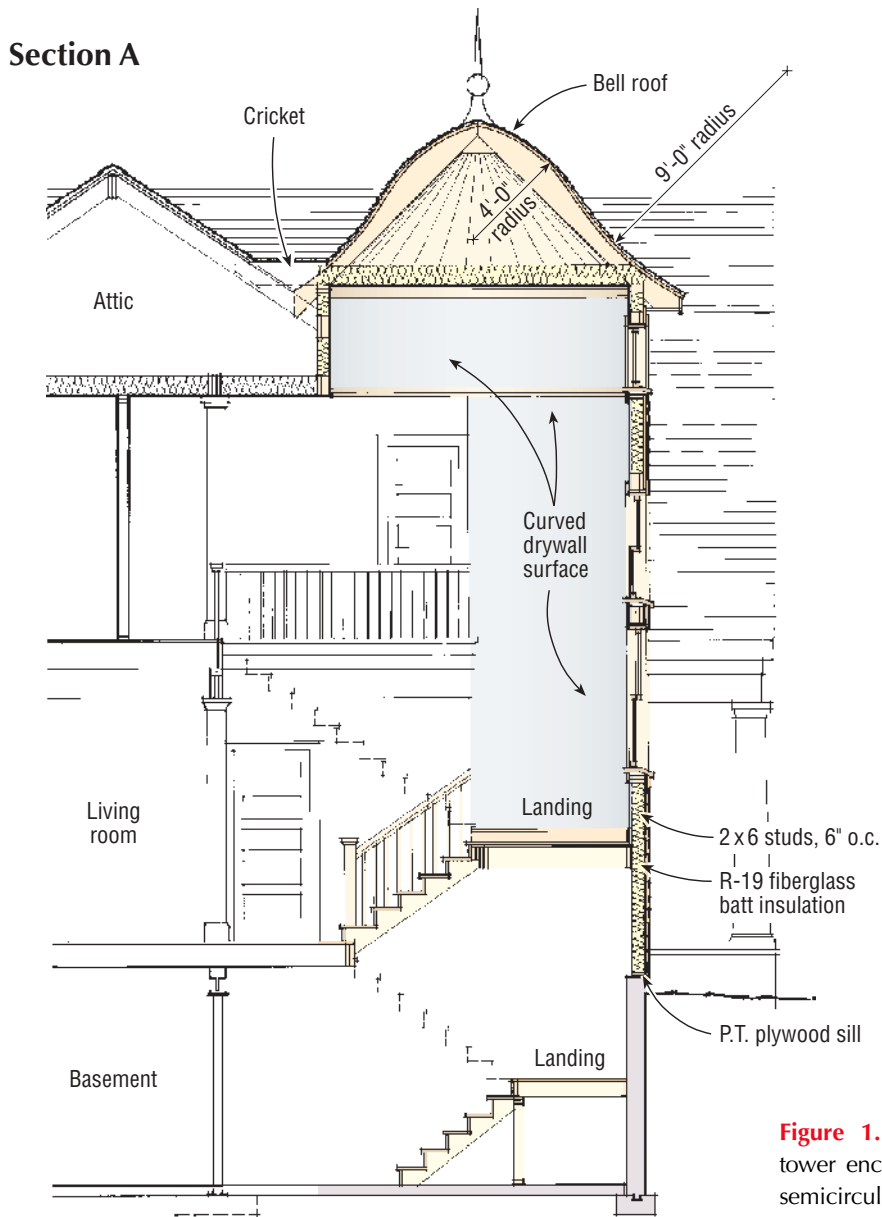
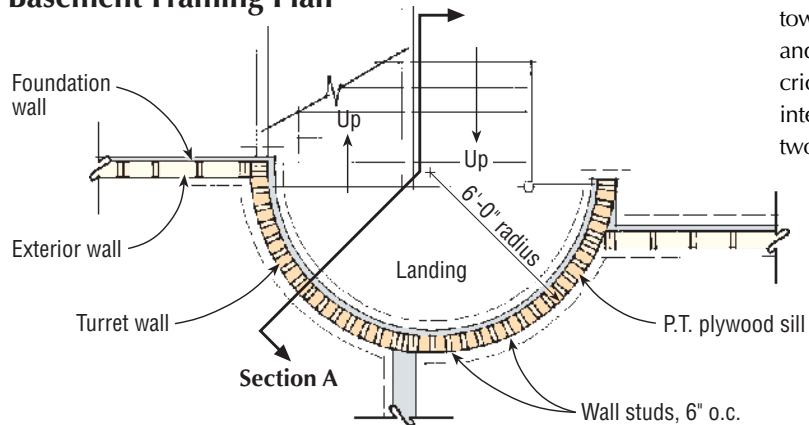


Figure 1. The 12-foot-diameter tower encloses a staircase with a semicircular landing at the first floor and an open railing at the second floor. Daylight from three windows floods the top of the tower, where it penetrates the roof and becomes fully round. Note the cricket where the tower's back wall interrupts the valley between the two gambrel roof sections.

Basement Framing Plan





and second floors on the inside, but it becomes full-round construction where it penetrates the roof. In this article, I'll explain how I tackled this complicated piece of framing.

Fred worked with the foundation sub to stake out the turret's footing and foundation, using a nail to pinpoint the turret location and the center of its radius. From this pivot point, he swung a tape measure to locate the center of a 24-inch-wide poured concrete footing. He later used a trammel stick to swing the outer radius of the foundation wall onto the footing, using the point of a nail to scratch the green concrete. The foundation sub used 6-inch-wide panels to form the wall in a faceted curve.

Circular Plates

The portion of the turret that projected from the building's facade was a little less than a half circle (see Figure 1, previous page). Accordingly, we needed a semicircular mudsill and several half-round wall plates to frame the outer walls of the turret. We made the sill and wall plates by laminating a double layer of $\frac{3}{4}$ -inch plywood; for the mudsill, we used pressure-treated southern yellow pine plywood; the rest of the plates were made from fir cdx.

We cleared a space on the subfloor, laid down a surface of clean plywood to work on, and I used a trammel to draw a full 12-foot-diameter circle to guide the assembly (Figure 2). The plates had to be made from several shorter segments of plywood; we were able to cut about five segments per 4x8-foot sheet. I used two marking points on the trammel, one at the 6-foot radius and the other $5\frac{1}{2}$ inches back, to make a nominal 2x6 plate. Although the cuts were curved, the radius was wide enough that we could make the cuts with a



Figure 2. Two layers of $\frac{3}{4}$ -inch plywood, glued and nailed together with overlapping joints, formed the top and bottom plates of the tower's frame (upper right). The sill plate (upper left) was made from pressure-treated plywood. The walls were assembled in place in three sections, with 2x6 studs toe-nailed in place on 6-inch centers, measured along the outside edge (above).



Figure 3. The top, full-round section of the tower was framed on the ground and hoisted into place with a material lift (top). The round section dropped neatly into place in a square opening framed to support it (above and right).



Figure 4. Simple curved window headers were made with doubled 2x8s sandwiched between plywood plate segments (left). Cripple blocking was added on the outside face where needed (below).

circular saw. Each layer required five or six segments to make a complete ring. We assembled full ring plates, then cut most of them into half-circles for use in the lower sections of the turret. We set aside four full circles with which to frame the section of the turret above the roofline as well as the bell-shaped turret roof. We also cut enough segments to fabricate curved window headers.

Wall framing began directly on top of the pressure-treated plywood mudsill, which was installed as usual over sill sealer and anchor bolts. The 2x6 studs were laid out radially around the sill every 6 inches on-center, measured along the outside perimeter.

We framed the turret platform-style, in three levels. The stacked plates and shorter stud lengths provided more stiffness than balloon framing.

The top plate of the second wall section stopped flush with the second-story ceiling joists. Above that, the framing went fully round where it projected through the roof.

We framed the second wall section with its top plate flush with the top of the ceiling joists over the second floor. Above that level, the turret framing projected above the roofline and became fully round. We framed the ceiling openings square as in a conventional stairwell and added diagonal framing to round off the corners (Figure 3, previous page).

The close radial layout created tight stud spacing on the interior side, which was an advantage for drywall application but made for a labor-intensive insulation job. (We used R-19 unfaced fiberglass batts, each batt carefully cut and stuffed to fill the bays' flared contours.)



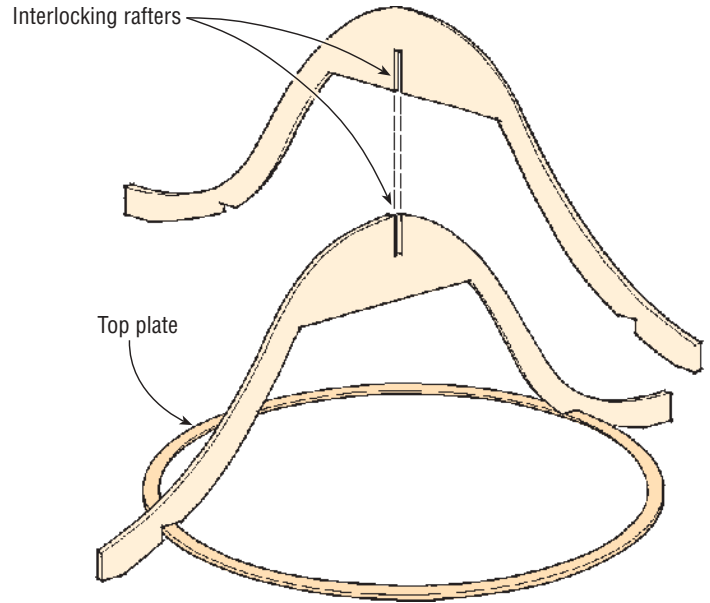


Figure 5. Plywood bends more easily parallel to the face grain, so the carpenters installed the double-layer $\frac{3}{8}$ -inch sheathing vertically (above). A lip at the top of the tower wall captured the bottom plate of the roof (above right). At right, the author measures for a cricket where the tower interrupts a valley.



Figure 6. Double-layer rafters, glued and nailed together with staggered joints, were laid out with trammel sticks on the deck.

Turret Roof Framing



The turret section above the roof stood about 6 feet high. We framed it as a unit, on the garage slab, between two full-round plates, and lifted it into place with our JCD Load-All, an all-terrain forklift.

Window headers. There were several windows in the tower. We used Kolbe & Kolbe wood units (Manawa, Wisc.; 920/596-2501, www.kolbe-kolbe.com), special-ordered with 6-foot-radius head jambs and sills. To keep the framing process simple, we framed the wall solid and cut the openings later. In a circular wall, all “sides” are load-bearing, so the windows required structural headers. We sandwiched a typical, double 2x8 header between single-thickness, 6-foot-radius, $\frac{3}{4}$ -inch plywood top and bottom plates. Short cripple blocks filled out the curved profile between plates (Figure 4, page 5).

Curved sheathing. The 6-inch stud spacing helped create a smoothly curved profile for sheathing and provided plenty of nailing surface. We sheathed the turret walls with a double layer of $\frac{3}{8}$ -inch-thick cdx plywood, which we found easier to bend around the framing when applied vertically (Figure 5, previous page). We offset the seams in both directions on the second layer, making sure to align the long edges over framing centers for solid nailing. A single layer might have been adequate, but the double layer provided a solid nail base for the cedar shingle siding.

We sheathed the topmost section first so we could continue with the roof framing, which depended on enclosing the turret. We brought the sheathing up $1\frac{1}{2}$ inches higher than the top plate to create a captive ring for the roof plate. When framing the roof, I left a $\frac{3}{4}$ -inch gap between



Figure 7. Turret roof framing began with a pair of interlocking rafter pairs on a round plate (top left and right). Intermediate rafters were then filled in (above).

Figure 8. The author determined the bevel cuts for the rafters (right) by drawing a full-size overhead plan view on plywood, then cut the acute angles with a modified wormdrive saw mounted on a swing-table adapter (below).



the rafter tail and the plate to allow the wall sheathing to slip up in between.

We framed and sheathed a cricket in the valley behind the tower to drain water around the sides. Our father, Fred Sr., is skilled in sheet-metal work; he fabricates and installs all our flashings. He clad the cricket in lead-coated copper, with all seams triple locked and soldered.

Bell Roof Framing

We framed the turret roof on the ground, using site-made laminated plywood rafters. Its curvy shape was developed by combining two major arcs, specified by the architect, and was based on a 12/12 interior roof pitch. I drew the rafters full-size, directly on $3/4$ -inch cdx plywood, with the aid of a trammel stick (Figure 6, page 6). A 4-foot radius formed the domed top, and a 9-foot radius defined the concave slope section. Each laminated rafter was $1\frac{1}{2}$ inches thick, with its layers made in segments to maximize the number of cuts per sheet — we chewed up 55 sheets of $3/4$ -inch plywood making the mudsill, plates, and custom-shaped rafters. I made two different layer configurations so we could stagger the butt joints.

Roof framing. I formed the basic roof outline with a pair of intersecting hips, using two full-span, plywood rafter “trusses,” notched at midspan to interlock at 90 degrees, like a paper model where tab “A” inserts into tab “B” (Figure 7, page 7).

Inside each of the four hip intersections, I fit five additional rafters in a radial pattern at 15-degree intervals. I spaced the rafters along the plate by making the intervals equal with a tape measure. A shortening bevel cut allowed them to converge at the top of the dome.



Figure 9. The tower's ceiling joists fanned out from a center triple-2x8 cross member (top left). The birdsmouths were cut loose (top right) to allow the roof to slip into place over the sheathing lip described in Figure 5. The eventual ceiling surface was backed with 1/2-inch plywood (above) to stiffen the roof assembly for lifting, as well as to provide nailing for the radius crown molding.

Some of the shortening bevels were extreme angles, but they were easy to cut with a swing-table adapter (Pairis Products, Phelan, Calif.; 760/868-0973, www.bestconstructiontools.com) mounted on a wormdrive saw. I modified mine to accept a Linear Link chainsaw blade (Muskegon Power Tool, North Muskegon, Mich.; 800/635-5465, www.linearlink.com), made for timber framing or gang-cutting rafters (Figure 8, previous page).

The interior ceiling was flat. We framed it with 2x8s, starting with a triple 2-by cross member and filling in with radial joists fanning around like spokes on a wheel (Figure 9). We sheathed the underside with plywood to tie everything together and resist deformation when we craned the roof into place. The plywood also provided full nailing for the interior crown molding (Figure 10, next page).

Compound-Curve Sheathing

To sheathe the roof, we paneled each rafter bay individually using 1/2-inch cdx plywood. We cut it to bend parallel to the face grain and used separate panels to cover the lower and upper curvatures. This way, we weren't fighting the plywood into a double inside and outside curve. I patterned the first set of panels by screwing blank stock directly to a bay and marking the rafters' centerlines. The rest of the panels were cut from tracings of the patterns.

We'd taken care to cut the rafters uniformly and space them equally, so the panels fit well with only minor adjustments needed. We applied a bead of construction adhesive to the rafter edges and used ringshank nails to hold the plywood down tight to the curves. We expected to have to bevel the rafter shoulders prior to sheathing, but it wasn't necessary.


While the roof was still on the ground, we applied the

Figure 10. One section of the roof sheathing was left off to allow for access inside the tower for installation (right). The roof was finished with a bendable plastic fascia and cedar shingles (below).



circular fascia board. I didn't want to back-kerf and bend a solid wood fascia or invest a lot of labor in a glue-laminated member. Instead, we used cellular PVC Azek (Vycom, Moosic, Pa.; 866/549-6900, www.azek.com). It wrapped easily around the roof's diameter. We used a double layer of $\frac{3}{4}$ -inch material, solvent-welded between layers and at the bevel-lapped butt joint.

Shingling in the Round

Like the rest of the roof, the turret roof was finished with Grade A 18-inch "Perfection" western red cedar shingles, installed over a self-adhering bituminous membrane. On top of the membrane, we applied Cedar Breather underlayment (Benjamin Obdyke, Horsham, Pa.; 800/346-7655, www.benjaminobdyke.com), a stiff nylon matrix that allows air to circulate under the shingles, and shingled directly over it, using hand-driven stainless-steel ringshank nails. The ever shrinking, concentric rings of the turret roof shingling required each shingle to be quite narrow and trimmed to a taper. This was a slow process. Our roofing sub had four of his guys working on this one little roof for three days, cutting, block-planing, and fitting shingles of increasingly smaller size as they neared the top. We saved some time by culling out all the narrowest shingles from the bundles and designating them for turret use. To cap the dome, Fred Sr. will fabricate a round, copper "beanie." The final touch will be a lead-coated copper finial, purchased from a specialty supplier. 

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