INSTALLING
Gable Roof Trusses

For fastest installation, make layout marks on trusses while they're still on the ground

Occasionally we run across a builder who refuses to use roof trusses. His reasons, other than something about tradition and quality, usually include, "They sent the wrong size trusses," "We nearly got killed putting them up," or "The roof was crooked and flimsy." These common complaints point toward lack of experience rather than any type of truss system failure. As with any new or different building product, there is always a learning curve. Fortunately, costly errors can be avoided if the builder takes the time to learn how to order roof trusses properly, develops good site handling and erection practices, and follows simple installation, straightening, and bracing methods.

by Rick Arnold & Mike Guertin

Usually we can set the trusses and sheathe a 2,500- to 3,500-square-foot colonial with a two-car garage in a day with five guys. In our experience, roof trusses are always more economical than stick-framing when you factor in the labor savings.

Begin With a Thorough Plan Review

We've been burned by incorrect truss orders before. Although the mistakes weren't ours, we still suffered downtime waiting for replacements. The problem was always poor communication — usually the intervention of a salesperson or a misunderstanding on an "over the phone" order. To eliminate these pitfalls, we create a "truss package" from our takeoffs.

Beginning with a clean set of prints, we become familiar with the roof design and ceiling details. Roof design may be obvious from the exterior elevations, but determining ceiling details requires close examination of the building section drawings. We highlight rooms with any details that need to be built into the trusses, like vaults, coffers, or trays. Some complicated details like barrel ceilings can't be efficiently fabricated into the trusses, but can be stick-framed after installation if accom-

Figure 1. After the trusses are dropped on site, the crew first flushes up the stacks (top left), then marks important layout lines, including ceiling strapping (bottom left) and the exterior wall plates (near left).

modations are created in the trusses. We note critical items like wall measurements within rooms so it's clear where a vault begins and ends.

Color coding. Using colored pencils, we plan the preliminary truss layout by drawing lines across the floor plan on 2-foot centers (the typical truss spacing). Each different truss size and pattern gets its own color. Even on a basic colonial like the one shown in this article, we used several different types of trusses, including common flat bottom chord trusses, gable end trusses, vaulted ceiling trusses above the master bedroom, and attic trusses above the garage to create useable space in the future. There was also a girder truss, a small gable truss, and a "valley kit" for a gable bumpout on the front elevation.

Just to be sure there's no confusion about the length of the trusses, we make notes on the plan indicating the distance from outside face to outside face of the exterior walls the trusses will be spanning. Often this information must be culled from several interior partition dimensions, and we double-check to be absolutely certain. The final design and layout will be done by the truss engineer, but our detailed notes create a basis for clear communication between all the parties involved.

Special notes. To complete our plan review, we make special notes on a separate page, including roof pitches, the widths of exterior bearing walls, the type of heel on the truss (top chord overhang, bottom chord overhang, or raised heel), and the live load requirements for the bottom chord. We also include the length of the overhang (projection of the truss beyond exterior wall). Twelve-inch overhangs are common in our area, but we spec 10 1/2 inches. This leaves room for us to install a 2-by subfascia without trimming the truss tails (more on this later).

Roof-mounted equipment. Finally, we include information about the location and weight of any hvac equipment that will be mounted to the roof or hung within the attic space. The truss designer may need to beef up a couple of trusses to handle these loads.

These notes, together with the marked plans, become the package from which we make our truss order. On simple jobs, we just pass the package along to our building material salesman or truss salesman and await the engineer's design. With complicated truss roofs, we meet with the manufacturer's engineer to review our detailed plans and notes before he begins the design work. In either case, it's important to include a full set of plans because the truss engineer will trace any concentrated roof loads down through the house to the foundation. Sometimes we may need to beef up studs in a wall or install squash blocks to accommodate these roof loads coming down through the frame.

We always request a full set of truss design plans before actually placing the order. Careful review and a follow-up meeting with the designer gives us a last chance to catch errors and omissions before fabrication and delivery.

Delivery Day

We plan the delivery date to mesh with our framing schedule. We want the trusses to arrive two to three days before we erect them. Receiving them any sooner causes problems. On small work sites, the bulky trusses get in the way. Also, the longer the trusses are stored on site, the greater the chance

they may twist and warp from exposure to wetting and drying cycles and the heat of the sun.

On delivery day, we're always on site to ensure the trusses are dropped where we want them. The drop spot has to be flat and out of our way but within reach of a crane. Extra space will be necessary if we have a complicated truss package because we break up the truss bundles to organize the pieces. If the site is extremely constrained, we may have to split the delivery in order to have enough room to maneuver.

Layout on the Ground

We do some prep work to the trusses on the ground to speed erection and installation. First, we block up any low points under the truss bundles to prevent kinking and bowing of the trusses. Once the bundles are good and flat, we break the banding straps (see Figure 1).

Next, two crew members align the peaks and seats so we can mark them for precise installation. One guy works back and forth between the tails of the trusses tapping them in and out with a sledge hammer while the other eyes the peaks and directs the adjustments. We take care not to damage the trusses, using a block of wood to protect the trusses whenever we tap them.

Once the trusses are stacked perfectly flush with one another, we measure the length of the bottom chord and mark the center point on the top and bottom truss in the pile. Next we mark the inside edges of the exterior walls by measuring back toward each end half the truss span. We always measure the frame to get the actual field distance rather than going off the plan, since field measurements are often a touch off.

Using a straightedge, we then draw a line across the bottom chords of all the trusses between the marks on the top and bottom trusses (Figure 1). During erection, our tag line operator will extend the marks up the flat side of the bottom chord about 1/2 inch for easy visibility when the trusses are placed. We also use spray paint to mark one end of the trusses so they go up oriented the same way they were built.

Figure 2. It takes a crew of five to set the trusses with a crane. A man on the ground attaches the crane hook and steers the truss with a tag line (top). A man at each plate positions the trusses to the layout lines, while two men above set the truss spacers (middle and bottom).

Figure 3. Gable-end trusses, which are sheathed on the ground, are set first and temporarily braced to the deck below (left). As subsequent trusses are set, steeper, more stable braces are added (right).

Premarking the trusses this way ensures the peaks are perfectly aligned as they go up. This ensures a nice flat plane once the sheathing is applied.

Strapping layout. It's common practice in our region to strap the ceilings with 1x3 furring. Laying out the strapping while the trusses are still on the ground is simple to do and saves a lot of time later. Starting from the mark we made indicating the inside face of the wall, we mark 16-inch on-center layouts and add an "X" on the strapping side of each line.

Sheathing guides. We also make lines on the top chords for our first course of roof sheathing. We measure down from the peak to the last full 4-foot increment before the end of the truss tail. We add 1 inch for ridge vent spacing and 1/8 inch for each of the gaps between sheathing panel courses. On a truss with a 19-foot-long top chord, for example, we would measure down 16 ft. 1 3/8 in. (4 sheets = 16 ft. + 1 in. for ridge vent + 3/8 in. for panel gaps). This operation saves us from having to measure and snap a line across the trusses once they're installed. When we sheathe the roof, we set the first course of sheathing above the line and continue to the ridge, then fill in the ripped sheet from staging at the bottom.

Prepping the gable trusses. The house featured in this article has standard gable ends, which we sheathe and trim out before lifting. But first we make sure that their bottom chords are straight. Occasionally they'll dip a little, which isn't a problem with regular trusses free-spanning between two walls. But because the gable trusses sit on top of the end walls, a dip in the bottom chord can raise the peak. So we snap a line along the bottom chord of the gable trusses and trim any excess off. This is permissible since the gable-end truss is supported its entire length by the gable-end wall. But no part of any other truss should ever be cut unless approved by the truss designer.

Presetting a girder truss. This house also had a small girder truss that supported one end of several of the main roof trusses at the gable bumpout. We chose to set this 12-foot-long truss by hand and install the hangers in advance to save time on crane day.

Organizing a Complex Roof

Complicated truss systems require a little extra attention. Difficult truss packages or hip roof configurations need to be restacked by hand in the order of erection so they get installed in proper sequence. The manufacturer marks each truss with an identification number; identical trusses are labeled with the same number and are interchangeable. The manufacturer's truss plan has each truss location clearly marked with those numbers. Following the plan keeps the truss reorganization in order.

With complicated roofs, we also use the truss plan to mark the top plates. The standard truss spacing is 24 inches but sometimes there are deviations, and they'll be noted on the plan. We write the truss number on the plate in place of the usual "X." This gives a fail-safe recheck during installation.

We prebuild the girder/jack portions of hip truss systems on the ground to save time and work safely. We use a process similar to the one described by Paul Bartholomew in the article "Installing Hip Roof Trusses" (6/97).

Crane Day

Whenever trusses are relatively small (no longer than 24 feet with a 6/12 pitch or less), we lift them by hand, particularly on single-story homes. But manhandling larger trusses becomes a dangerous operation, especially on two-story houses. Besides personal safety, the biggest risk is damage to the trusses. Trusses are strong in their upright position, but are flimsy when handled horizontally. Sometimes truss plates can pop off or loosen enough to cause a future failure.

Most of the trusses we use are larger, so we hire a crane. It's safer for us and easier on the trusses since they're lifted evenly in an upright position. It also speeds the process so that it's cost-effective. While

we have the crane on site, we also use it to lift second-floor interior studs, roof sheathing, and sometimes roof shingles up to the second floor deck.

We schedule truss-raising day well in advance. This gives us time to prepare for the arrival of the crane, which requires clear access to the site and a couple of spots to set up to reach the entire house. Occasionally on tight sites, we've had to move the trusses to put them in reach of the crane. Other building materials, trash containers, and debris piles also need to be out of the way. We mark out any underground installations: Cranes are heavy and can easily crush a shallow sewer pipe when the stabilizers are set. Tree and power line locations are also a consideration when planning the lift.

Staging. Good staging is essential for quick installation. We set up different types depending on the job's requirements — pump jacks if we'll be doing the siding, wall jacks if we're only doing the trim. We sometimes set staging up on the inside of the house. The bottom line is that we provide a working platform in every area involved rather than doing something crazy like "walking the plates."

Bracing the walls. Just before the crane shows up, we line up and brace the walls. We also install the truss tie-down clips if there's time — they help hold the trusses in place until we nail them off. We then assemble the tools: long adjustable braces, levels, plumb bobs, tag line, strapping marked on 24-inch centers to be used as temporary braces, and our Truslock spacers (Truslock, 2176 Old Calvert Rd., Calvert City, KY 42029; 800/334-9689).

Figure 4. Temporary diagonal braces along inner webs, along with Truslock spacers on the top chords, keep the trusses from collapsing until the sheathing is installed.

Expanded crew. The crane operators we use are familiar with truss raising and have all the straps and rigging hardware we need. We usually run with an expanded crew of five on truss day (Figure 2). One crew member attaches the strap onto each truss and connects it to the crane hook; he also handles the tag line to keep the truss from spinning and in proper alignment with the house. Before each truss is lifted, he makes sure that the wall mark we made earlier is continued up the side of the truss at least 1/2 inch. Two members man the front and rear staging. They guide the trusses into their location on the top plate and set the position by the wall marks. The last two on the crew get the fun job of dancing the peaks of the trusses and bracing them as each one is set into place.

Start at the Gable

As the first gable-end truss is set in place to the locating marks we've made, the tag line guy climbs a ladder and drives spikes through the bottom chord into cleats we previously fastened to

Figure 5. The sheathing is installed to premarked layout lines on the top chord. The layout is planned so that installer begins with the first full sheet at the bottom and works up (left), leaving a ventilation gap at the top (right).

Figure 6. The authors prefer a rugged 2-by subfascia, which is installed at the truss tails before the last narrow piece of roof sheathing is filled in.

Figure 7. After the field of the roof is sheathed, the crew installs the valley kit for a small gable bumpout, leaving a gap in the sheathing below to allow for ventilation.

the end wall top plate 1 1/2 inches in from the outside face. Before the truss is disconnected from the crane, we nail a long adjustable brace from the floor up to the peak of the truss (Figure 3). This brace is set at a steep enough angle to allow the bottom chord of the next truss to pass by. We roughly plumb the gable truss and send the crane for the next truss.

The first regular truss is positioned according to the layout lines and nailed on one wall only. The opposite end is left loose next to its tie-down until later. This allows us to straighten the walls later after the jostling they get while we're setting the trusses. The guys working the peaks space and secure the truss to the gable end, using temporary braces marked with 24-inch centers. Then we install a second adjustable floor-to-peak brace through the webs of the first regular truss to the gable truss. This brace isn't as steep as the first one and gives better support. Before lifting any more trusses, we accurately replumb the gable end using a long level and straightedge. Straightening the gable end at this point is easier than after all the trusses are in place.

The rest of the trusses are lifted in sequence, set, and nailed according to the marks at one end. Once we have a couple of regular trusses in place and have established our on-center spacing, we use the Truslock spacers, which automatically space the trusses at the top as they are set.

When we reach the opposite gable end, it is braced temporarily and the entire ridge is measured and adjusted to match the length of the building. We check the gables for plumb with a plumb bob all the way down to the floor deck just for accuracy's sake, and fine-tune using the adjustable braces. Next, we diagonally brace the top chords and vertical webs of the trusses to ensure stability until we can sheathe the roof (Figure 4). The process of lifting, setting, and bracing a typical house takes about three hours, while a complicated roof can take a full day.

Once all of the trusses are set, we check the strings and braces that are keeping the walls straight. We readjust if necessary before nailing down the truss ends we left loose during installation. Had we nailed off both ends during installation, we couldn't make any adjustments to the walls without using a cat's paw.

Sheathing, Fascia & Bracing

While some of the crew goes to work sheathing (Figure 5), others work on the subfascia. We install a 2-by subfascia sized and sometimes ripped to match the end of the truss chords (Figure 6). The subfascia gives us a good base for attaching a 1-by finish fascia or for covering with aluminum coil stock. It also eliminates flimsy installation of gutters by installers who don't bother to locate truss tails behind the trim. We shim between the trusses and the subfascia if necessary to adjust for deviations in the truss tails. Occasionally, we have to trim a couple of extra-long truss tails — made evident by a quick string line. We straighten the subfascia by eye in most instances; that gets us within 1/8 inch. After the subfascia is completed, we measure, rip, and install the bottom course of roof sheathing.

After the sheathing goes down, we install the valley kit for the small gable bumpout (Figure 7).

Permanent bracing. The process isn't complete until we install the permanent web bracing specified by our truss designer. We follow the provided details exactly, using the specified material. Omitting the permanent braces can, in extreme conditions, contribute to truss failure.

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