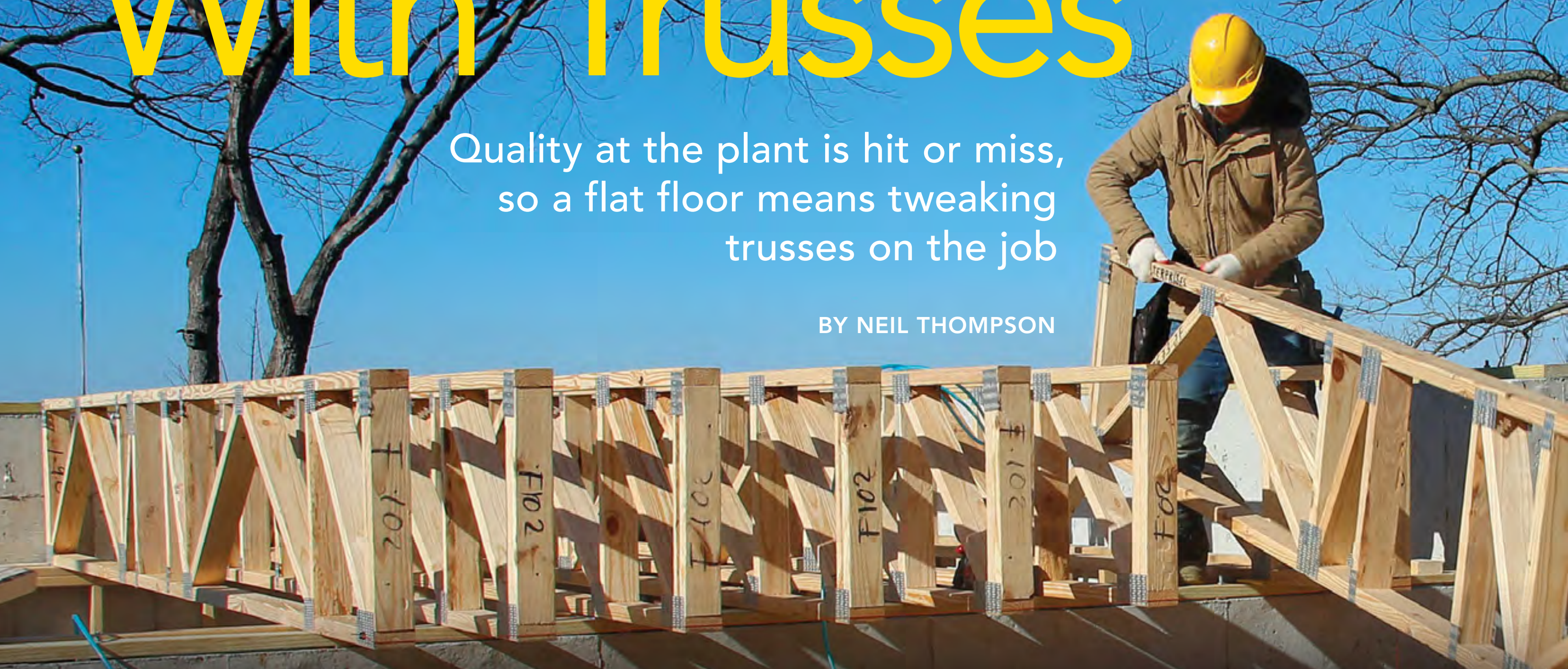
Successful Floors With Trusses



Quality at the plant is hit or miss, so a flat floor means tweaking trusses on the job

BY NEIL THOMPSON

To tell you the truth, my company and I don't really like wood floor trusses. Even when we install them within a day or two of delivery, the low-grade lumber favored by truss plants for cost savings starts twisting and bowing hours after delivery. And bad stock isn't the only problem. The steel plates that help hold the individual components together sometimes overhang the truss end or a top or bottom chord. The projecting metal can prevent the truss from sitting flat on the mudsill or plate, or it can create a hump in the subfloor or wall sheathing. Sometimes the lumber components aren't cut flush with each other and an overhanging piece must be trimmed with a saw or power plane.

If you've never used them, open-web floor trusses are a type of parallel-chord truss, usually from 11¼ in. to 24 in. deep. The top horizontal member (chord) has subfloor nailed to its top. The bottom chord usually has a drywall ceiling. In between the chords, webs arranged in triangular sections give the 2x4 chords their strength. All of these components are joined with spiky metal connectors called truss plates.

Given the quality-control problems, you're likely asking why we don't use sawn lumber or I-joists for floors. There's one reason: Trusses are the only floor system that can accommodate the large HVAC ducts and open floor plans common to the custom homes we build. Unlike sawn lumber or I-joists, open-web floor trusses can have a utility chase large enough to contain a trunk line for a large furnace or air handler, and they can be built for almost any loading and span. The end result is a sturdy floor that hides big ducts, and a beam- and soffit-free ceiling below.

Unfortunately, trusses that aren't perfectly level and coplanar are the norm and will reveal themselves when tile and hardwood flooring are installed. There can also be problems with uneven reveals at doors and windows and gaps at trim, cabinets, and transitions. The problems are especially noticeable with modern homes like the one shown here. This house has huge expanses of glass and minimalist trim details that accentuate discrepancies caused by problematic floor framing.

Since floor trusses aren't perfect, framers must fix any problem trusses before installing them. Of course, this takes extra time, which costs more than just slamming the floor together. Make sure that you're clear about expectations when you're talking with your crew or subcontractor before they start framing the floor—even show them this article so they know what you're asking them to do.

Before you say that we should use a different building-component supplier, one that makes perfect trusses that don't need any rework—in my experience, that company doesn't exist. I wish it did. We've tried several truss manufacturers and we always end up tweaking a few trusses to get an acceptably flat floor. The effort is worth it, though, because a few extra hours spent framing the floor makes the rest of the build more efficient, and you end up with a higher-quality home. Fixing or accommodating a less-than-level or wonky floor later in the construction process is harder and more expensive, and almost always involves compromising the end product. Isn't it better to get it right from the start? □

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NOTES ON ORDERING AND FIRE SAFETY

Component manufacturers have engineers and trained staff who can help contractors and design professionals with floor-truss sizing and design. Their assistance with the permitting and architectural process can be invaluable. Our truss companies can usually turn around a floor-truss order in two or three weeks, so we place the order shortly after the foundation forms are stripped.

When ordering, don't rely on the plans. Confirm site dimensions and conditions and make sure you order enough trusses. Ducts, floor registers, and pipes can affect the truss layout and you may need extra trusses so you don't exceed the subfloor's allowable on-center spacing or the allowable truss spacing for tile and other finish flooring. Like I-joists, wood trusses can have unacceptable bounce and vibration if you don't have intermediate bearing points or add additional mass, like a drywall ceiling on the underside.

Drywall also prevents flame spread and is generally code-required in wood-truss floor systems. Trusses are especially susceptible to fire because of the small cross section of their components; flames and combustion gases can move easily through the open spaces. The International Residential Code section R302.12 describes draftstopping requirements for open-web floor trusses; it specifies that when a floor exceeds 1000 sq. ft., the space must be divided into roughly equal areas using an approved draftstopping material, such as ½-in. drywall, to limit the spread of fire.

Special delivery. *Building-component manufacturers have machinery to help with delivery, but sites with poor access may require a crane for unloading, or you may have to arrange to shuttle trusses from a suitable unloading area. When the trusses are delivered, put them on even ground so they're uniformly supported and keep them banded to minimize warping and twisting.*

LOCATE PIPES AND DUCTS

You can't cut a truss to make room for an HVAC register or a closet flange, so the truss layout has to avoid pipes and mechanicals. To prevent problems, plan the exact locations of pipes and ducts before setting trusses and adjust the truss layout to avoid them. In this house, the floor registers are centered on the windows, and the trusses can't be in the way of register boots, so marking the layout starts with identifying register locations.

Transfer register locations. *I use the center of the window opening, found on the floor plan, and transfer its location to the mudsill to mark the center of the register boot. Once the HVAC boots are marked, I lay out the trusses on both sides of the boot location.*

Lay out the rest. *Next I mark the rest of the truss layout, which is often 16 in. on center for our builds, but wider (19.6 in. and 24 in.) spacings are also common.*

ANCHORS OUT OF THE WAY

Once the truss layout is done, we tighten the anchor bolts on the mudsill because it is easier to do now than when the floor system is in place. Inevitably one or more of the anchor bolts lands where a truss will sit; these anchors get recessed, and additional anchors get added to beef up the mudsill's connection to the foundation.

Tighten the anchor bolts. *We put down a layer of foam sill gasket and transfer the anchor-bolt locations to the mudsill. Then we drill ⅝-in. holes to accommodate the bolts, which are capped with nuts and flat washers. We tighten the anchor bolts with an adjustable wrench until the wood fibers begin to compress.*

Make room. *When the layout puts a truss on top of an anchor bolt, we recess the nut and washer by chiseling a square countersink wide enough for the washer and deep enough for it and the nut to flush out with the mudsill.*

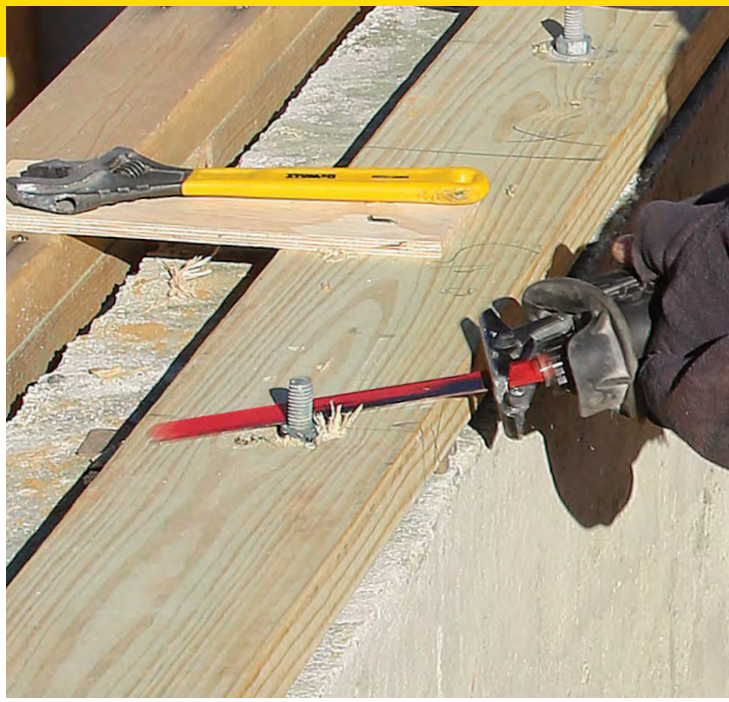
LOOK FOR PROBLEMS

Some manufacturing inconsistencies in floor trusses can be found right when they're delivered and still in the pile. The truss ends should be perpendicular to the top and bottom chord, but they aren't always. We check all the trusses for square before installing them, since repairs and adjustments are easier now than when the trusses are nailed to the mudsill. If one or two trusses are out of square, we usually can fix them; more than a few, and we expect replacements from the manufacturer.

Check for square. *If one or two trusses have an end out of square, we plane off the difference with a power planer. If an end is significantly out of square, we contact the truss manufacturer for a field fix or a replacement truss. If we find a top or bottom chord that is proud of the end, we trim it with a circular saw. Sometimes you have to trim a truss plate too.*

Trim overhanging ends. *Altering trusses can destroy their strength, but we were able to trim this overhanging top chord, which doesn't affect the truss's structure, so there wouldn't be a hump in the wall sheathing and finished siding.*

Make it flush. *Once the countersink is complete, we add the nut and washer and tighten them down. Before installing the floor sheathing, we add an epoxy anchor on one side of the truss to compensate for the loss of holding strength caused by the countersinks.*



Shorten the bolt. *Once the nut and washer are recessed and tight, we cut the bolt flush with the nut using a reciprocating saw equipped with a metal-cutting blade.*

PLACE AND PLUMB

SET ON LAYOUT

Once you start placing trusses on the layout lines, progress can go fast or slow depending on the quality control at the truss plant and the levelness of the foundation. The project managers at my company check the foundation forms and are present when the concrete is placed, which minimizes out-of-level and out-of-square foundation problems, but we generally have to fix a few minor truss defects.

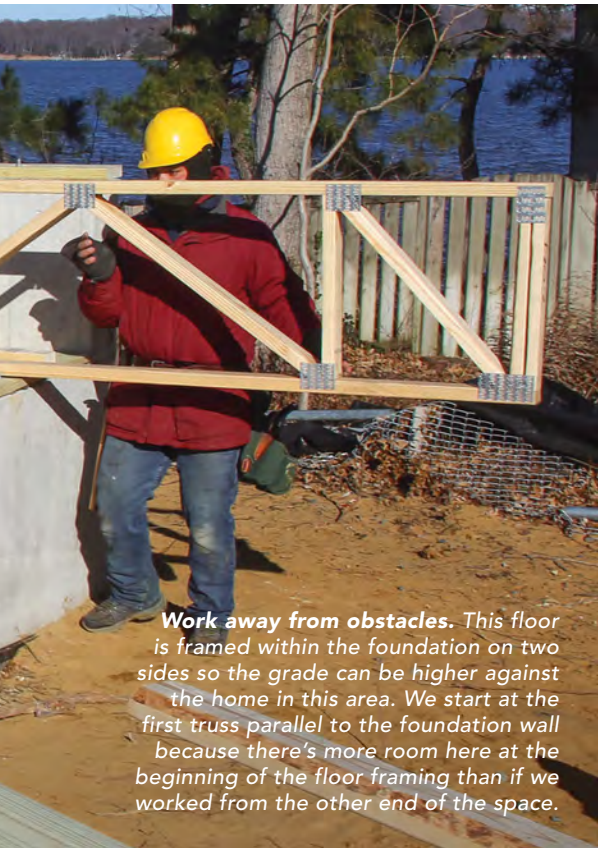
Most of these fixes are done in about 15 minutes, but it's a different story if a truss breaks or if there's a serious manufacturing error—those require an engineered fix or replacement. A good truss company should bring a replacement in 24 to 48 hours. Once you have the truss floor framed, use a high-quality subfloor adhesive and install the subfloor panels as soon as possible to prevent the trusses from warping or twisting after they're in place.

CHECK ALIGNMENT

Check for straight. *If the truss ends aren't exactly aligned, the discrepancy will show up as wavy sheathing and siding. We stretch a string to check their alignment and identify what needs adjusting.*

Persuasion may be necessary. *When we have to move a truss that's already nailed to the mudsill, we use a sledgehammer to coax the offending truss into alignment. A sacrificial board screwed to the end prevents damage.*

Trim the plate... *This truss was a bit too long, and it was determined that shaving the end wouldn't be a problem. We start by trimming back the truss plate to the mudsill, which is where the truss should plane out.*



Work away from obstacles. *This floor is framed within the foundation on two sides so the grade can be higher against the home in this area. We start at the first truss parallel to the foundation wall because there's more room here at the beginning of the floor framing than if we worked from the other end of the space.*

...then plane the excess. *After the truss plates are trimmed, we plane about ¼ in. off the end of the offending truss so the sheathing will be straight without a hump. If you need to remove more than ¼ in., check with the truss maker to determine if you can make the fix and if any additional reinforcement will be required.*

BRACE FOR STRENGTH

Check for plumb. *These trusses, which overhang the foundation wall, will have 2x4 blocking cut to fit between the top chords above the foundation. We check pairs of neighboring trusses for plumb (and temporarily brace if necessary) so the blocking pieces are cut and installed at the correct length.*

Connect the top chords. *These trusses, which are flush with the foundation wall, have a 2x4 band to help plumb the trusses and strengthen the assembly. We transfer the truss layout to the band before installing it, and follow the component manufacturer's instructions for fastening.*