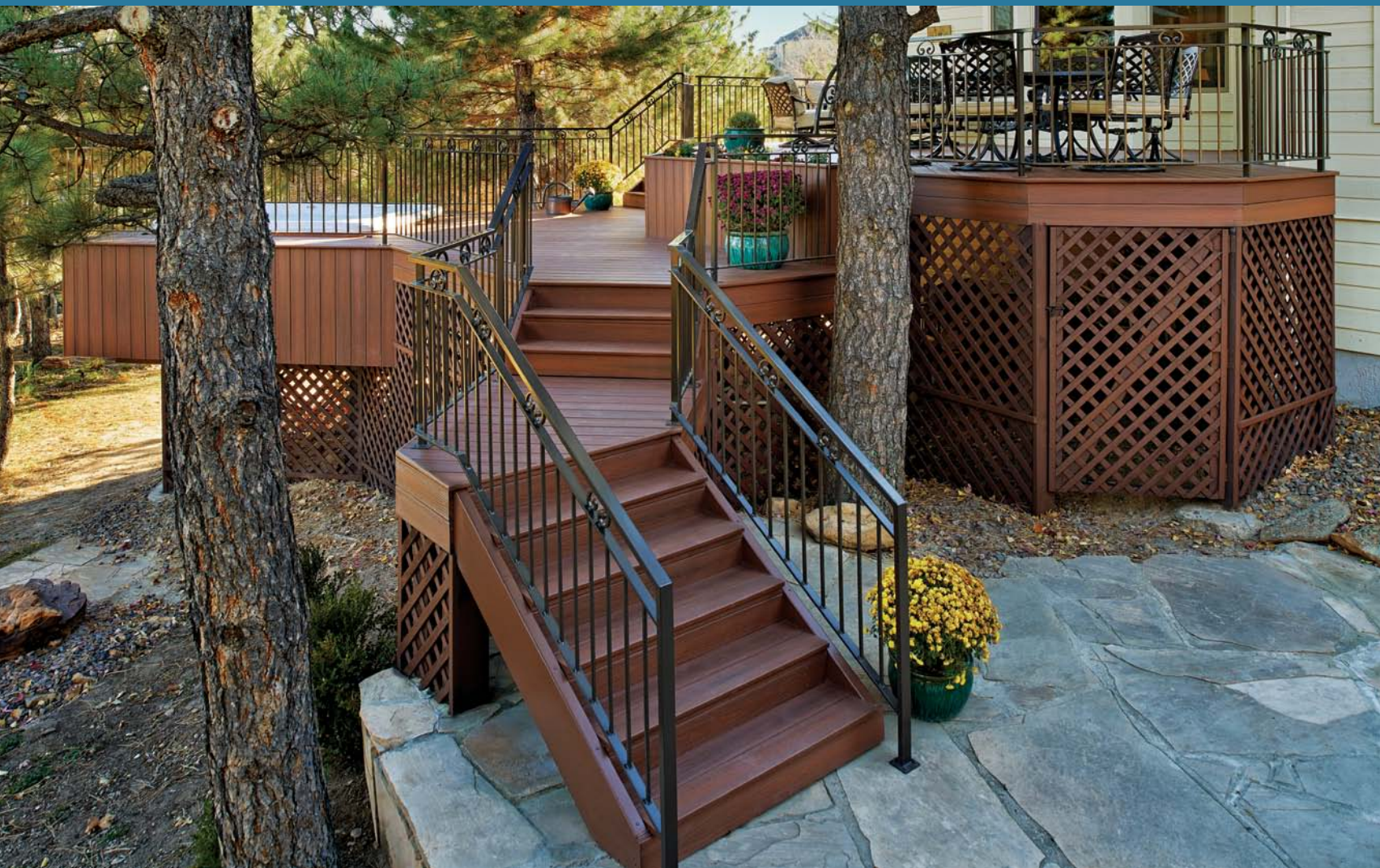


Framing a Deck



BY ROBERT SHAW

My company focuses on building high-quality decks. Over the years, one of our biggest issues had been the quality of the pressure-treated lumber available for framing. The joists weren't uniform in depth, and they always twisted and warped as they dried.

When I heard about light-gauge steel deck framing in 2006, I was impressed by its apparent advantages: It's light, straight, and uniform in size. Still, the available information was limited, and I spent a few more years sorting through wet, heavy, pressure-treated framing lumber, culling out bad boards, crowning joists, sorting joists by variation in depth, planing the joists after installation, and trying my best to build a perfectly flat frame, only to come back the next day to more warped joists.

In 2009, I decided to give steel framing a shot. I faced three main hurdles, however: dealing with building departments that were used to wood framing, finding a supplier, and learning how to work with steel. Once I overcame these hurdles, steel's advantages made it a no-brainer for me, even though it costs more per piece than lumber. (A treated 16-ft. 2x12 costs me about \$32. A 10-in. steel joist with similar span capabilities costs about \$44.) Despite steel's higher cost per piece, on a high-quality project with synthetic or hardwood decking and a manufactured rail system, the framing is a relatively small part of the whole cost.

Although it's lighter than wood, steel offers greater spans in smaller profiles than wood, allowing for more-flexible designs and fewer footings, which can compensate for some of steel's higher cost. Steel

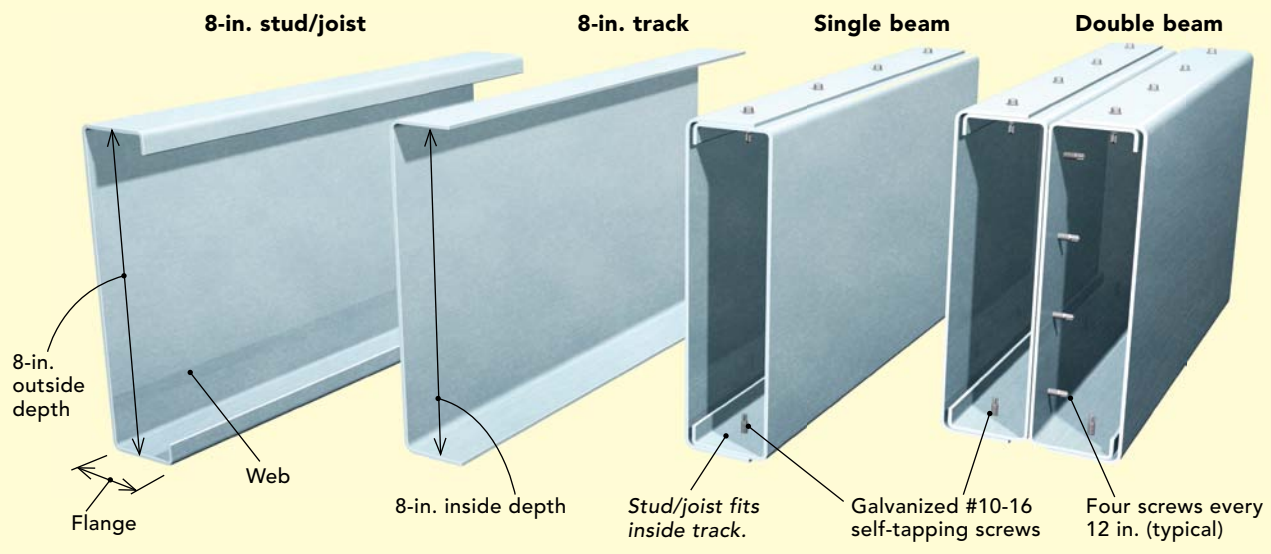
With Steel

Lighter, straighter, and stronger than wood, steel joists and beams can be a long-lasting option



JOISTS + TRACKS = BEAMS

Light-gauge steel is identified in dimensions like this: 800S20054. That piece is an 8-in. stud (or joist) with a 2-in. flange made from 54-mil-thick (or 16-ga.) material. A piece identified as 800T20054 is the same, except it's a track. The edges of a track's flange are straight, not curled like a stud's. Tracks are sized so that studs fit between their flanges.



BEGIN WITH THE LEDGER

The ledger on a steel-framed deck is a piece of track that's bolted or screwed to the house. Lay out the ledger so that the bolts don't interfere with joist connections. Unlike with a wood ledger, holes have to be drilled in steel even for structural

screws. Drill 1/8-in. starter holes on layout, then switch to a step drill and enlarge the holes to fit the fasteners. After all the holes have been drilled, spray the exposed steel with Rustoleum cold galvanizing compound.



Screw it up. Just like a wood deck ledger, steel ledgers must be properly bolted to the house framing and installed level.



Drill holes in the ledger. Lay out the holes for the mounting screws so they don't interfere with the joist layout. Start the holes with a 1/8-in. twist bit, and finish with a step drill marked at the desired hole diameter.



Don't create opportunities for rust. Coat all cuts and holes with cold galvanizing spray.

Just like cutting wood. Cut steel with a circular saw. The author likes Freud's Diablo steel blades. The hot metal chips produced call for full-face protection.




Grinder for the notches. An inexpensive abrasive cutoff wheel in a die grinder makes short work of little cuts.

BUILD THE BEAM

Single beams are built up by screwing together a track and a joist, typically with $\frac{3}{4}$ -in. #10-16 self-tapping galvanized sheet-metal screws through the flanges every 12 in. A double beam consists of two single beams built together.

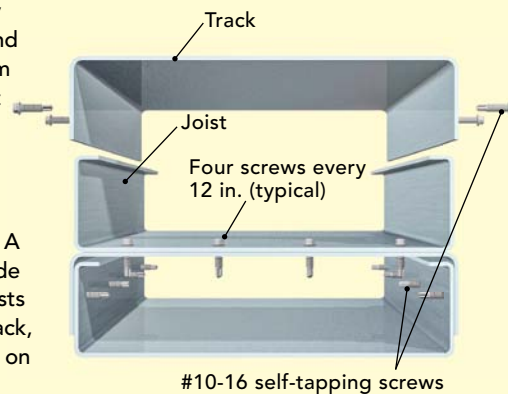
galvanized (HDG) screws are recommended in any moist environment. Commodity screws don't perform as well as some name-brand ones. Hilti and Starborn Industries both offer high-quality screws.



Build beams straight. Sight the length of a track to be sure it's supported flat and straight before joining it with a joist into a beam.

Building beams from tracks and joists

Beams are made by combining tracks and joists. A single beam consists of one joist nested inside one track and typically fastened with one screw through the flanges every 12 in. A double beam is made by screwing two joists together back to back, then adding a track on each side.



is rotproof (although it can corrode), noncombustible, termite proof, and free of chemicals. It can be ordered in custom lengths to minimize field cuts, and any scrap is easily recycled.

First hurdle: The building department

Even though the International Residential Code (IRC) devotes page after page to steel framing, it's much more common in commercial buildings than in houses. Most building departments aren't used to the idea of a steel-framed deck and so may be somewhat resistant. Despite the depth of coverage the IRC gives to light-gauge steel framing, most of it is specific to house walls, floors, and roofs, not to decks.

I've found that talking face to face with inspectors helps the process along best. Bring along some information (including this article) so that you can show them what you're talking about. Still, the line you'll probably hear is "I can approve this only with an engineer's design stamp."

If this happens, find an engineer who specializes in light commercial construction, because he or she most likely will be familiar with the use of light-gauge steel. Once again, have some information to present. If you demonstrate a thorough understanding of steel framing and present high-quality, detailed drawings, an engineer might be willing simply to review and stamp your plans for a small fee. The big details on the plans won't be much different from those you'd see

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A joist and a track make a beam. Join the two nested members with self-tapping sheet-metal screws through their flanges.

Wood posts are easier. In most cases, it's faster to notch and bolt a wood post to a steel beam than it is to assemble a steel post from tracks and joists.

INSTALL JOISTS AND BLOCKING

Without help, steel joists aren't as laterally stable as wood joists. So that they don't tip under load, steel joists require blocking (joist stock) where they bear on a beam. Depending on the span, additional blocking may be required at the

center of the deck. You usually only need to block every other bay because each piece of blocking stabilizes the two adjacent joists. Alternating the joists so that flat faces flat simplifies blocking. Where the blocking is over a beam, add



Alternate sides. Face each pair of joists away from each other so that the flat sides face every other bay. This is to simplify blocking installation.



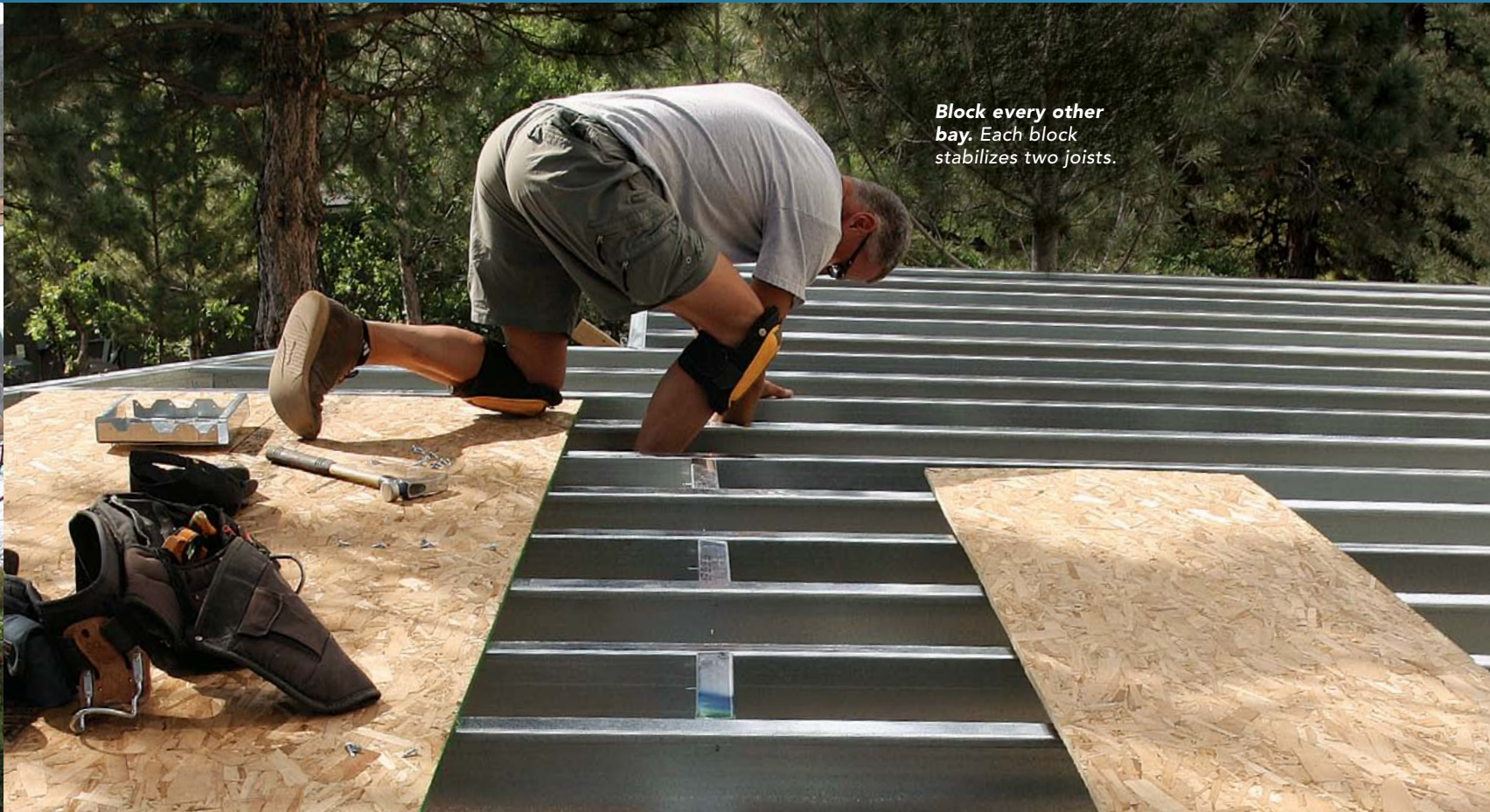
Standard framing angles join joist to ledger. Fasten the framing angle to both members with self-tapping sheet-metal screws.



Screw joists to beam. Connect a joist to a beam with a screw between the flanges.

two screws through the flange of the block into the beam below. Joists attach to the ledger with standard Simpson Strong-Tie or USP Structural Connectors framing-angle hardware. Steel joists are dead straight, so there's no need

to crown them before installation. Fastening joists to a beam takes one screw through the flange and into the beam below. The rim is a piece of track that fits right over the ends of the joists and is then screwed through its top and bottom flanges.



Block every other bay. Each block stabilizes two joists.



Block between the joists. Self-tapping screws fasten framing angles to blocking and to the joists. Two additional screws secure the blocking to the beam.



Screw rim to joists. Sight along the rim as you screw it to the joists to keep the edge of the deck straight.

SCREW DOWN THE DECKING

You can install decking on steel frames in several ways. No matter which method you choose, you'll need to accommodate the protruding heads of the screws that secure the top flange of the rim to the joists. I mark the screw locations by holding the deck board in place and tapping it

with a hammer and block. Then I flip the board over and drill shallow counterbores where the screw heads left dents.

You can install decking by drilling through the flange and screwing from below. I often mix this with biscuit-type hidden fasteners that engage in slots in the edge of the decking.



Counterbore for protruding screws. To keep the decking from rocking on the screws holding the rim to the joists, drill shallow holes in the bottom of the decking.



Fasten from below. Short galvanized screws through joist flanges from below hold the edge boards.



Hidden fasteners work well with steel framing. The key is to use a biscuit-type fastener that relies on a vertically driven galvanized screw, not an angled screw, which won't engage in steel framing.



Cover the steel. Fascia material—in this case, a pair of deck boards—hides the shiny rim joist from view.

for a wood deck; there are still posts, beams, and joists. The main differences are in the details for fastening and blocking.

Second hurdle: Finding a supplier

Your local lumberyard or home center probably won't have a clue about light-gauge steel. The place to buy light-gauge steel is usually a drywall-supply house that also deals in steel studs. Knowing this, I contacted drywall-supply houses and asked about material for decks. I got confused salespeople on the phone and funny looks at the store.

I changed my approach. Rather than explaining that I was building a deck and asking if they could supply the framing, I simply started using nomenclature from the engineer's plans. Once I learned how to speak the language, buying steel became a lot simpler.

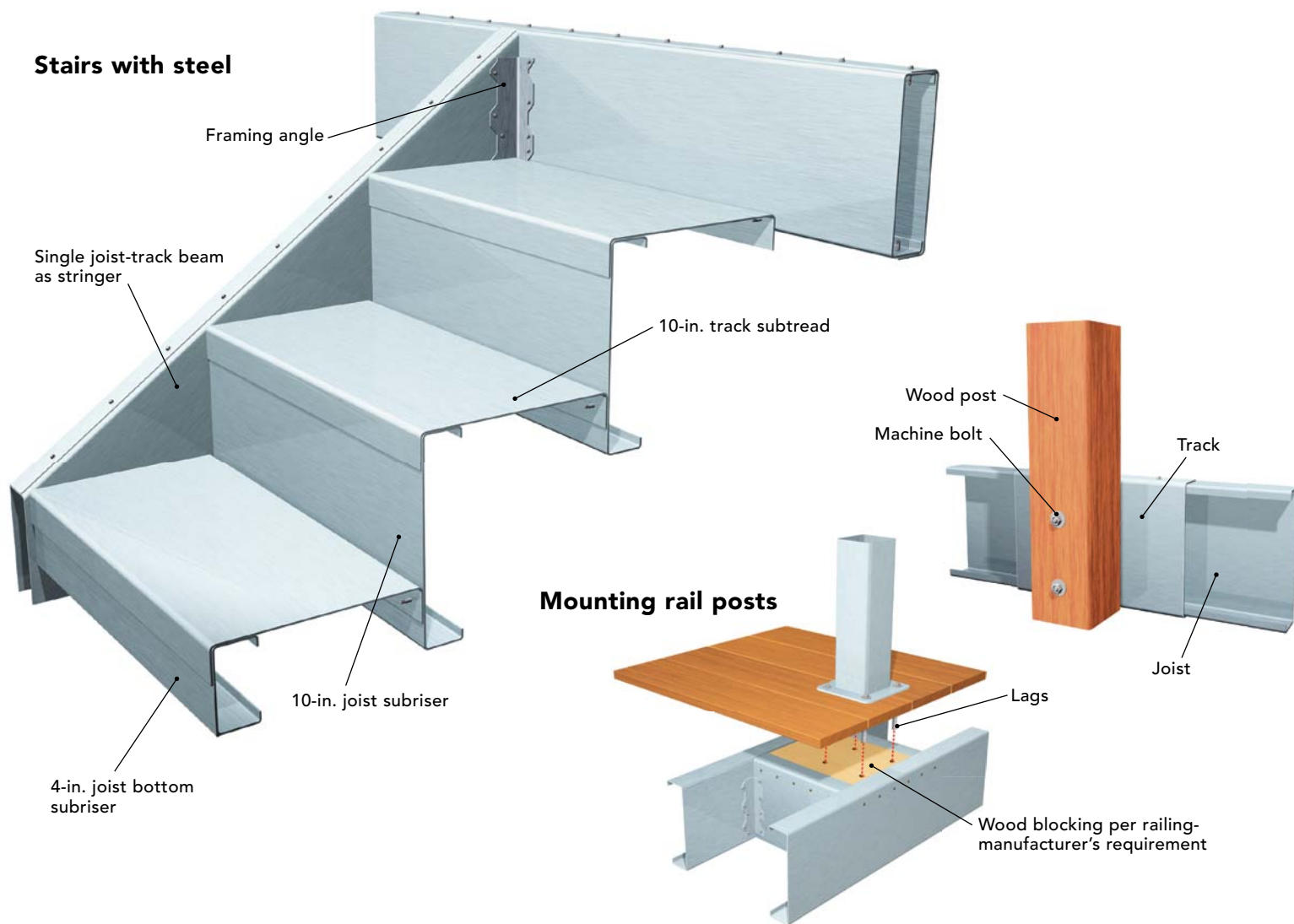
Steel joists are technically referred to as studs. Studs fit inside tracks, which are supplied just slightly wider than the studs to ensure a proper fit. (Because of how I use these studs, I refer to them here as joists; when ordering, though, I call them studs to avoid confusing the supplier.) Like framing lumber, steel framing is sold in certain depths, but it's also sold in a variety of flange widths, which is sort of like being able to buy 3x and 4x lumber as well as 2x lumber. Steel also comes in various gauges, or thicknesses. (For more information, go to the Steel Stud Manufacturer's Association website: ssma.com.)

Steel used outside must be galvanized. Many galvanization levels are available; G60, G90, and G135 are typical. The number indicates the ounces of zinc applied per square foot of material. For example, G60 has 0.6 oz. of zinc per sq. ft. (0.3 oz. on each side), while G135 has

BUILD STAIRS AND ATTACH RAILING POSTS

For railings, I use a lot of top-mount posts and a locally sourced welded railing or a system from Fortress Iron or RDI. These systems require solid-wood blocking. Conventional wood posts can be installed with blocking and 1/2-in. through bolts. Where stairs attach, I add a track to the joist to support

the extra weight. Stairs can be steel, with the stringers consisting of single beams, painted to match the decking that covers the steel subtreads and risers. Sometimes I use 2x12 treated-wood stringers, which fasten to the deck with Simpson's LSSU210Z or LSCZ brackets.



1.35 oz. per sq. ft. This is the same system used for framing hardware intended for wood decks, which comes with a G185 coating. Before 2004, when the standard wood preservative was CCA, G60 and G90 coatings were commonly used on hardware. The G185 standard is a response to the greater corrosiveness of the chemicals that replaced CCA. Because it doesn't contact treated lumber, steel framing doesn't require the same galvanization level as hardware. Where I build, G90 is sufficient. If you live in a wetter environment or near a road that's treated with deicing salt, consider thicker galvanization. If you live on the seacoast, steel framing may not be acceptable at all.

Steel studs typically come with holes already punched for wiring and plumbing. Order yours without them. They're unsightly, unnecessary on a deck, and could line up with a spot where a screw is required.

Third hurdle: Putting it together

There's a lot about framing a steel deck that's no different from framing a wood deck. The footings are the same, although there may be fewer of them. Ledger flashing is the same, with one caveat: If your flashing will contact the framing, use either vinyl or galvanized-steel flashing; other metals will corrode. Most important, do not combine stainless steel with galvanized framing. Stainless steel and zinc are on opposite ends of the galvanic scale. This means that in the presence of moisture, the zinc galvanization will rapidly oxidize and will expose the underlying steel, which then will rust. □

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