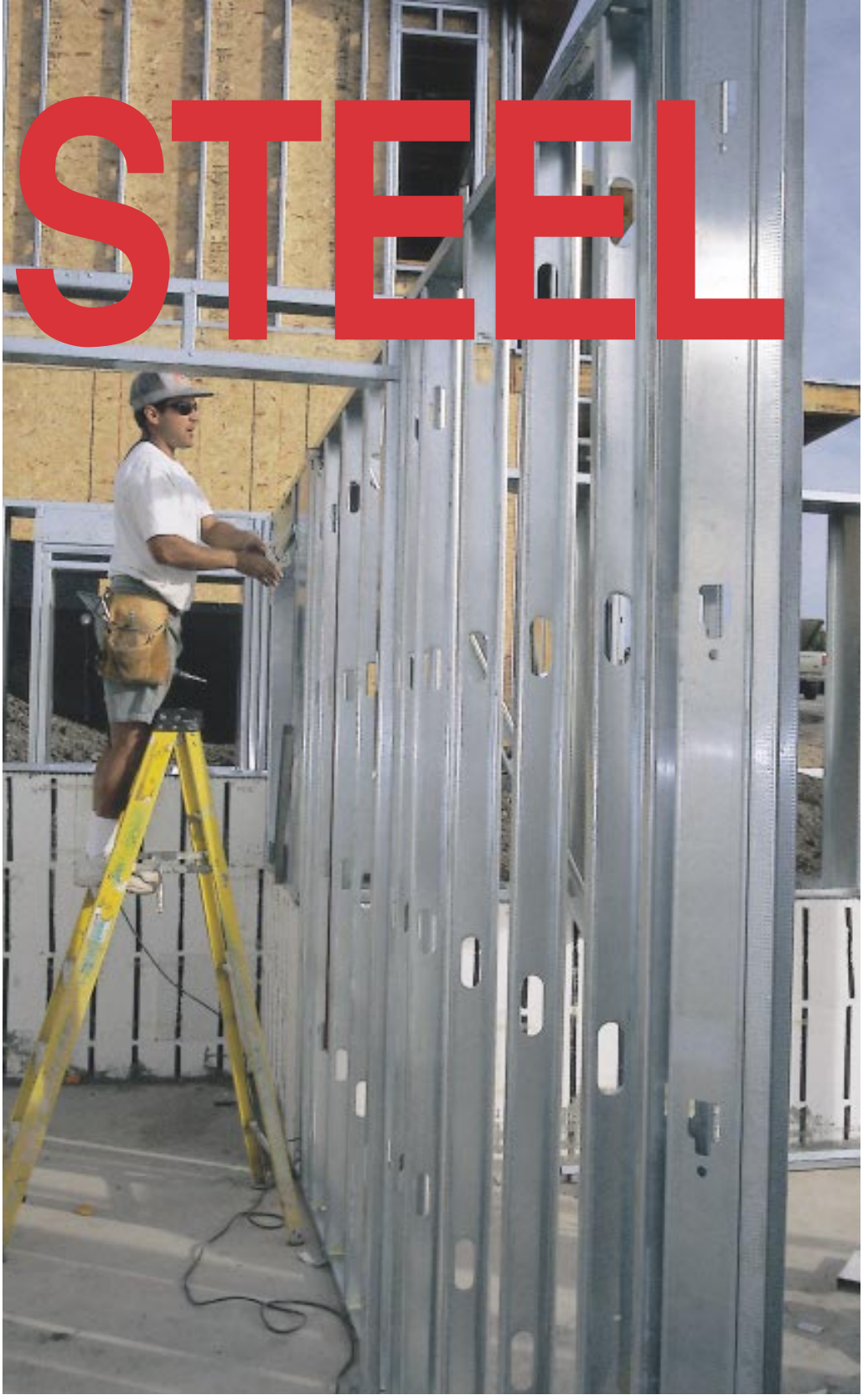
Making the Switch to STEEL



We'd been building wood-framed houses for more than two decades, but seven years ago, we decided it was time to make the move to light-gauge steel framing. The quality of

by Jeff Loughead

the lumber we'd been getting was just terrible. At one point, we found that we were only using a little more than a third of every truckload of lumber, and the price was going through the roof.

I had read about the advantages of steel, but with no practical experience of our own, we were anxious about making such a big change. We discussed it with several local steel suppliers, and got a lot of help from one sales rep who was willing to spend time training us.

At the time, we thought lumber prices were just going to keep going up. As it turned out, things started to stabilize within a couple of years, but by that time we were using nothing but steel and could see the advantages for ourselves. Now we wouldn't think of going back.

Preconstruction Benefits

It's a lot easier to do takeoffs and bids on steel-framed jobs, because steel suppliers will hold a price for 30 days or more, and their prices usually go up only once a quarter. If you're using wood, most suppliers won't guarantee a price for more than a week, two at the most. If it takes the client a month and a half to get back to me, I've got to have language in the contract that says the price is subject to change if lumber prices go up. But on a steel job, I can pull up the list from a job I did last

Though it's initially more expensive than wood framing, steel will save you money by eliminating many callbacks

Figure 1. In steel framing, walls go up piece by piece, rather than being preassembled on the deck. Self-locking clamps hold the studs in position while the framer drives screws through the side flanges of the top and bottom tracks — the steel equivalent of the top and bottom plates — and into the studs.

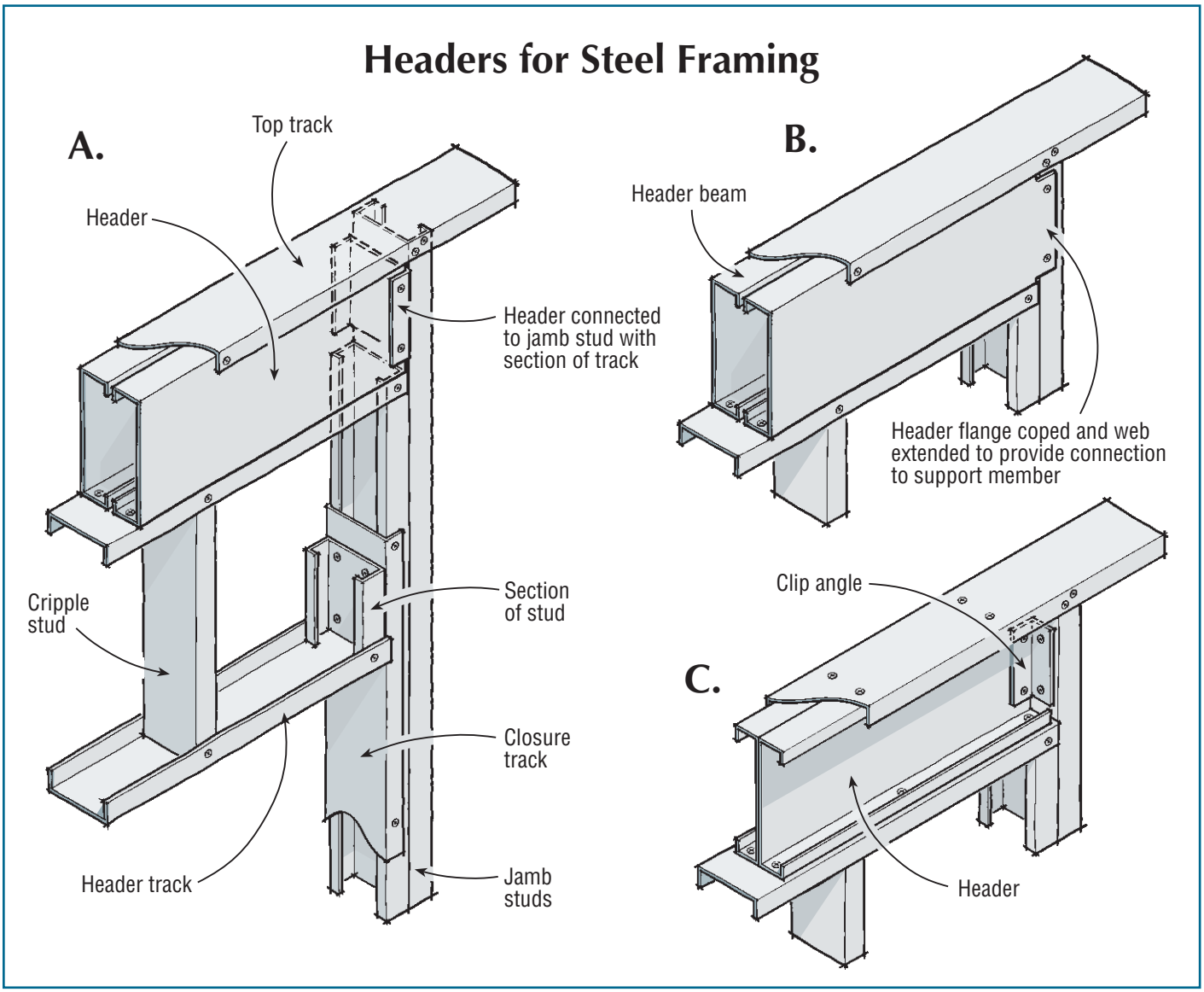


Figure 2. The author mainly uses two header types, both made from two pieces of structural C steel. The profiles can be assembled face to face (A & B) or back to back (C), depending on the engineer's specifications. Connections to the studs may vary, but the author prefers the clean, solid coped joint in sketch B.

month, reference it for the takeoff I'm doing today, and get an accurate price out there a lot sooner.

Waste not, want not. We also save time because the material itself is so consistent. Every stud is perfectly straight, so I don't even have to go meet the trucks at the drop site. Everything but the headers comes precut — if you need 9 foot 6 inch studs, that's what you order. All the framing waste from an 1,800-square-foot house fits into one 32-gallon trash can. Instead of paying someone to haul it away, I just drop it off at a local metal scrap yard.

Labor

When I first started looking at steel, I thought I could just go down the street and hire some of the commercial guys who were finishing a big supermarket. But there's a big difference: In most commercial jobs, the building is held up with structural steel, and the light-gauge stuff is only used for partitions. We found that the commercial guys had the basic skills, but they didn't know anything about load-bearing walls.

Square one. At first, I had to snap and measure the layout for each wall myself. I'd take a sharpie pen and mark the rough openings with a K for a king stud and a T for a trimmer. But most of the commercial guys caught on pretty quickly.

In fact, we found that it was easier to convert the commercial guys to residential steel than it was to retrain carpenters to work with steel. Steel framers are already used to working with the material, and know how to use screw guns and chop saws. Steel either fits or it doesn't, and if it doesn't you've got to unscrew it and fix the problem. Steel guys know that, but it's an adjustment for wood framers, who are used to hammering on things until they fit. Some of our wood framers did make the switch to steel, and the guys who wanted to stick with wood now frame our I-joist floors and truss roofs.

Design and Construction

Our first project was a tract of 46 houses. The first unit took us nearly

Figure 3. Cripples extend downward from the header beneath the top plate, and terminate at the rough opening.

Figure 4. While bearing walls and partitions are framed with steel, I-joist floors (top) and conventional wood roof trusses (bottom) save money on fasteners and permit an efficient framing sequence.

three weeks to frame, when it should have taken less than a week. There's no way to avoid taking an initial hit when you make the switch — but if you plan ahead, you can make it a lot less painful.

Engineering. Framing with steel is slower than working with wood. That increases your costs, so if you don't compensate by using the material efficiently, you're in trouble. That means having an engineer gauge the material and design the header systems from the ground up, rather than taking a set of wood-frame plans and converting them.

When we started out, there were no prescriptive tables for light-gauge steel. It's easier now, because the engineer can reference the charts and come up with the specs in a lot less time. Steel is stronger than wood, so the studs can easily go 24 inches on-center. Our joists and roof trusses use the same layout spacing so all the loads line up and transfer right into the foundation.

Figure 5. Plastic grommets protect wiring from the sharp edges of the framing punchouts. At electrical boxes, the wiring is secured to a special connector screwed to the stud (above), or a plastic wire tie looped through a punchout (right).

Division of Labor

Although all of our bearing walls and partitions are framed with steel, we use wood I-joists in our floors. Like steel, they're straight and consistent, but we think they provide a nicer floor. When you jump on them, they produce a satisfying "thud," rather than the disconcerting "boing" of a floor supported by steel joists.

Because we have separate wood and steel crews, we work on two houses at once. The steel crew finishes framing the first-floor walls, then the wood crew moves in and installs the floor joists and subfloor. By the time they're done, the steel crew has the first-floor walls of the next unit ready.

Work smart. When a carpenter grabs a piece of material on a wood-framed job, all he has to do is get the right dimension. But a steel framer has to choose between 18-gauge material for a bearing wall, and 20-gauge for a partition. We order materials on a per-home basis, so if the framers use material from the wrong pile, they're going to come up short somewhere.

All the walls are built in place, rather than assembled on the deck. Once we've bolted the bottom track to the slab, we brace the corners in position, run string lines across the top to check for level, and screw the top track in place.

Headers. Next, we fill in the remaining studs, and header off the rough openings (Figure 1, page 2). This is a critical area, because every header has to be made up on site as specified by the engineer (Figure 2, page 2). On some

jobs, there might be six different header types and gauges, although we can usually reduce that number by using heavier headers than we need for some openings. This wastes a little material, but it simplifies things and saves time. Another difference between wood and steel is that steel headers are attached to the top track, with cripples extending down to the opening, rather than sitting at the top of the opening with cripples extending up to the top plate, as in a wood frame (Figure 3, page 3).

Quality framing starts with accurate material. Steel won't warp or twist, but that doesn't help if the material isn't correctly sized to begin with. Cross-sectional dimensions and gauge are always consistent, but unless your supplier cuts the material to length accurately, you're in trouble. There's no problem with studs that are 1/8 inch long or so, but if the variance is much more than that the material has to be recut. Because steel framing is labor-intensive to begin with, this isn't something you can afford. Studs that are too short will fit, but they're a structural problem because a short stud is just hanging from the screws. That's not so bad in a partition, but in a bearing wall the studs must butt tightly against the top and bottom tracks.

Floors, sheathing, and trusses. All the framing is screwed together, but we fasten the OSB wall sheathing with Erico pneumatic nailers and ICBO-approved knurled steel pins. Although the fasteners are more expensive than screws, the savings in time are worth it. Using wood I-joists and lumber roof trusses saves money, because the wood crew can nail off the subfloors and roof sheathing with regular air nailers (Figure 4, page 3).

That also makes the drywall go faster, because it lets the drywallers tack each sheet to the bottom web with nails before they screw it off. With steel trusses, they'd have to screw in every fastener.

Working with Subs

When I first took a set of steel plans around to my electrician and plumber, they were pretty skeptical. But once I got them to try it, they didn't have any serious problems.

Electrical. The big difference for the electrician is that he has to put a plastic grommet in the stud punchouts to prevent the wiring from coming into contact with the steel (Figure 5). The grommets cost money and take time to install, but there's no hole-hogging through the studs, so it saves time. Most studs come with a 1 1/2-inch punchout spaced every 24 inches, although you can specify different spacing if you want. The punchouts line up, so you get nice, neat-looking wire runs. You also don't have piles of sawdust everywhere from hole-hogging through the studs.

Figure 6. Plastic grommets also isolate the copper water lines from the steel framing (left). A plasma cutter is the tool of choice for making large-diameter openings for drain lines (below, left).

The other difference for the electrician is that he can't staple the wire to the stud at the electrical box. Instead, he has to fasten a tie wrap to the wire and screw it to the stud 8 inches from the box.

Plumbing. Plumbers also have to use grommets, to prevent a galvanic reaction between the steel and copper supply pipe (Figure 6, previous page). The plumbers used to use a hole hog where they couldn't use an existing knockout, but it was hard work and they went through a lot of bits. Now they use a plasma cutter, which does a fast, neat job, especially for waste lines. With the I-joist floors, running waste lines through the floor space is a snap.

Stucco. Where there's no exterior shear wall, we sheathe the exterior walls with 7/16 Celotex foam, which matches the thickness of the OSB. The stucco lath is screwed on over it with 1 1/4 inch screws (Figure 7). We tried using the air-driven Erico fasteners, but to use them with lath you have to put a separate washer in a magnetic recess at the tip of the gun before you fire them. Because you've got to reach down for a washer before each fastener, we found that it wasn't much faster than screws. The screws are also cheaper than the Erico fasteners — they're about 3 1/2 cents each, compared to 7 1/2 cents for the Erico pins and washers — which helps offset the added labor cost. Once the lath is in place, we finish the walls with conventional three-coat stucco.

Figure 7. Screws secure the stucco lath to the steel frame. An underlying layer of 7/16 inch foam board provides a thermal break between the conductive steel studs and the exterior finish.

Figure 8. Spray cellulose in stud cavities reduces sound transmission and provides backing for 5/8 inch drywall.

Details and Finish

In the part of California where we build, the temperature almost never falls below 35°F or climbs to more than 90°F or so. The exterior foam sheathing provides all the thermal insulation we need, but we also insulate the exterior wall stud cavities with spray cellulose. Besides reducing sound transmission from outside, it also provides backing for the 5/8-inch drywall, giving the walls a more solid feel (Figure 8).

Windows and trim. We use vinyl windows from Milgard. According to the stickers, you're not supposed to screw them at the head, but their rep has us do it because steel framing doesn't settle. To allow for trim, we frame the rough openings oversized and screw pieces of 2x4 flat to the framing. The wood goes on all three sides of the doorway, because they're trimmed all around (Figure 9). Window openings only receive a liner on the rough sill, where it provides a nailing base for an MDF finish sill and apron. In place of window side and head casing, we return the drywall to the window and finish the corners with corner bead. We fasten the baseboards to the studs with conventional pneumatic trim nails and construction adhesive.

Cabinet backing. Before the drywall sub arrives, we screw 6-inch-wide strips

of 5/8 plywood to the studs where the kitchen cabinets will go. The drywallers fit the wallboard around it so everything comes out flush, and the cabinets screw to the plywood (Figure 10).

The Bottom Line

Steel is cheaper than lumber, but nails go in faster than screws. In the end, steel framing costs a little more than wood. We've found that building an 1,800-square-foot, three bedroom home from start to finish on a steel frame costs an extra $1.57 per square foot, when you compare it to wood. That includes everything — the extra labor, the savings from reduced waste, materials cost, and the extra price charged by subs who aren't familiar with steel.

No callbacks. The biggest advantage to steel is the quality of the finished product. When we were using wood, we had endless problems with things like bowed studs, and twisted headers cracking the drywall at window corners. You have to go back and fix those kinds of things, and we used to spend a lot of time doing it.

But what a lot of people don't realize is that even when you fix a problem, it's still a problem. You can send someone over the same day the customer complains and do a perfect repair job, but the customer is only going to remember one thing: The builder screwed something up, and we had to make him come back and fix it. In our first tract of 46 steel houses, we only had one callback, and it didn't have anything to do with the steel framing.

It's also easier to sell a steel house, because it looks better. When you look at a wood-framed wall, you can see the humps and the dips, especially when there's no furniture, which is how customers see it for the first time. A steel wall is always perfectly flat and square. Termites won't eat it, and it won't rot. It's just a better product.

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Figure 9. To provide solid nailing for door trim, openings are blocked with 2x4 material on three sides.

Figure 10. Plywood strapping, screwed to the studs before the drywall goes up, provides a solid base for kitchen cabinets.