

# Framing for Garage Doors

Think about the door before you pour

By Steve Riley

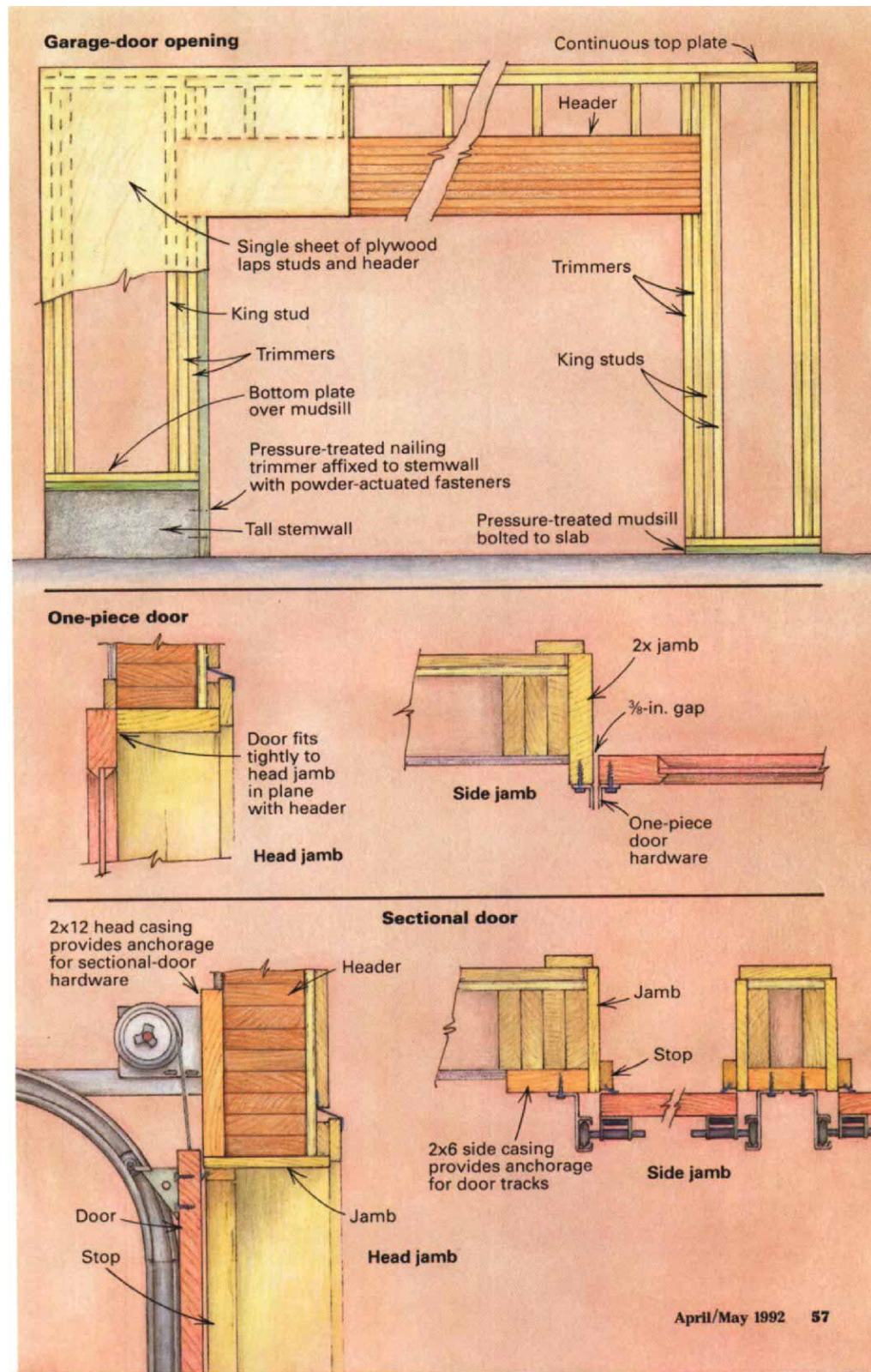
The low hum and clickety-clack rhythm of an automatic garage-door opener is a sound of our times. And yet the ingenious hardware and signal receivers that operate the doors are affixed to the most basic form in building: a beam supported by posts or, as we call them today, a header on trimmers and king studs. Making sure the framing around the door is assembled accurately and with structural integrity is the topic of this article. Building a garage and getting it ready for a door typically involves several different trades, and it takes some planning to make sure the guy who finally installs the door can do a clean job with no complaints. After all, nobody likes to chip away concrete to make room for the door tracks, and nobody wants to pay for a custom garage door because the stock one didn't quite fit in the opening.

**Door types and sizes**—Stock residential garage doors generally range in size from 8 ft. wide and 6 ft. 6 in. tall to 18 ft. by 8 ft. A good set of construction drawings will call out the garage-door details on the framing plans and on the elevation sheet. If the drawings lack this information, I check with the clients to find out what kind of vehicles they plan to park in their garage. For a mid-sized car, the typical door will have to be 8 ft. wide and 7 ft. tall. But most people want the flexibility of pulling a Suburban with a luggage rack into their garage, which requires a 9-ft. wide door that is 8 ft. tall. The extra width also reduces the chance of a driver ripping off the passenger-side mirror.

Here in the Wood River Valley in Idaho where I build houses, clients prefer sectional garage doors. They are made of four or more horizontal panels linked by hinges, with rollers that ride in tracks mounted to 2x6 side casings (drawing below right). The hardware that mounts over the door is attached to a 2x12 head casing.

Sectional doors don't mount between the jambs. Instead, they mount just inside the garage and are sealed against the weather by stops nailed to the jambs. The weatherseal is one reason why folks around here prefer sectional doors. For an even better seal, the stops can include weatherstripping.

In some parts of the country, people still use one-piece, or tilt-up, garage doors (drawing middle right). These are less expensive than sectional doors and easier for builders, or homeowners, to install. One-piece doors fit between 2x side jambs that extend into the garage 2 in. beyond

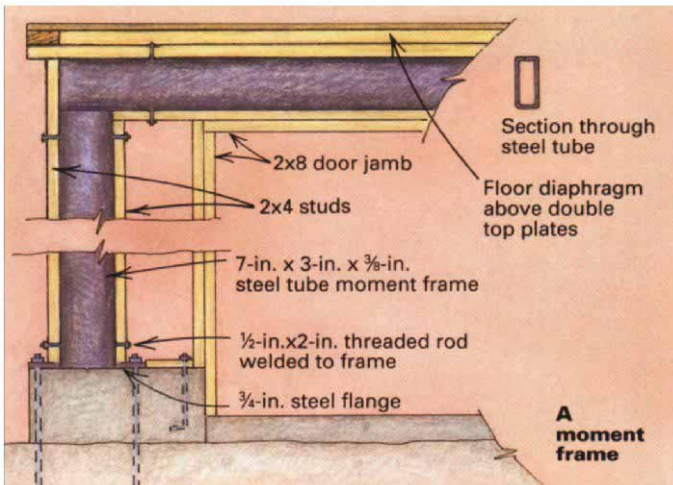


# Framing with steel

Building designers in Santa Cruz, California, have their share of specialized design criteria. And sometimes the criteria can work to cross purposes. Take, for example, two of the conditions I had to reconcile in the design of a duplex for one of our historic residential districts.

The original duplex was destroyed in the 1989 earthquake, along with many of the neighboring homes and commercial buildings.

By Tom Conerly



Fortunately, enough of the original structures remained undamaged to preserve the flavor of the old part of town, and to make sure it stays that way, any new construction on this street has to be compatible with the neighborhood. So among other guidelines, the two single-car garages required for the new duplex had to be kept separate to reduce their bulk. I put the living spaces over the garages, which fits with the row-house look along this street. But stacking a floor over a narrow garage that's mostly doorway makes for some potentially heavy loading on the garage-door framing.

As you can imagine, we have to adhere to some of the toughest seismic design standards anywhere in the world. Ordinarily, I would reinforce the corners of the garage-door wall with plywood sidewalls. But our tall, narrow building precluded that option because the garage sidewalls were too narrow to contribute much stiffness. Fortunately, our project engineer, Michael Martin, had a budget-conscious alternative for us: the moment frame (photos below)

Martin learned about steel-moment frames designing fast-food restaurants, a job that required him to reinforce openings for large windows in wood-frame buildings. A moment frame relies on a stiff connection between framing members to resist the *moment*, or forces that cause bending, in a structural member. It's difficult to make a moment connection with wood because the fasteners tend to act as pins, thereby allowing some flex. No flex is allowed in a moment connection.

As shown in the drawing at left, our moment frames are made of 3-in. by 7-in. by  $\frac{3}{8}$ -in. thick steel tubing. They are bolted to the foundation with  $\frac{3}{4}$ -in. thick steel flanges over 1-in. dia. threaded steel rods (photo below). The rods are 27 in. long, and they have nuts and washers on their lower ends to anchor them in the concrete. The 2x wood framing members that sandwich the steel are secured by 2-in. long pieces of  $\frac{1}{2}$ -in. threaded rod welded to the sides of the steel tubes.

We had the two frames fabricated by a local welding shop for \$650 apiece, plus another \$100 to transport them to the site. To ensure accuracy, our contractor, Rob Moeller, provided the shop with flange templates that gave the exact positions of the foundation bolts.

We scheduled the arrival of the frames to coincide with a crane that had to be there anyway to lift other materials onto the roof. It took an hour's worth of crane time to place the two frames and another couple of hours of carpentry to bolt the 2x stock to the steel.

I put narrow gable roofs on top of each garage to break up the facades of the duplex and to keep them from looking top-heavy. As a consequence, the upstairs walls are about 2 ft. back from the plane of the moment frame. Shear loads are transferred from the walls to the frame by way of a horizontal plywood diaphragm (for more on how wood-frame buildings react in earthquakes, see *FHB* #64, pp.60-65).

— Tom Conerly is a building designer based in Santa Cruz, Calif. Photos by the author.



the plane of the header. The hardware is bolted to the edge of the jamb. Many builders make the mistake of using redwood jambs for this detail. Garage-door installers prefer Douglas-fir jambs because lag bolts hold better in them. Unlike sectional garage doors, one-piece doors require a  $\frac{3}{8}$ -in. gap at each side to keep them from scraping the jambs during operation.

The type of door and the hardware it uses influence the ceiling height of the garage. The minimum overhead clearance for standard sectional-door hardware is 12 in. above the bottom of the head jamb, plus another 2 in. if the installation includes an automatic door opener. Reduced-clearance tracks that fit in a 6-in. deep space can be specially ordered from most manufacturers for low-headroom situations.

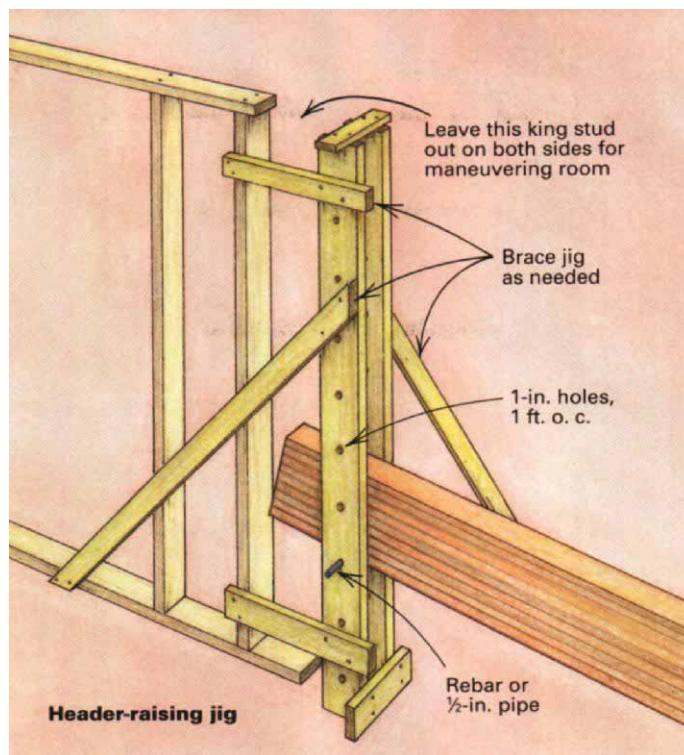
**Stemwall or slab**—Garage walls bear on either a monolithic slab that includes a footing or on stemwalls that border a slab. In either case, make sure anchor bolts and hold-downs are accurately placed—especially in the short walls that flank the garage opening. These walls are typically 2 ft. long and require a pair of anchor bolts, each within 1 ft. of the ends. Nowadays, building codes often require metal hold-downs as well. To fit all the hardware, I make these short walls as long as possible by running them past any adjoining walls instead of abutting them.

Of the two foundations, I prefer the stemwall because it's easier to position the anchor bolts on the forms prior to the pour. If hold-downs are called for, consider the strap-type, such as Simpson's HPAHD22 (Simpson Strong-Tie Co., Inc., 1450 Doolittle Dr., San Leandro, Calif. 94557; 510-562-7775) if it satisfies the engineer. This hold-down has a hook that angles into the stemwall while the strap extends up and is anchored to the side of the studs. It's easier to deal with than hold-downs that require foundation bolts.

For a sectional door, I want an opening between stemwalls that is equal to the width of the door plus the thickness of two nailing trimmers and two jambs. For a one-piece door, the opening between the stemwalls is equal to the width of the door plus two jambs and a  $\frac{3}{4}$ -in. gap. I don't leave a shim space because I make sure my trimmers are plumb during framing.

**King studs, trimmers and headers**—Whether on a slab or on a stemwall, I prefer that the ends of my garage headers rest on two trimmers (top drawing, p. 57). With a tall stemwall (8 in. or more), I add a third pressure-treated trimmer that extends all the way to the garage floor to provide a nailing base for the bottom of the jamb and casing. I secure this trimmer to the stemwall with a couple of powder-actuated fasteners.

For a sectional door, I want at least four framing members on each side of the door opening. That way I've got backing for the drywall and for the

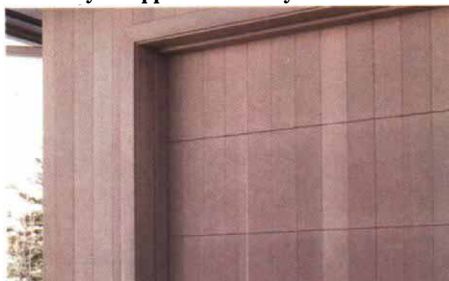


2x6 casings that carry the tracks for the doors. The framing members can be two trimmers and two king studs or three trimmers and one king stud. When framing two, one-car sectional doors next to one another, you need a column at least 6½ in. wide between them for the door tracks (bottom drawing, p. 57).

Although the front of a garage is a continuous wall, the large opening makes it tough to erect this way. So I frame the short sections that flank the door as separate walls and connect them later with a continuous top plate. I frame these short walls with bottom plates drilled to fit over the anchor bolts holding down the mudsills. After lifting a wall into place, I make sure the outside edge of the bottom plate is flush with the face of the stemwall. This step ensures that the sheathing and the siding will be outside the plane of the concrete. At this stage, stretch a Stringline from corner to corner to make sure the walls are in the same plane—stemwalls aren't always exactly where they're supposed to be.

Bottom plates aligned, I nail them to the mudsills. Then I nail the outside corners of the adjoining walls and brace the narrow walls so that they stay put as we place the header.

**Custom veneer.** A sectional garage door can blend with the house when compatible siding is affixed to it. Horizontal finishes (lap siding or shingles) can make the lines between panels virtually disappear. Photo by Charles Miller.



We can muscle a single-door header into place by hand (for example, a 9-ft., 6x14 weighs about 175 lb.). But it's almost essential to have a crane or a forklift on site to place a header large enough to span a double-wide door. Lacking a crane or a lift, we resort to a ladder-like header-raising jig that allows us to lift one end of the header at a time (drawing left). Using this jig requires the cripples and the two king studs to be left out of the walls for maneuvering room until the header is in place. I stick with either glulams or laminated veneer beams for header stock because large, sawn timbers have a tendency to twist and check. Also, I don't use built-up headers made of 2x stock and plywood because the labor required to fabricate them costs more than the extra expense for solid stock, and built-up headers are rarely as accurate as glulams or veneered beams.

Once the header is positioned, I tie it into the wall by nailing through the king stud into its ends—a typical nailing schedule is pairs of nails on 2-in. centers. Then I add my cripples and double plates to tie it all together. After plumbing and stringlining, the wall is ready for plywood. It's important to lap full sheets over the intersections of the header, the trimmers and the king studs to reinforce these areas (top drawing, p. 57). Now I can put up my 2x casings for the door hardware and call in the door man.

Because carpenters do not install garage doors regularly, it's best to have an expert install the door. Otherwise, count on watching two or three carpenters spend several hours hunched over a set of instructions while they figure them out.

**A custom touch**—The most economical garage doors have hollow-core panels skinned with metal or hardboard. The next step up is the same doors, but insulated. High-end stock doors are the raised-panel variety made of solid wood.

An elegant way to make a garage door match its surroundings is to skin it with the same siding that covers the house (photo below). This step adds some weight and, in my experience, works best on doors that are 9 ft. wide or less. Consult with your door installer to find out how much weight the hardware can bear.

For a substrate, I specify insulated hardboard doors with a smooth face. Then I use galvanized staples and construction adhesive to apply the veneer to the door sections. I've put siding on doors before installation, and I've sided them after installation. The second method is better because the siding adds weight to the door, making it more difficult to install. Also, the alignment of the siding stays true when affixed to a door that's in place. The installer will come back to adjust the spring tension to offset the extra weight. □

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