FAST & ACCURATE Wall Framing

by Don Dunkley

Following careful layout, walls are banged together and raised with assembly-line speed and efficiency.

I frame high-end custom homes in California's suburbs, and I pride myself on turning out "clean" work. But I wouldn't be in business around here very long if I weren't fast. With my three-man crew, I'm expected to frame and sheathe a 3,000-square-foot custom home with lots of high rake walls and a complex roof in about one month.

That kind of speed comes from using production techniques. I learned them in the "tracts" — the West Coast's large, suburban developments that have been the breeding ground for these innovative techniques for more than 40 years. Contractors unfamiliar with these methods tend to think of them as inherently sloppy and out of control. On the contrary, each move is orchestrated to achieve efficiency.

The key is to learn the points in the process where exercising a little more care will allow you to really "crank" the rest of the time and still produce a tight frame. Here are some of the places where I insist on accuracy — and the techniques I use — in wall framing.

Laying It All Out

Production framing loads the "thinking" part of the job into the early stages — floor layout, plating, and detailing the plates — so that your crew can concentrate on pure speed later on. The first task is to establish a benchmark on the deck for square.

Snapping lines. Even if I built the floor, I no longer just hook my chalkline over the edge of a subfloor or slab and begin snapping out walls, compensating for square as I go.

Instead, I take the time to establish a square base — a giant 90 degree angle — with string. Then I use this as a reference for pulling my wall dimensions and establishing the layout on the floor with a chalkline. This lets me concentrate on the plans and how I want to build the walls when snapping out lines, rather than getting distracted with a lot of double-checking.

Production speed doesn't mean a sloppy frame if you know when to take your time and when to hustle

To establish square I pick the longest or least movable wall to use as a *base line*. I measure in 3½ inches to the inside of the wall (or 7 inches if it's full of plumbing) and stretch a string the full length. With another "dry line," I establish the inside edge of a wall that's approximately 90 degrees to the first one (we'll call this the *adjustable line*). If this isn't a corner of the subfloor, I measure in the appropriate distance from the closest parallel wall.

I perfect my 90 degree angle by establishing arbitrary lengths for each line, marking these on the floor, calculating the exact length of the diagonal between them, and moving the adjustable line in or out to hit this dimension.

Most of us learned to do this with multiples of 3-4-5, but I find I have less chance of error and more flexibility in choosing dimensions (I want the longest lines the layout will allow) with a calculator. The one I use is a Construction Master II from Calculated Industries (22720 Savi Ranch, Yorba Linda, CA, 92687; 714/921-1800). By punching in *rise* and *run*, I get a diagonal length that I can measure from the end point of the base line to the end point of the adjustable line.

If the plan is complex or contains a step-down, I'll create several of these 90 degree angles. And if I have lots of 45 degree angles in a plan, I'll even bisect my 90 degree angle with a string so I can measure directly off it. Once I've established these reference angles, I can pull exact dimensions from anywhere on these strings, and trust them in snapping out the walls.

However, I always double-check for square any areas where tile will be used; its grid lines just don't offer any forgiveness.

Plating. Once the floor has been snapped out, my crew scatters plate stock. We tack together bottom and top plates for all the walls and cut them at the same time using the chalk lines of the floor layout as a template.

Here is a situation where I combine production techniques with old-fashioned care. In the tracts, I never got out a tape measure or a pencil for plating; instead, I'd cut everything by eyeballing it where it lay. But in my custom frames I measure and fit the wall plates

Figure 1. *A layout stick eliminates the occasional errors that come from stretching a tape and having to pick out stud centers. It also saves the extra steps of squaring off marks and making Xs.*

as tightly as possible. If they don't fit just right, I redo them.

This way, when we nail the walls together and *plumb and line* them (brace the walls plumb and straight), the top plates can be trusted to be a duplicate of what's snapped out on the floor. Particularly when you're dealing with tall walls, angles, double walls, and other strange configurations, precise cutting will pay off.

With walls that exceed the stock length, I tack plate stock on the subfloor till I get close to the end of the wall and either measure or scribe the remaining piece. However, I'll try to break my plate over a header, or second best, on a stud at least 4 feet from corners or partitions so the double top plate isn't the only thing keeping the wall stiff.

When plating for a rake wall, I only cut the bottom plate at this stage, leaving the top plates for actual framing later on.

Plate layout. Layout is a three-step process. First I mark all *corners* and *channels* (where one wall intersects another), then I detail all windows, doors, and *specials* (beam pockets, bearing posts, etc.), and finally I add the stud markings.

Every crew has its own philosophy and style of detailing. You want enough layout information that you don't have to think when you're nailing together walls, but you also want to keep things simple.

For window and door openings, I use *keel* (lumber crayon) to mark the location of the header along with its length. If it's a window, I also write down the length of the sill cripples. I make an X to the outside of these lines to indicate *king studs*. I don't show the *trimmers* (jacks) inside the king studs — it's a given — unless I want them doubled because the header is over 8 feet or because the wall is carrying a beam load from above.

I use one color keel for all my original layout marks. This allows me to use a second color to make changes or correct errors. My layout assumes what's standard; when stud length, header size, or anything else is unusual, I note these exceptions on the plates as concisely as possible.

I only use a tape measure at this stage to locate openings, partitions, and specials. For everything else I use a *channel marker* and a *layout stick*. These tools were born in the tracts, and make short work of stud and corner layout.

A channel marker is an L-shaped jig made of 1x4, metal, or plastic. It measures 3 inches on one side and 3 1/2 inches on the other. It's simply a template that allows you to mark all corners and mid-wall intersections with a quick pencil scribe down each side.

A layout stick is usually 4 feet long with 1 1/2-inch-wide fingers that extend down about 6 inches (see Figure 1). They're attached at 16 inches on-center. On exterior walls, I position the tool so the first finger is only half on the stock — this gives me the 15 1/4-inch or 47 1/4-inch offset (whichever way you do it) that allows the plywood to break on a stud. I then run my pencil against both sides of each finger, and move the stick down another 4 feet so the first finger is positioned directly over the preceding marks.

When using a layout stick on interior walls, I start a new layout whenever I run into a partition channel. This saves me the stud that would fall somewhere in the first 16 inches if I continued the original layout. That can add up to a bunch of studs over a whole house.

Building Walls

When it comes to banging together the walls, there's no need for finesse. Most of the details that bear on quality have been dealt with in layout and plating; all you're doing now is putting the pieces together. The main emphasis should be on grouping tasks so you're doing as much of one thing at a time as you can to increase your efficiency.

Establishing an order. I frame all the walls I can in the space available. After numbering them for location, I spread out the wall plates on the deck.

Experience is everybody's teacher when it comes to determining which walls should go up first. The trick is to make sure you leave room to build the next set after the first ones are up. Long hallway walls can really be a bear if you box yourself in. It helps if you keep reading the floor layout in front of you and imagine the walls going up.

Studs and specials. After all the plates are spread, I stock them with studs, headers, trimmers, sills, cripples, corners, channels, and specials like 4x bearing posts. All of these are cut on the radial-arm saw by one of my crew while I'm laying out, so when we start framing our rhythm isn't interrupted by missing pieces.

Although I cull out badly bowed or warped studs when stocking the walls, I don't bother to crown them. I've found with the green framing lumber we use in this area that I get better results by waiting until we do *pick up*. (These are the small framing details or corrections we do after the walls are up so they don't break the flow of the work.) This way, the studs that are going to go sour will have as much time as possible, and I can fix or replace them.

Nailing. With the plates spread and stocked, the standard wall banging chore can begin. We nail together all the walls we can accommodate before cutting double top plates, let-in braces, and blocks. The process of doing one step at a time really shows its worth here.

Double top plates. I typically install the double top-plate and blocking without ever using a tape measure. This saves time and eliminates the transfer of measurements that causes so many cutting errors. To top plate a wall fast and accurately, lay your stock down along the existing top plate and use it as a template to mark where it should break for partitions.

To produce the "tab" that will lap the neighboring wall at a corner, hold the end of your double top plate stock to the *far side* of the nearest partition channel and cut the other end flush with the end of the wall. Then shift the double top plate back to the *near side* of the partition before nailing it. If the wall has no channel, I use the 3 1/2-inch side of the table on my worm-drive saw or a scrap piece of 2x4 as a gauge.

Let-in braces. We use "let-ins" a lot where I build. These are 1x4 sway braces that are notched into the studs and plates on the outside face of a wall. Their ultimate purpose is to provide shear strength. They should run from the top corner down to the bottom plate at a 45 degree angle, and be repeated every 25 feet or so on long walls.

Figure 2. *To speed up the process of cutting in sway (let-in) braces, framers hold the 1x in place with one foot and run the saw along each side. This short cut takes practice and caution.*

Figure 3. *Blocking can typically be cut in place without measuring by laying the stock on the wall and eyeballing the saw blade.*

Let-in braces also make plumbing the walls a good deal easier by giving us a way to quickly lock the wall in position when it's plumb. We cut the braces into the wall while it's still down, but only nail the brace at the bottom plate and first stud. However, we start nails at every other stud and at the top plates so there's no fumbling around when other crew members are straining to rack the wall into a plumb position.

I even use let-ins on exterior walls that will eventually be shear paneled. This allows me to plumb and brace those walls along with the rest, and then put one of my crew on shear panel while I'm laying out floor or ceiling joists.

The reason I use let-ins so freely is the speed we've developed when installing them. The procedure most of us around here use takes some practice and won't win any awards for safety, but it allows you to let in a brace in two or three minutes.

First, lay the 1x4 down in position; it should extend slightly beyond the bottom and top plates. Then, while you hold the brace in place with your foot, trim it off flush at the bottom of the wall and run the blade alongside the brace, cutting into the bottom plate (see Figure 2). You will need to set your saw at a little more than 1 1/2 inches deep so that it can ride on the brace and still notch the plate by at least 3/4 inch.

Then keeping one foot on the brace, run the blade up both sides of the 1x4 cutting into each stud as you go until you reach the top plate. Keeping your elbow locked against your knee will help guard against kickback. Then trim off the top of the brace about 3/4 inch shy so it can't run above the double top plate when the wall is racked plumb.

Now kick the brace out of the way and use your saw parallel to the deck (the table will actually be resting on the face, not the edge, of the stud) to cut the bottom of each notch. This "pocket" cut is a little awkward at first, but you can get very fast with practice. You will have to overcut the kerfs that form the sides of the notch on the face of the stud so the bottom of the blade makes the full cut on the other side.

Now you can clear the chunks of waste in between the cut lines with your hammer, nestle the 1x in place, nail it at the bottom, and bend a nail over the brace at the top plate so it won't flop around too much. It ain't pretty, but it's very fast and effective.

Blocking. Most exterior walls require fire/draft stop blocking. This can be a tedious job if you measure each one to fit, and it won't contribute a bit to real quality. Instead, lay a piece of stock alongside the bottom or top plate (not in the middle of the wall where bowed studs can throw you off layout), and cut the blocks for each stud bay by eyeballing your sawblade. With a little practice, you can churn out tight fitting blocks in no time (see Figure 3, previous page).

When nailing the blocking, it's

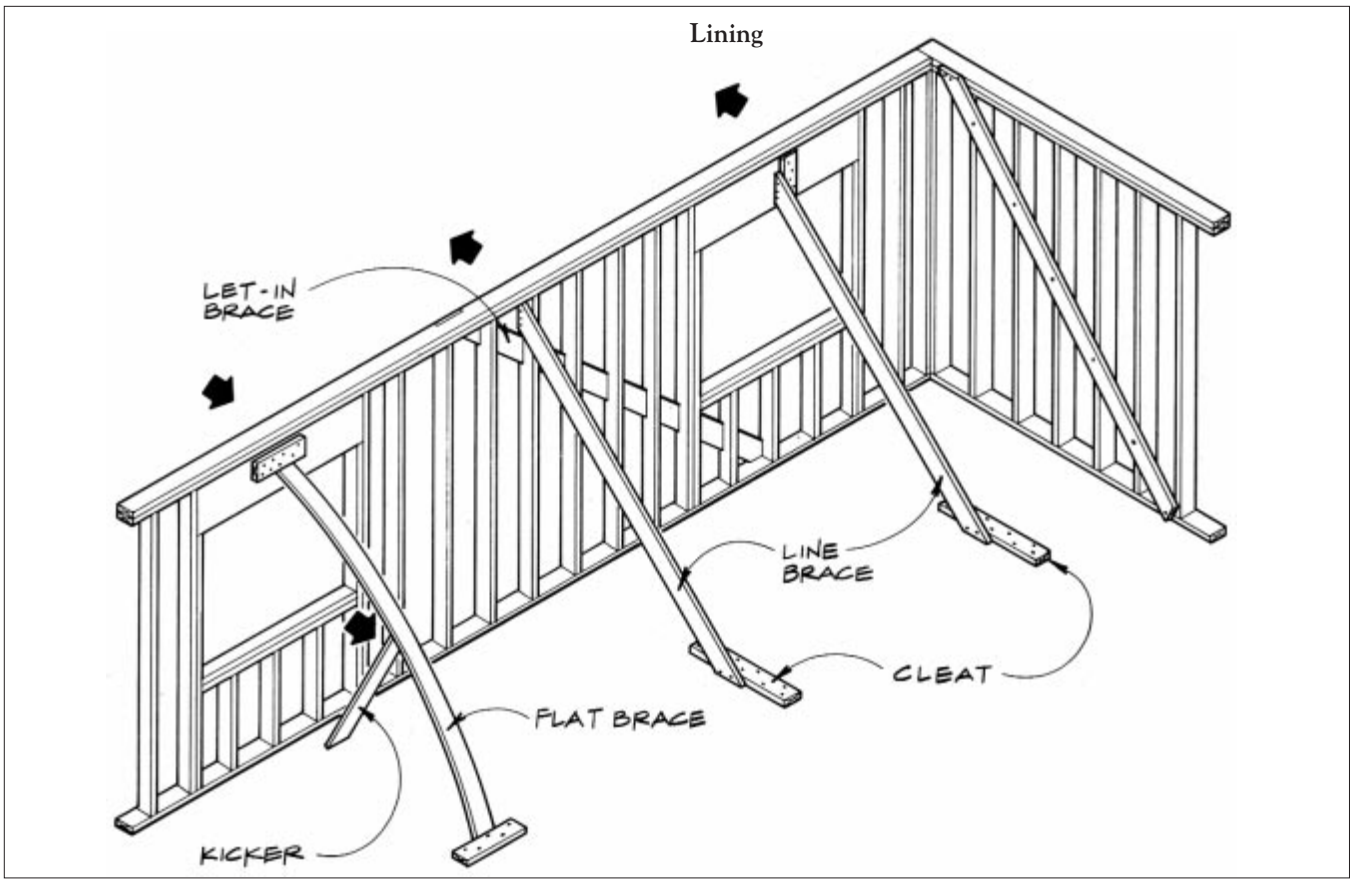

Figure 4. *Bringing the tops of your walls into line requires standard line braces for pushing walls out and keeping them there, and flat braces with kickers to bring them in. The author uses his eye rather than a string for lining most walls because, with practice, it's fast and accurate.*

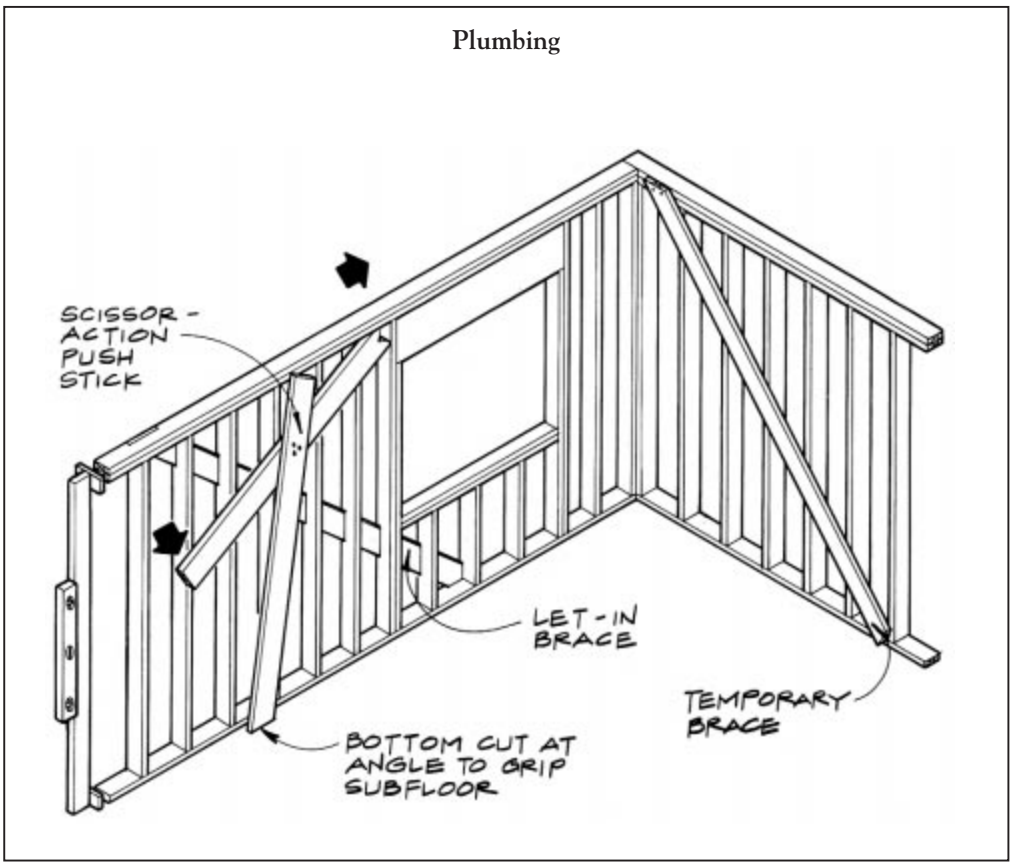

Figure 5. *The scissor-action push stick shown here is a good site-made tool for racking tall walls with lots of blocking. It can also be used to persuade walls that bow in at the top during the "lining" procedure.*

a good practice to leave the last block out, or better yet, tack it to the stud bay for later installation. This will avoid those situations where the block bows out the last stud enough to make it hang up on a neighboring wall while you're struggling to raise it.

Plumb and Line

"Plumbing" refers to racking the walls side to side to make them plumb. "Lining" means pushing the tops of the walls in and out to straighten them. "Plumb and line" begins when the walls have all been framed, stood up, and tied off. This includes nailing off (or with a slab, shooting in) bottom plates to the snap lines on the floor, and nailing together intersecting walls at corners, channels, and double plates. Remember to drive these together tightly or you will be wasting the accuracy you achieved with careful layout and plating.

The first step in plumb and line is to scatter the stock for the braces throughout the rooms and tack them where they'll be needed. Then you'll need to systematically rack each wall until it's plumb, and nail off the braces to keep it there. Finally, you'll need to make sure the tops of your walls are straight and parallel by forcing them in or out using *line braces* and nailing them off.

Stocking braces and cleats. To keep the walls plumb, I rely largely on the let-ins, but you can also use temporary 2x4 diagonal braces on the inside face of walls at the same general spacing and angle as let-ins. Long interior walls, or ones that are largely independent of other walls, should be diagonally braced as well. Nail diagonal braces at the top, but just start nails on the rest of the brace for now.

Line braces are set perpendicular to the walls, and run from the top of the wall down to the floor at approximately 45 degrees. We spike our line braces to the face of a stud just under the top plate (see Figure 4, previous page). If we need one at a header, we'll nail a 2x4 cleat to the top plate and header, and nail the line brace into the side of the cleat.

On fairly short walls, I generally use a line brace right in the middle. On long runs, I take a peep at the wall to spot obvious bows and put line braces there. If I have a long wall that will remain open for some time, such as a vaulted ceiling wall, I use a few extra braces so it can't move around. I also drive all my nails home.

We nail 2x4 cleats to the floor where the line braces fall. Centering a 2-footer on the end of the line brace usually allows enough adjustment back or forth to line the wall and still get good nailing. We also supply each room with a few 3- to 4-foot lengths of 2x to use as *kickers*. These are jammed between the floor and the underside of flat line braces and act as fulcrums that help pull the wall in.

Plumbing. I rack all the exterior walls plumb using one of my guys on the level, another on a push stick, and a third nailing the let-ins or temporary diagonal braces. In my piecework days in the tracts, there were just two of us doing plumb and line, but it's pretty hard to keep your eye on a level and nail off braces at the same time.

On 8-foot-high walls, a 10-foot push stick made from two face-nailed 1x4s works well. It is wedged between the floor and the intersection of a stud and the top plate at a 45 degree angle and then flexed to rack the wall. But most of the custom homes I build now include tall walls with two or more rows of blocking that require something with more leverage.

The answer is a scissor-action push stick (see Figure 5). This consists of two studs nailed together so they overlap by at least a few feet. The amount of overlap depends on the height of the walls. I use three 16d nails grouped in a tight circle to allow the top "lever" to rotate. A notch at the top helps to engage the top plate of the wall I'm trying to move, and an angle on the bottom keeps it in one place on the subfloor.

You can use a scissor stick to rack a wall plumb, or to push it into line. To plumb a wall with it, place the notch end at the intersection of a stud and the top plate (a king stud is best so you don't blow out a regular layout stud) and with the bottom leg in a near vertical position, push down on the tail of the top leg. This "stretcher" can really tweak some walls.

Another problem in a house with walls of various heights is how to rig up a level to accommodate them all. Like everybody else, I've taped or nailed levels to long 2x4s, but it's a clumsy arrangement at best. Lately, I've been using a level that will adjust in height from 5 to 13 feet (Plumb-It, 3045 North Dodge Blvd., Tucson, AZ, 85716; 800/759-9925), and I've been amazed at how quickly and accurately it's allowed me to work on some of the crazy custom designs I'm asked to build.

Armed with the level and a push stick, we start at an exterior corner and methodically work our way through the house. The crew member on the level should keep the guy on the push stick aware of what's needed, and ask him to keep a steady tension on the stick once the bubble looks good. Then he needs to quickly check the other end of the wall to make sure it also reads plumb. If it doesn't, they'll have to split the difference. When the wall is where they want it, they'll give the third guy the go ahead to drive home the nails that have been started in the braces while they check to make sure the wall is holding steady.

I do all the exterior walls and those that intersect them first. If there are two intersecting walls close together, such as a closet, I plumb one and catch the other later. After exteriors are done, I work my way through the interior walls from one end of the house to the other.

Lining. After all walls have been satisfactorily plumbed, I line all the exteriors and then any of the longer interior walls. Although a dry line held out by plywood spacers is the ultimate in accuracy, I find my eye is sufficient most of the time and a great deal faster. I steady myself on a 6-foot stepladder and just eyeball the top exterior corner of the double top plate, while talking with the guy nailing the bottoms of the line braces.

Walls that are bowed in are pretty simple; just lever up on the bottom of the line brace — the scissor push stick can be used on really stubborn walls — and nail to the cleat when it looks good. Line braces can also be run back to the bottom plates of interior walls. If the wall bows out, you'll have to nail your line brace flat to the wall with a cleat above it to keep it there, and use a kicker to create an upward bow on the line brace.

If you've taken some care with layout, framing, and plumb and line, you'll end up with top plates that are straight, square, and rock solid. And that means less measuring and adjusting when you add joists or rafters, which in turn, saves time, effort, and error. ■

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