# COMMERCIAL METAL STUD FRAMING

By Ray Clark

Craftsman

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## Dedication

*This book is dedicated to the memory of my mother, Berna Mae Clark,*
*to Jerry Deutch, a great boss who was loved and is missed by all*
*and to God*
*for His gifts of forgiveness and perseverance.*



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## SECTION II: STEP-BY-STEP METHODS 75

# SECTION I

# Tricks of the Trade

Welcome to the world of metal stud framing. My name is Ray Clark and I'll be your guide to this challenging and rewarding trade. I've been working in the metal stud and drywall trades for 15 years, and have taught these trades as a Junior College instructor. While teaching, I contacted publishers from coast to coast looking for a text to use in my class. I couldn't find one. So I started writing one for my class — and it evolved into this book.

To keep the information simple, to the point, and useful for both journeyman wood carpenters and apprentices alike, I've organized the book into two sections. The first, Tricks of the Trade, focuses on the unique methods and techniques common to the metal framing trade. The second, the Step-by-Step Methods section, concentrates on the process and flow of work involved in framing metal stud walls, ceilings and soffits. As we work through each chapter, I'll also introduce you to tools that are common to the trade, but which may be new to you.

We'll cover the many advantages of framing with metal studs as opposed to the traditional wood. The most obvious is that metal studs won't burn, rot or become a termite buffet. Structurally, as in bearing walls, metal studs are many times stronger than wood studs, greatly reducing the amount of materials needed to support the load, as well as the amount of time it takes to frame the job. And the fact that you screw metal studs together as opposed to nailing wood studs also makes them stronger and faster to assemble. The metal stud material doesn't dry out, either, so warping, bowing and twisting aren't problems. That lets you build straighter walls and flatter ceilings.

And here's another advantage. Wood prices are jumping all over the place. You can bid a job in January, based on lumber prices at that time, then get a nasty surprise when you get the job and order the lumber in February. Maybe you'll find an owner who's sympathetic and understanding about your request for more money. But probably not. I never have. Steel, on the other hand, remains pretty stable. Weather, politics, overharvesting, environmental issues, rarely come into it. Plus, you don't have to worry about quality. Twenty gauge steel is 20 gauge steel, no matter where it comes from. With wood, especially lately, you never know what you'll get.

Commercial metal stud projects range from small, tenant finish jobs that'll only take a few hours to frame up, to extremely large project that often last for a year or more. Most metal stud contractors, whether union or not, will pay by the hour, with wages ranging from a low of $7 in some areas of the country to $20-plus, depending on your experience, in others. Many contractors also offer benefit packages including health insurance and 401(k) plans, as well as paid vacations and holidays.

In this section we'll discuss some commonly-used tricks of the trade in metal stud construction. They're shortcuts and methods that have become standards of this trade. Obviously, knowing the tricks of the trade gives you an edge. First, it'll reduce the time it takes you to reach journeyman status. Second, you'll know "what's going on" when you begin working with a new partner or new outfit. In either case, the result is the same. It'll help you become more proficient, which makes you a better hand, which means you earn more money. Isn't that the reason you bought this book?

Consider this section as a reference guide that lets us cover the principles of metal stud construction without getting sidetracked on the details of how to accomplish each particular step. This is general knowledge you need under your belt before you actually begin putting up metal stud walls. If you're already an experienced wood carpenter, you may know some of this already. If that's the case, skim through any familiar material in this first section. But I don't recommend skipping anything entirely. You never know when you might pick up a new idea or improved method. It's probably worth your time to read these first four chapters just in case there's a trick or technique that's new for you. And I'll bet there is. Nobody knows it all — not even the authors of books about it.

As you put these methods to work, experience will quickly teach you in where you can put them to work. You can also use this section as a reference guide in connection with the step-by-step directions in the second section of the book.

CHAPTER 1

# Wall Methods



## Reading the Blueprints

Reading blueprints and layout are subjects too large for us to cover thoroughly here. There are many books available about both subjects. I'll only cover the fundamentals of layout work and blueprint reading to give you a basic understanding. Experience will teach you much more. If you need more information, look at the order form in the back of the book for *Blueprint Reading for the Building Trades* and *Building Layout*. In this chapter, I'll just cover the basics of print notations.

The *magnetic north arrow,* shown in Figure 1–1, is located on the right-hand side of each page of the prints. It helps keep all of the work on the job site going the same direction.

The *detail symbol* indicates a specialty item or condition in a wall, and gives the location of a detailed drawing for the item. The detail symbol in Figure 1–2 refers the reader to detail A (top letter) on page A2.4 (bottom number). The detailed drawing is often called a *cut.*

The *wall legend,* also known as a *key* (Figure 1–3), distinguishes the various wall types in the prints. Each wall type in the legend

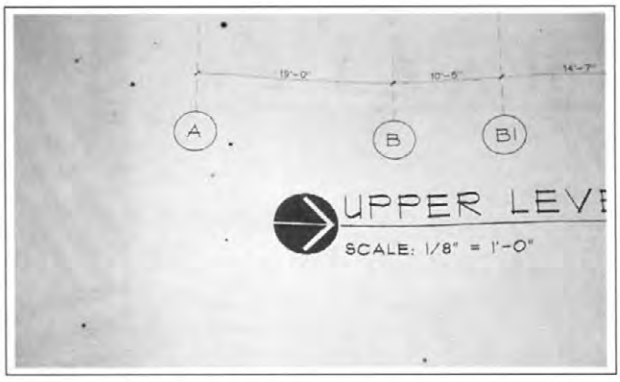


***Figure 1–1.*** This shows a north or "magnetic north" arrow which points to true north, and helps keep everything going in the same direction.

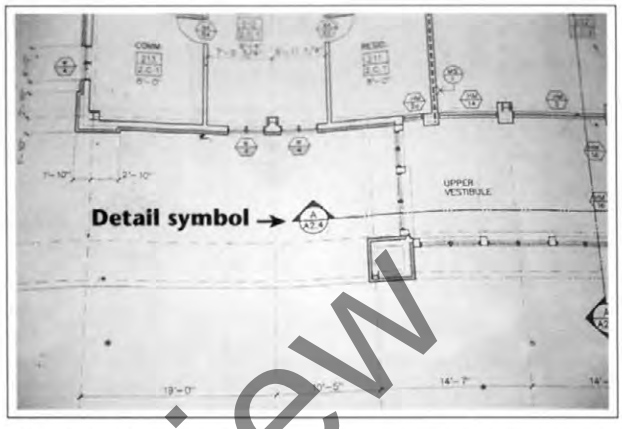


***Figure 1–2.*** This detail symbol is directing the carpenter to a detail (or cut) "A" on page A2.4 in the prints.

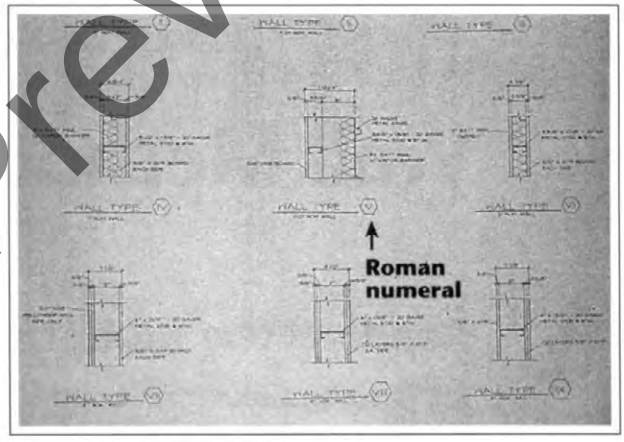


***Figure 1–3.*** This wall legend uses Roman numerals to distinguish the different types of walls on the job.

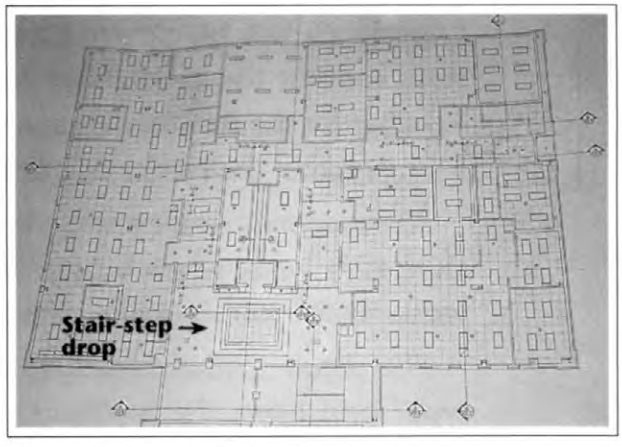


***Figure 1–4.*** The reflective ceiling plan shown here breaks this floor of the building into "grid ceilings" and "hard lids." You can also see a large stair-step drop in the entry way in the rectangle grid near the bottom of the plan. The lines around the rectangle show the separate widths of the stair-steps. The detail symbol cutting through the drop will give the rest of the information.

has a detailed description and a number. The wall numbers in the legend coincide with wall numbers in the floor plan. The wall legend tells you what type of metal stud framing material you'll use for each wall. It also lets you know whether the wall is freestanding or framed to the deck. If it's a freestanding wall, it also gives you the required height. The wall legend also indicates the thickness, type and the number of layers of drywall used, and any insulation materials.

The *reflective ceiling section* of the prints (Figure 1–4) gives all the ceiling elevations and the material they're to be built of. Rooms that show light grid lines have a grid ceiling, while clear rooms have a drywall ceiling. The dimensions and elevations for soffits are also given in the reflective ceiling plans, as well as the location of recessed lights and HVAC vents in the ceiling. All elevations are finish elevations, so you've got to add the thickness of the drywall to achieve the frame line elevation.

## The 3-4-5 Squaring Method

Let's begin with one of the most basic tricks in construction—making a right angle that's exactly 90 degrees. If you can't do that, you'll create problems that will affect not only your work, but that of all the trades that follow you.

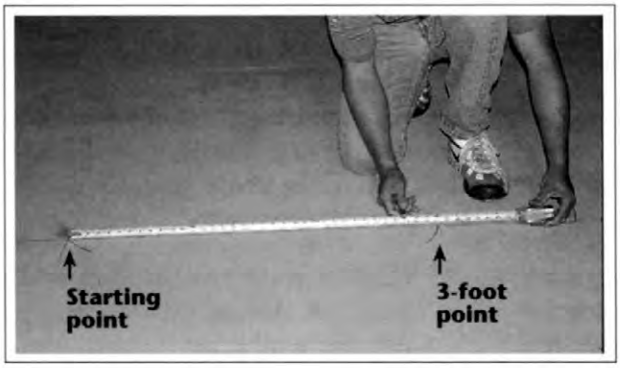


***Figure 1–5.*** The squaring method begins with marking first the starting point on the chalk line, then the 3-foot point.

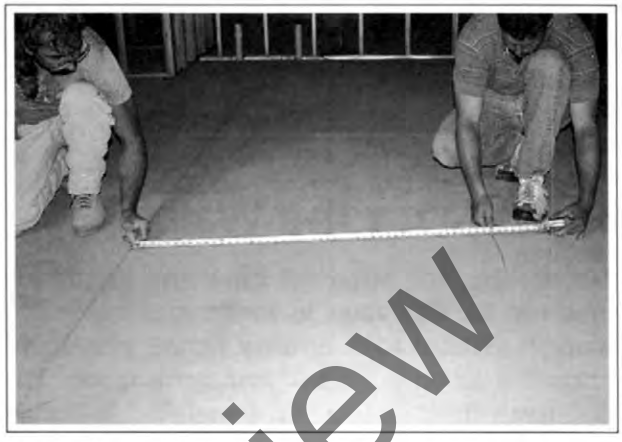

***Figure 1–6.*** Measuring from the 3-foot mark and striking an arc at 4 feet, using the same edge of the tape at both points.

The 3-4-5 method is a simple way to square a perpendicular line off an established wall or reference line using only your tape and pencil. It's accurate, it's easy and it's faster than setting up a transit or laser to do the same job. There are five steps in this method:

***Step 1*** Mark a crow's-foot anywhere along the reference line (see Figure 1–5). That's your starting point for the squaring process.

***Step 2*** From the first crow's-foot, measure straight down the reference line 3 feet and mark a second crow's-foot.

***Step 3*** From the 3-foot mark, measure 4 feet off the reference line, as close to 90 degrees as possible, and strike an arc approximately 1 foot long (shown in Figure 1–6). As you draw the arc, hold the tape measure to the crow's-foot on one specific edge of the tape. To ensure accuracy, you've got to hold the pencil on the same edge of the tape while striking the arc. Striking the arc is easiest as a two-man job. But if there's no help close by, drive a concrete pin into the pivot point and hook the end of your tape to the pin.

***Step 4*** Return the end of your tape measure to the first crow's-foot marked on the reference line, and from there strike a second, intersecting arc at 5 feet (see Figure 1–7).

***Step 5*** Next, pull a chalk line from the 3-foot crow's-foot on the reference line, through the point where the two arcs intersect (Figure 1–8). Pull the chalk line quite a ways past the intersecting arcs.

***Figure 1–7.*** With the end of the tape anchored at the starting point, strike the 5-foot arc intersecting with the 4-foot arc.

***Figure 1–8.*** Pulling the chalk line from the 3-foot mark through the intersecting arcs completes the 3-4-5 squaring method.

Just be sure you can see the chalk line pulling through the intersecting arcs. To square larger areas, double the 3-4-5 measurements to 6-8-10.

## Laying Out the Walls

Establishing the reference lines and laying out the work area are the first steps in metal stud framing. The layout work is critical to a quality frame job. That's why it's entrusted to only the top hands on a job. The reference line (sometimes called the *gospel line*) is the centerline of the job. All the other wall lines will be established from the gospel line. It *has* to be right.

Establish the gospel line by measuring the overall width of the concrete slab (or pad) at the two opposite ends of the building. Or you can establish the gospel line from the red iron columns to the structural steel. Then mark half of the overall width at each end (Figure 1–9). Next, snap a chalk line from mark to mark. For long slabs, use a laser to make multiple center reference marks so you can snap a consistently straight chalk line. Finally, spray clear enamel over the chalk line to protect it. You want it to last until the layout is complete.

With the gospel line in place, your next move is to establish a perpendicular reference line exactly 90 degrees to the gospel line. You can establish it with a transit or laser, or with the 3-4-5 or 6-8-10 method (as long as you do it carefully and accurately).

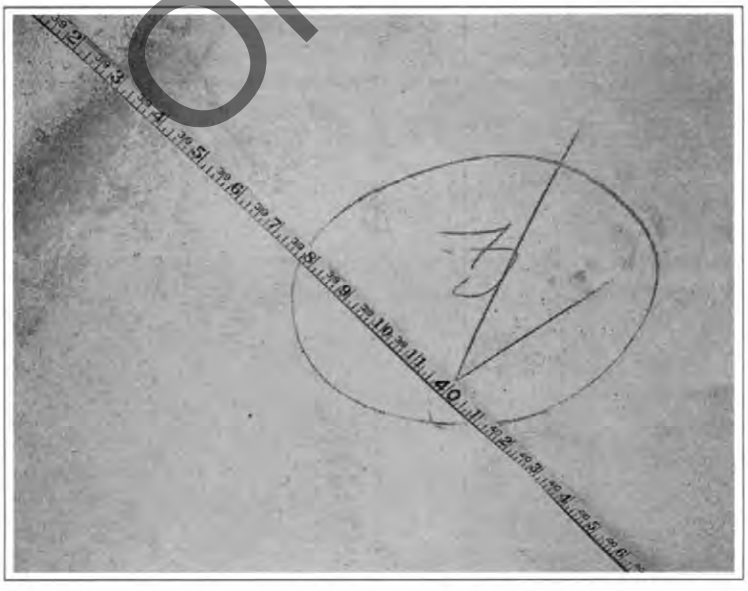

***Figure 1–9.*** Here you can see the center of an 80-foot slab marked near one end of the pad.

Now check the floor plan section of the blueprints to determine the layout of the wall line. Begin with the exterior walls and then move to the interior, starting on the long walls first. The hallways are a good starting point, for two reasons:

1. They're long continuous walls you can use to establish other parallel wall lines.
2. The hallways are among the few walls on a job that have very little tolerance for variance. The *Accessibility for the Disabled Act* requires you to meet stringent guidelines for width. Bathrooms are another area where wheelchair accessibility is very important, so you don't have much tolerance for these walls either.

As you lay out the wall lines, remember to allow for the thickness of the drywall. Forget this and your walls will be more than an inch short. When the building inspector takes out his tape measure, you're done for! All wall line dimensions in the prints are *finished walls* unless otherwise noted. You have to consider all the thickness of all the layers of drywall. You'll find this information in the *wall legend* section of the prints.

After you've marked the starting walls (exterior walls and hallways), work your way through the job from end to end, snapping all the long walls first. As you figure the wall dimensions, mark them as close to the ends of the wall as possible. Then snap a chalk line between the marks. It's common to add the width of the framing material and snap a line for both sides of the bottom plate (Figure 1–10). This eliminates a common mistake: plating the wrong side of a wall line. Snapping a chalk line to both sides of a wall also makes it much easier to mark the next wall, since you measure it from the wall you just completed. If you don't snap both

sides of the plate, always mark an "X" on the side of the line where the wall will sit (Figure 1–11).

## Laying Out the Doors and Windows

As you're laying out the walls, it's important to lay out doors and windows at the same time, completing each wall as you go. Square the wall lines off on both sides of the door opening and clearly mark the opening *DOOR*. Then write the door number inside the opening and mark the swing of the door (Figure 1–12). Lay out the opening for a door 4 inches wider than the door's width according to the prints. The dimensions in the door schedule section of the prints are the size of the door itself. You need to add 4 inches (2 inches on each side) for the jamb.

After you've chalked the wall lines, go back and lay out the windows. Write the window number between the layout marks, as well as the elevation of the bottom of the jamb. Figure 1–13 shows a properly laid-out window. The window studs are clearly marked right at the wall line. The information (42" off FF 40" x 40") tells the framer that the bottom of the window jamb is 42 inches off of the finish floor, and the window is 40 inches tall and 40 inches wide.

Every outfit has its own customs, so you won't find windows laid out like this on every job. It's also an accepted practice to lay out the window jambs *after* the plate is shot down. In this case, the layout for the window studs is marked along the edge of the plate with the layout for the studs. You can also use this method for laying out items like fire extinguishers and tissue dispensers that are recessed in the wall. Write their elevations inside the plate between the stud layout marks. You'll find items recessed in a wall noted in the prints on the wall line with a *detail symbol.*

It's important to maintain consistency in the window and door jamb elevations. It's common to find an unlevel or poorly-floated pad that causes the top elevation of the jambs to be uneven. In most cases, the jambs should have a common elevation throughout a given work area. If they don't, it'll be noticeable when the room's finished—and then it's too late. Make bench marks with a water level or transit, or use a laser to make sure they're consistent.

## Layout Around an Obstacle

What if there's an obstacle that prevents you from snapping a chalk line on the wall line? Here's a four-step method you can use to extend an accurate chalk line around any obstructions.

***Step 1*** From a reference or wall line, measure out and mark two crow's-foot marks as far apart as possible.

***Figure 1–10.*** In this example you see an intersecting $3^{5}/_{8}$-inch wall line laid out with both sides of the wall snapped.


***Figure 1–11.*** One side of a wall line snapped out with X's marking the side of the line the wall will sit on.


***Figure 1–12.*** A door laid out along the wall line with the door number and swing marked out in the door opening.

***Figure 1–13.*** The rough opening for a window laid out along the wall line, telling the carpenter that the window R.O. is 42 inches off the finish floor and 40 x 40 inches.

***Step 2*** Hold the end of the chalk line down to the first crow's-foot, then pull the chalk line past the second crow's-foot, as far as you can accurately line up the chalk line on the crow's-foot (Figure 1–14).

***Step 3*** While you hold the chalk line tightly to the first crow's-foot, your partner will wrap the opposite end of the chalk line around a flat carpenter's pencil to keep it raised slightly off of the floor (Figure 1–15). Then your partner can adjust the chalk line until it's positioned directly over the second crow's-foot (Figure 1–16). If your partner is so far away from the second crow's-foot that he can't accurately set the chalk line to the crow's-foot, you'll need a third person to help. The third person will also hold the chalk line down to the floor in the center after it's adjusted into place, and snap the chalk line on each side.

***Step 4*** Check the line just snapped for accuracy by looking to make sure that the chalk line came exactly through the crow's-foot. If the chalk line is off, even slightly, erase it and start over again with a different color of chalk. If the line is off by $1/4$ inch in 10 feet, it'll be off by $1/2$ inch in 20 feet. It's surprising what trouble a $1/2$ inch can make.

## Plumbing with the Plumb Bob

The plumb bob is a very simple, accurate and quick way to transfer a wall line from the floor to the deck. Make sure the plumb bob has a string line that's braided, not wound. That helps prevent the plumb bob from spinning excessively. Here are some common techniques for plumbing up.

The first step in the plumbing process is to adjust the elevation of the plumb bob, so the tip is between $1/8$ and $3/8$ inch above the floor or edge of the plate. A quick way to achieve the desired elevation is to lace the plumb bob string through the fingers of your hand holding the plumb bob. Run the string line over your little finger, then under the ring and middle fingers, and over the index finger to the thumb (Figure 1–17). The thumb will hold the string line tight to the deck or other surface you're plumbing to. When you release pressure on the thumb, it's easy to raise and lower the plumb bob, with control.

***Figure 1–14.*** In this example you see the chalk line being pulled well past the far crow's-foot, and adjusted to the crow's-foot.

***Figure 1–15.*** Wrapping the chalk line around your pencil not only keeps the chalk line off the floor as it's set to the crow's-foot, it will also keep the line straight over humps in the slab.

***Figure 1–16.*** Here the chalk line has been set and is ready to snap.

***Figure 1–17.*** The string line of a plumb bob properly run through the fingers and held to the deck with the thumb. Notice that both the wall line plumb point and a 90-degree plumb mark were marked.

The tip of the plumb bob must be steady to get an accurate reading. To steady the tip, your partner will place both hands close together on the floor, one hand on each side of the plumb bob. By raising the index finger of each hand to the tip, with light and equal pressure, he can steady the plumb bob (Figure 1–18).

In directing the movement of the plumb bob, use clear concise terms like "left an eighth" or "right a quarter." These directions are quicker and easier to understand when they're coupled with hand signals. Once plumb is achieved, sing out loud and clear. Don't leave your partner guessing about what's going on.

On the deck, make two crow's-foot marks at the exact point of the string line, one mark in the same direction as the wall line below, the second mark at 90 degrees to the wall line. You can see these marks in Figure 1–17. Also mark the 90-degree point at the bottom plate or wall line. The 90-degree plumb marks will be used later as a reference mark. From this reference mark, transfer the layout marks for the studs from the bottom plate to the top plate. You can also use the plumb marks to establish perpendicular wall lines by measuring from the reference mark to the perpendicular wall line. Then transfer the measurement to the deck above (Figure 1–19).

The pocket laser is a great advance in carpentry tools. These battery-powered lasers are accurate to about 50 feet, and allow one person to do the plumbing work. Bump the laser up to the plate and measure from the laser beam 1 inch to the plate line, as shown in Figure 1–20. The laser can also be set right to the wall line,

***Figure 1–18.*** Steadying the tip of the plumb bob with light, even pressure from each index finger.

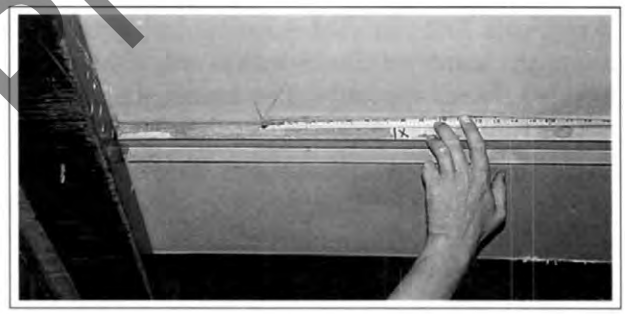

***Figure 1–19.*** Measuring from the 90-degree plumb mark to establish the stud layout at the top plate.


***Figure 1–20.*** A pocket laser set up against the bottom plate of a $3^5/_8$-inch wall. While the wind and vibration will affect the pocket laser to a certain extent, it's still much faster and easier to use than a plumb bob. Use caution, though; never look directly into the beam. It can damage your eyes.

matching the hash marks on the laser to the chalk line. These little lasers also shoot a level beam, and both the plumb and level beams form a square 90-degree angle.

## Cutting Plate and Studs by Hand

There are two ways to cut your metal plates and studs: with snips or by scoring them. We'll start by cutting with snips.

### Cutting with Snips

To begin with, let me make a couple of recommendations. First, *always* wear leather gloves while working with metal stud material of any kind. (The carpenters in our examples aren't wearing gloves to give you a clear view of the work being done.) Second, if you're going to start with just one pair of the snips used in the trade, I recommend the straight cuts. The snips are available in three different directional cuts. Red-handled snips cut left, green-handled snips cut right, and yellow-handled snips cut straight. You'll have to choose the snips that are most comfortable for you. Eventually, you'll probably want to have all three cuts.

Cut light gauge (25, 22 and 20 gauge) studs and plate in two smooth fluid moves. But this smooth fluid movement comes with experience. We'll break the cutting process into three steps:

***Step 1*** Measure out and mark the length of the cut, marking the cut with your snips instead of your pencil (Figure 1–21). This eliminates the time spent switching the pencil for the snips. But be careful not to cut your tape measure—especially if someone's watching!

***Step 2*** Square the cut from one leg, across to the other leg of the material. Whenever possible, eyeball the cut across from one leg to the other. Eyeballing cuts is an important skill that you need to master as quickly as possible. Sight through the cut in the first leg of the stud to the other leg, and cut it with your snips (Figure 1–22). Mastering this step takes practice. Use some scrap stud to work on until you can make the two cuts and fold the material back over with the edges lining up evenly. The stud in Figure 1–23 has a perfect square cut. While this is the ideal, there's usually some room for error. If the situation calls for a perfectly-square cut, use a speed or combination square to mark the cut (Figure 1–24).

***Step 3*** Fold the material back at the cuts you made in the two legs, then unfold the material. Using your free hand, grab one side of the material 2 to 3 inches from the

***Figure 1–21.*** Marking the length of the cut with snips.

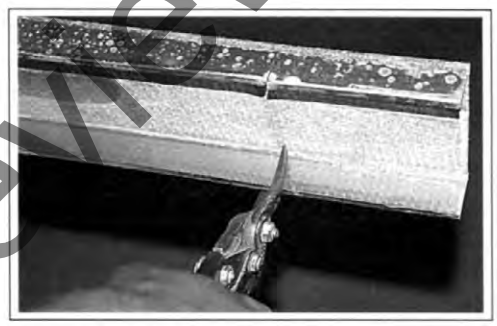

***Figure 1–22.*** Eyeballing across the stud from the first cut to the second.

***Figure 1–23.*** A stud cut squarely, using snips. You can tell if the cut is square by folding the stud back over and making sure the edges of the stud line up.

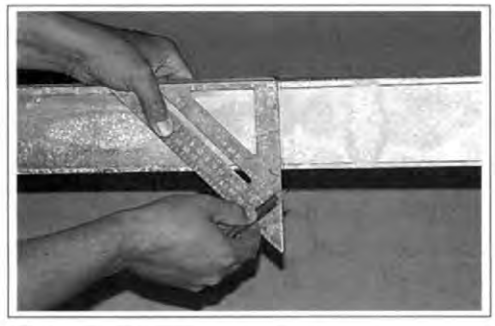

***Figure 1–24.*** The cut point squared across the hard side of a stud with a speed square, with one leg of the stud cut to the squared line.

cut. Next, cut across the fold line in the material. As you're making the cut, grip the material tightly so it rolls out of the way of the cut (Figure 1–25). Rolling the side of the stud out of the way will allow the snips to pass through your material and complete the cut.

***Figure 1–25.*** The scrap side of the stud rolls up out of the way if you grip it tightly, allowing the snips to easily pass through the cut.

## Cutting by Scoring

Use this method to cut heavy gauge material using only hand tools. It's particularly useful when there's no chop saw available, or it's in use. The procedure is similar to cutting with snips, so I won't go into great detail.

***Step 1*** After marking the length of the cut on the hard side of the stud in pencil, set your speed or combination square to the mark. Using your utility knife, score the hard side of the stud, two to four times depending on the sharpness of the knife blade. Make certain that your hand is above the direction of the cut, and that your body is positioned to the side of the cut (Figure 1–26).

***Step 2*** Using your snips, cut the legs of the stud at the score. Heavy gauge bullnose cutters are the ideal snips for cutting structural material, or keep an old pair of snips around for this purpose. That prevents your good snips from being trashed.

***Step 3*** After completing the cut, fold the stud back and forth a few times until it breaks along the score.

***Figure 1–26.*** Using a speed square to "score" a 6-inch structural stud with a utility knife. The stud sometimes needs to be scored several times. The better it's scored, the quicker it will snap off when you fold it back and forth.

# Splicing Plate

Splicing plate (or *track*, as it's also called) is the common way of joining the sticks of plate to form one long continuous piece. You'll have to splice the plate in many situations, including the top and bottom plates of walls, and in suspension systems like soffits and suspension walls, to name just a few. Unless you're framing in an expansion, everything has to tie together. Tying the metal stud framing together provides much of its strength. I'll break the process into steps to describe it, but when you do it in the field, it'll become a fluid movement.

1. Using your snips, cut a 1-inch to $1^1/_2$-inch-deep slice in the hard side (back) of the plate, as shown in Figure 1–27. Keep in mind that the cut for the splice is always made in the next piece of plate to be set in place.
2. Next, place the splice against the end of the plate already shot in place. Figure 1–28 shows two sticks of

***Figure 1–27.*** Cutting the slice in one end of a stick of $3^5/_8$-inch plate, using snips.

bottom plate being spliced correctly. Leave the end of the first stick loose so you can slide the two pieces together. The splice also acts as a third hand to hold up one end of the plate while you slip it onto the studs in suspension work. Figure 1–29 shows this happening while plating the top of a freestanding wall. Any time you're plating the bottom of the studs in a soffit or suspension work, clamp the splice together. In Figure 1–30, the plate is clamped right in the corners to prevent any offsets in the plate — either in and out or up and down. Tack the splice together with only one framing screw, then add more screws to the other side and bottom of the plate as you set it to the string line. This prevents kinks from forming at the joints of the plate.

3. In walls running from floor to deck, hold the spliced joints cut into the top and bottom plate to the wall line and shoot them in place (Figure 1–31). As you can see, the ends of the plate are spliced and then shot down with one pin. This technique creates one continuous length of plate while saving one pin and load per joint.

## Splicing or Scabbing Structural Plate

To splice structural plate, follow the same steps, except you'll make the splice with a chop saw or your old pair of snips. (Making cuts on structural material with your good pair of snips will make them an old pair real quick.) The problem you'll have with splicing the heavy gauge material is that the material's thickness may cause a bump in the finish material. In some situations you can get by with this, but in others you can't. The type of finish material will dictate your splice. When a splice won't work for you, scab the plate together. A scab is simply a scrap piece of stud cut from the same width material as you're using to frame the wall. Scab the plate together following these steps:

1. First, cut the scab about 6 inches long, so each piece of plate has roughly 3 inches of the scab to screw into. Slide the scab into the first stick of plate already in place, and clamp in the corners. Then fasten the scab

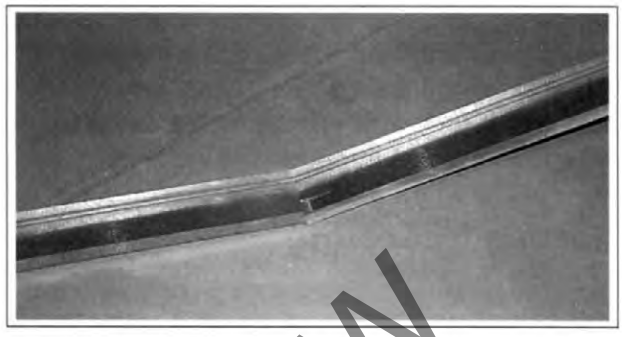

***Figure 1–28.*** Two sticks of bottom plate being spliced together.

***Figure 1–29.*** The splice will hold up one end of the top plate in this freestanding wall.

***Figure 1–30.*** A joint in the plate is clamped directly in the corners of the plate.

***Figure 1–31.*** The ends of two sticks of bottom plate spliced together and shot down with one pin.

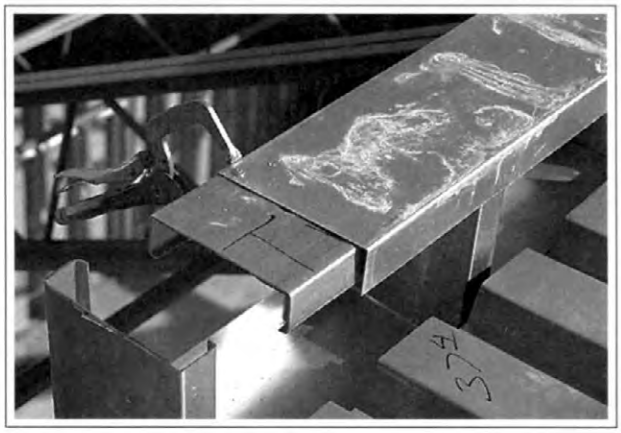

*Figure 1–32.* Here a scab is clamped and screwed off into the first stick of 6-inch structural plate, forming the joint. Wider 6-inch deflection plate was used in this example to highlight the scab itself.

in place with one self-drilling framing screw (commonly referred to as an S-12 or pan head), as shown in Figure 1–32.

2. Now, slide the next piece of plate onto the scab as it's slipped onto the studs. Then clamp and fasten it in place with one S-12. The two screws will hold everything together until you straighten the wall with a string line. Then run three more screws in each side of the scab.

## Shooting Down the Bottom Plate

As you shoot down the bottom plate (fasten it in place with a powder-actuated nail set), it must follow the wall line precisely. Plate that doesn't follow the wall line will create dips and bumps in a wall that may make the wall unacceptable. In situations where only one side of the wall line has been snapped, shoot the plate down on the side of the wall line marked with an "X," as shown in Figure 1–33.

You'll splice light gauge plate at the joints as you shoot it down. With heavy gauge plate, you can simply butt the ends together at the joint (Figure 1–34). Space the pins approximately 24 inches apart in either case, as shown in Figure 1–35.


*Figure 1–33.* Bottom plate shot down following the wall line with the plate sitting on the side of the wall line marked with an X.

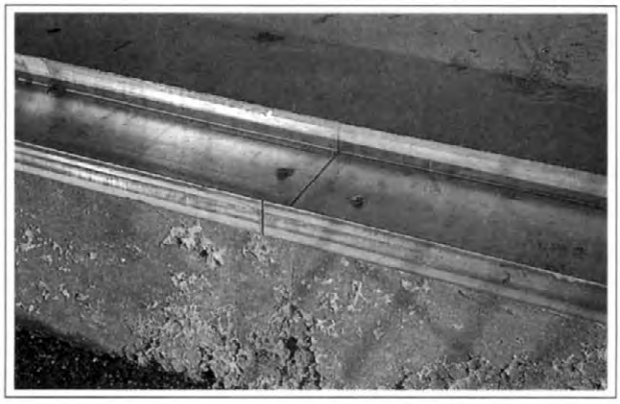

*Figure 1–34.* Bottom plate on a 6-inch structural stud wall butted together and shot down.

The bottom plate runs continuously under windows and other wall penetrations. As you shoot it down, transfer any layout information for these items from the wall line to the plate with a black felt tip marker. At door jambs and wrapped openings, stop the bottom plate 1/8 inch short of the opening (Figure 1–36). The exception to this rule is when you're installing a computer floor. In that case, the bottom plate runs through the door jamb's rough opening. We'll look at this situation in detail in Chapter 7.

Sometimes the bottom plate will be interrupted by obstacles in a wall line, such as plumbing lines and large conduit. In the plumbing walls (chase walls) of bathrooms, for example, you may have to piece in the bottom plate (Figure 1–37).

As you shoot down the bottom plate, establish the sliders (or slap studs) at intersecting walls and inside corners. Frame the slider into the shorter walls, so that they tie into the longer wall of the corner. That's important because it allows a 3/4-inch gap between the two pieces of plate that form a corner in the metal stud walls. The gap allows the drywall to slide inside the corner. Then, as the walls are rocked, the slider is tied into the drywall to form a solid corner. There are two common types of corners:

1. The *inside/outside corner* is shown properly plated in Figure 1–38. This corner is a widely-accepted method of plating an inside/outside corner.
2. The *double inside corner,* formed by a partition wall tying into a long wall (such as a hallway), is shown properly plated in Figure 1–39.

Shooting down the bottom plate is a two-man job. As one carpenter makes any needed cuts, including splicing the plate and putting it in place along the wall line, his partner follows behind setting the plate to the wall line and shooting it in place.

While you're shooting the plate in place, there'll be some changes or mistakes that'll make it necessary to pull the plate back up. To get the pins loose quickly and easily, you can shoot them loose with the shotgun. Using the shotgun with no pin in it, set the barrel right on top of the pin you want to pop loose, and fire. The piston in the shotgun will drive the pin on

***Figure 1–35.*** You can see the first stick of bottom plate shot down for a 3 5/8-inch wall with the pins staggered from side to side every 24 inches. Notice the end is left loose so the next stick can be spliced to it.

***Figure 1–36.*** The bottom plate of a 3 5/8-inch wall stopped for both a corner and a door.

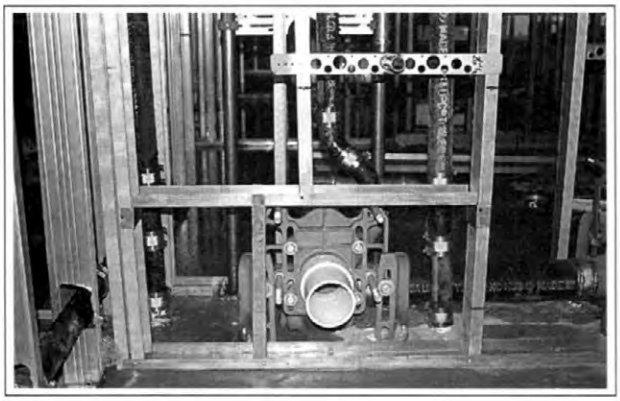

***Figure 1–37.*** Here's a good example of a congested plumbing wall that required a header at the bottom of the wall to get around an obstacle.

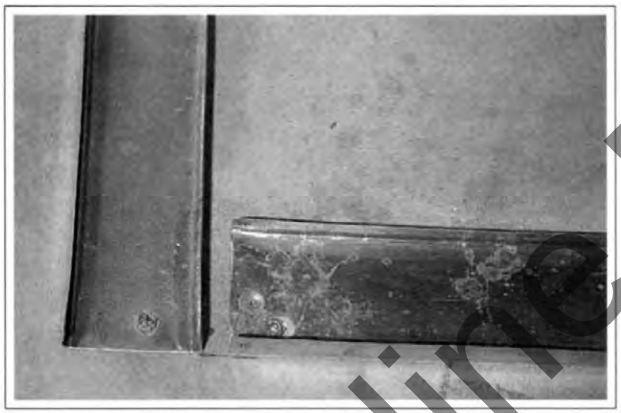

***Figure 1–38.*** Here we see the bottom plate of a $3^{5}/_{8}$-inch wall forming an inside/outside corner, leaving a $^{3}/_{4}$-inch gap for the drywall to slide inside the wall.

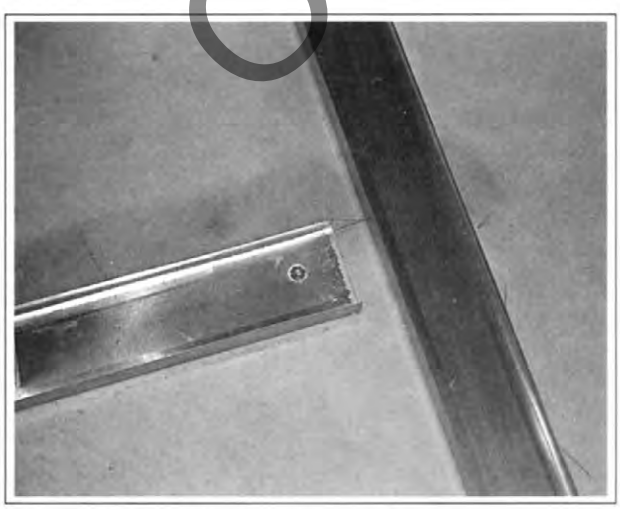

***Figure 1–39.*** A $^{3}/_{4}$-inch gap left open between the bottom plate of two intersecting walls, forming a double inside corner.

through the plate into the concrete. Never use this technique when the pins are shot into steel. Instead, grab the pin shot into the steel with your end nippers and work the pin back and forth until it comes loose.

## Shooting Up the Top Plate

When you start shooting up the top plate, you might expect that you could simply learn a few standard procedures and get to work. That's true—up to a point. The standard procedures will carry you through the "gravy" work. But you need more than that. We'll cover the basic principles of plating the deck, *and* the deck conditions you're likely to find which will complicate the process. You need to know what problems to look for, and how to overcome them.

### The Basics

The basic methods for plating the deck are a lot like those for shooting down the bottom plate. Shoot the plate to the deck with a gas- or power-actuated nail set, following the wall line exactly and spacing the pins approximately 24 inches apart. The splice plays an additional role with the top plate. You can use the splice to hold up one end of a stick of plate as you fasten the opposite end in place.

The top plate follows the bottom plate's slider (slap stud) placement, with the same $^{3}/_{4}$-inch gap (Figure 1–40) to allow the drywall to slide inside the intersecting wall at inside corners. The outside corners are also determined by the bottom plate, using the 90-degree plumb mark to establish the corner points and the stud layout for the wall. Run the top plate continuous unless there are obstacles that prevent it. Stop the top plate at all wall expansions, leaving a $^{3}/_{4}$-inch void in the plate. Plumb the wall expansion from floor to deck.

### Concrete Decking

Concrete decks are typical in multistory buildings. They're formed of raw concrete, corrugated metal decking with concrete poured on top of it, or a prestressed concrete truss system (Figure 1–41). You can fasten the plate to any of these

decks with a gas- or powder-actuated nail set. But don't shoot into corrugated metal decking until you've checked that the concrete has been poured. If you shoot a pin to unpoured metal decking, it won't hold the plate in place. It also poses a serious safety hazard. In this situation, screw the plate to the deck using S-12s. If the deck is concrete trusses, you may have to span them with studs that have tabs cut on the ends. Shoot them to the bottom of the ribs, then screw the top plate to the studs.

## Metal Decking

In a single-story commercial building like department stores and malls, corrugated metal decking is commonly used as the roofing material. Screw the top plate to the deck with S-12s. But there are two common problems.

First, the long decking screws used to fasten down the roofing materials often come through the decking in the wall line. They're in the way of the top plate. To solve the problem, snap off the screw close to the deck (Figure 1–42). Simply grab the screw close to the deck with your lineman's pliers and bend it until it breaks off.

Second, the top plate may line up inside the concave groove of the corrugated metal decking. That makes it difficult to attach the plate to the deck, as well as to fasten the studs into the plate later. To solve the problem, cut short pieces of plate with tabs and screw them to the deck spanning the concave groove. Space the bridging 24 inches on center and screw it to the decking with S-12s, or shoot it up if the decking has concrete poured on top. Once in place, plumb and snap the wall line to the bridging. Then fasten the top plate to the bridging with S-12s or tek screws (Figure 1–43).

## Plating to the Bar Joist

In some framing situations, it's acceptable to attach the top plate to the bottom of the bar joist (a structural steel roofing and flooring joist). See Figure 1–44. There are two advantages to doing this. First, it eliminates the need to plumb up the wall line between each set of bar joists. Second, because the studs will only run up to the bottom of the bar joist.

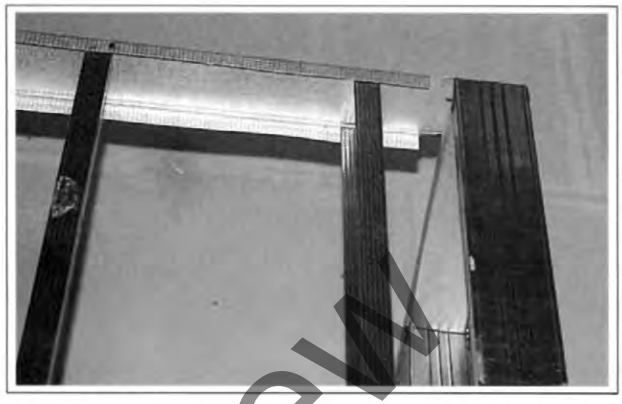

***Figure 1–40.*** Here you can see the top plate fastened together using the tab method. The plate is cut, leaving a $^3/_4$-inch gap to allow the drywall to pass through the wall.

***Figure 1–41.*** This prestressed concrete truss system supports the floor above.

***Figure 1–42.*** Grab a long decking screw near its base with lineman's pliers and bend it over, snapping it off.

The type of fastener you'll use to fasten the plate to the bar joist depends on the bar joist's hardness. In some cases you can use S-12s, as long as they take to the bar joist without stripping out. If the bar joist is too hard to use S-12s, use a powder-actuated nail set to fasten the plate in place. When you use a shotgun to fasten the plate to a bar joist or any part of the red iron superstructure, always use steel pins. Shoot the pins into the bar joist close to the angle (inside edge) in the steel (Figure 1–45). Shooting the pins near the outside edge will cause the bar joist to bend under the force of the shotgun.

While you're plating the bar joist, use clamps to hold the plate in place on the wall line as you're shooting it to the bar joist. That prevents the plate from slipping — or even falling — as it's shot to the bar joist. You can avoid having to drop a plumb bob to establish the outside corner by using the 90-degree plumb mark we discussed earlier. Outside corners will often fall between two bar joists. To make a strong corner, run the top plate on past the actual corner point to the next bar joist, then fasten it as shown in Figure 1–46. Later in the chapter I'll cover how to form the corners.

When you're framing a fire, smoke or sound wall to the bottom of the bar joist, it must continue to the deck. As you stuff the studs (install them into the plate), cut scrap stud or plate to fit in between the bar joist, then fasten it to the deck. To continue the wall line up to the deck, set a straightedge, either a drywall rip or a level, to a wall stud and slide it up to the deck. Then mark the wall line, as shown in Figure 1–47.

## Forming a Corner with Plate

There are two basic skills every metal stud framer needs:

1. The ability to determine the type of corner you'll need in a given situation
2. The ability to quickly and correctly cut the plate for the corner you've chosen

***Figure 1–43.*** The concave grooves in a corrugated metal deck spanned with tabbed plate. The top plate of a $3^5/_8$-inch wall is screwed in place to the spreaders.

***Figure 1–44.*** The top plate of a $3^5/_8$-inch wall screwed to the bottom of the bar joist using S-12s (self-drilling framing screws).

***Figure 1–45.*** Here we see a pin shot right at the bend point of the angle iron at the bottom of the bar joist.

*Figure 1–46.* The top plate of a $3^5/_8$-inch wall run past the actual corner point to the next bar joist and shot in place, with the top plate of the intersecting wall tabbed and set in place.

*Figure 1–47.* Using a 4-foot magnetic level to continue the wall line on up to the deck. If you look closely you can see the bottom of a stud up on the floor above.

Here we'll take a look at four common methods of forming a corner with both plate and utility angle. Each style of corner is useful in certain framing situations.

## Top Plate Outside Corners

To form this type of corner, begin with the first of the two intersecting plates fastened in place along the wall line, with the end roughly $^1/_4$ inch short of the actual corner point. As you form the corner, notch the first stick of plate for the intersecting wall that'll form the corner. Measure back from the end of the plate a distance equal to the width of the material you're using, plus $^1/_2$ inch. Cut the inside leg of the plate with your snips and fold the cut material up out of the way (Figure 1–48).

Now set the end of the plate up to the corner, overlapping the end of the plate already fastened in place. That holds up one end of the plate while you clamp the opposite end in place to the wall line. Eyeball the end of the plate to within $^1/_4$ inch of the actual corner point (Figure 1–49). Make any needed adjustments, then fasten the plate in place. In freestanding or suspended conditions, screw the corner together using three framing screws. You'll find this technique useful when framing to bar joist and freestanding walls, and also when framing to the deck. You'll also use it for capping jigs and parapet walls.

## Intersecting Walls

There are two common types of corners for intersecting walls, depending on whether the two walls have equal plate elevations.

### *Walls with Equal Plate Elevation*

You'll use this type of corner for framing an intersecting wall into a long wall that runs past, such as a partition wall to a hallway wall. To form this corner, begin by cutting about a 2-inch tab on one end of a stick of plate. Now set the tab on top of the plate of the wall that's already in place. The tab will support one end of the plate as you position it on the wall line at the other end and stand up a stud to support the top plate. Don't forget to leave a $^3/_4$-inch gap for the drywall to slide through. When the plate's in position, clamp it in place, then fasten it with the appropriate fasteners, as shown in Figure 1–50. This style of corner will work in most situations where the top plates of the two intersecting walls are at the same elevation.

### *Walls with Offset Plate Elevations*

Use this corner when you're tying together two walls with different plate elevations. After the long wall is framed, figure out whether the new wall line will hit a stud or fall between two studs. If it hits a stud, first run a diagonal brace

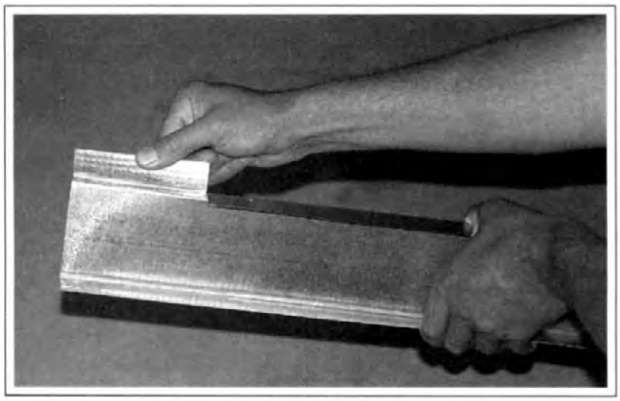

***Figure 1–48.*** The inside leg of the plate is cut and folded out to allow it to overlap.

***Figure 1–49.*** You can see the plate set in place overlapping the first stick of plate to form the corner.

***Figure 1–50.*** The top plate of an intersecting wall tabbed and screwed in place with four tek screws. The shoe of a kicker is screwed in place right next to the corner joint.

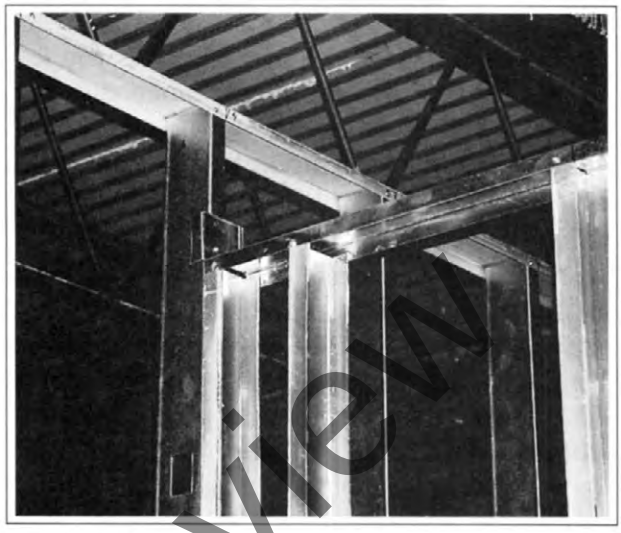

***Figure 1–51.*** A shoe cut on one end of the top plate of a shorter intersecting wall is screwed off to a layout stud of a taller wall.

***Figure 1–52.*** Here the top plate of the shorter intersecting wall is tabbed and screwed off to a spreader.

from the top plate to the stud you're going to fasten the top plate to. With the stud plumbed and braced, simply cut a shoe on one end of the plate, and clamp it to the stud at the desired height (Figure 1–51). Slip the opposite end of the plate onto a wall stud that's been screwed off on layout in the bottom plate. This will carry the top plate as you work the wall.

When the wall line falls between two of the layout studs, cut a spreader from scrap stud material with tabs on each end. Use it to span the gap between the studs, using the tabs to fasten the spreader to the wall studs (Figure 1–52). To figure the spreader length, measure between the studs at the bottom plate, minus an additional $^3/_8$ inch for play. Put the spreader $^3/_8$ inch

higher than the length of the studs used in the wall, and screw it to the wall studs. As you fasten the spreader to the studs, make sure you maintain the 16- or 24-inch stud layout. A temporary diagonal brace from the top plate of the original wall, down to just over the spreader, will hold the new wall plumb (Figure 1–53).

Screw the brace to the top plate and clamp it to the studs over the spreader until you get everything plumb. Here's how to do it. Measure from one of the studs supporting the spreader to the bottom plate of the wall you're framing. From the same stud, measure over and mark the same number on the spreader. Put an "X" on the side of the mark that you'll set the plate to. Now clamp the top plate of your wall to the bottom of the spreader with the edge of the plate on your mark. Just tack the plate in place with one framing screw for now; you'll add another after you've plumbed the other end of the plate. Now the diagonal brace will hold everything plumb when you plumb up the top plate, because the spreader holds the stud and plate. When the tall wall is rocked, tie the slider of the short wall into the drywall and remove the diagonal brace. This technique works well for framing a freestanding wall into a wall that's framed up to the deck.

***Figure 1–53.*** A diagonal brace run from the top plate of a tall wall to just above the spreader and top plate of a shorter intersecting wall. The spreader will be taken off as the tall wall is rocked and the slider is tied in.

### *Tying Into Preexisting Conditions*

To form this type of corner, fasten the first stud of the wall to a preexisting condition, whether it's drywall, concrete, steel or a block wall. Naturally, you'll want to plumb the stud with your level while you're fastening it. In this case, simply screw the top plate to the end stud, securing the corner at the top plate (Figure 1–54). An alternative method is to use a shoe at one end of the plate. Flatten out the shoe and fasten it to the preexisting condition $^1/_4$ to $^3/_8$ inch higher than the studs used to frame the wall (Figure 1–55).

***Figure 1–54.*** The first stud of this wall was tied into an already-framed and -rocked wall. Then the top plate of this wall was screwed off to the stud to start the wall. The first stud of a freestanding wall like this can also be shot to structural steel or block walls.

## Bottom Plate Outside Corner

Form this corner like the top plate outside corner. Cut one leg of the plate, but fold in or cut off the excess plate to allow the overlapping (Figure 1–56). This type of corner is often used in suspension walls, jigs and soffits.

***Figure 1–55.*** Here's the top plate of a freestanding wall fastened in place using a shoe turned up and flattened out.

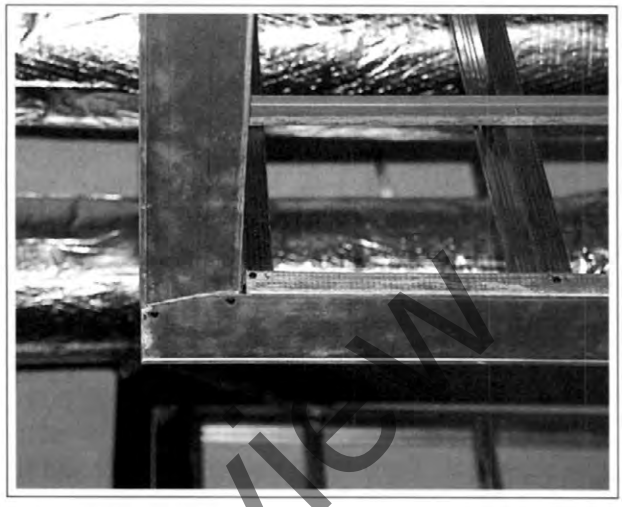

***Figure 1–56.*** Here the bottom outside corner plate of a soffit is cut and screwed together.

## Laying Out Plate

As you lay out the plate to receive the wall studs, it's important to consider the drywall. Place the studs so the drywallers can hang the rock in a series of full sheets without cutting the drywall or adding studs (Figure 1–57). Since most commercial drywall is hung vertically (stood up) with only 4 feet between joints, it's easy to see how much extra work a poor layout job will cause.

To begin the layout, find the point the first sheet of drywall will butt into, and pull your layout from there. The blueprints will call out the spacing of the studs—either 16 or 24 inches on center. If you're pulling the layout off a wall that's not rocked yet, figure the thickness of all the layers of drywall that will cover that wall. Add that thickness to the layout for the first stud. Then clamp the end of your tape measure to this layout mark with a pony clamp and pull the layout from this point, as shown in Figure 1–58. Because the stud layout is commonly marked at either the centers or the soft sides (open sides) of the studs, it's important to indicate which side of the layout mark the studs will sit on. Figure 1–59 shows how to mark the studs for both centers and the soft side. The "X" beside the layout mark tells you the stud sits on that side of the layout mark. Mark the centers with the centerline symbol.

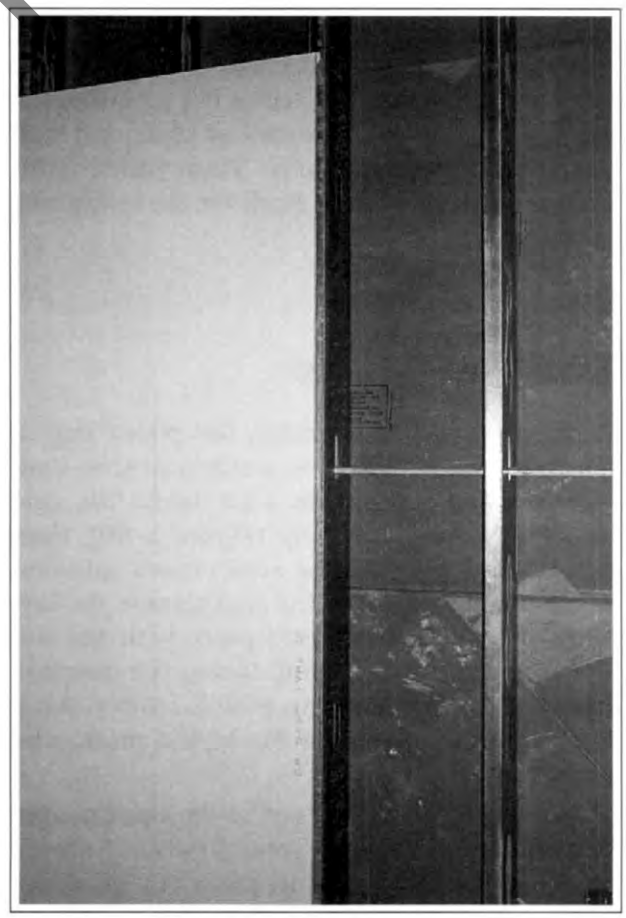

***Figure 1–57.*** An 8-foot sheet of drywall "stood up," breaking perfectly on a structural stud.

Another thing to watch for while pulling layout is to ensure that the drywall doesn't "break" at the edge of door and window jambs. When laying out walls with multiple doors and windows, I recommend pulling an exploratory layout to see where it will hit on the door and window jambs. If the layout hits at unacceptable points around the jambs, burn the necessary number of inches at the beginning of the layout to correct the condition, then mark the first stud layout.

Once you've established the beginning point of the layout, pull layout for the length of your tape measure. Then use a pony clamp to clamp the end of your tape measure to the last layout mark, and lay out the remainder of the wall.

Transfer the layout up for the top plate using the 90-degree reference marks you made while plumbing up the wall line. Your partner will measure from the 90-degree reference mark to the closest layout mark on the bottom plate. Then measure this distance from the 90-degree reference mark at the top plate to establish the first stud layout mark. Because your work area for top plate work is limited to the length of the scaffold, lay out the first stick of plate and stuff the studs simultaneously. Then pull layout from the soft side of the studs for the remainder of the wall.

***Figure 1–58.*** This picture shows the end of a tape measure set to a layout mark and clamped to the bottom plate while pulling stud layout.

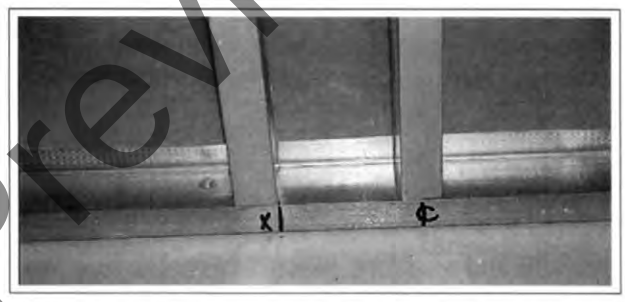

***Figure 1–59.*** The bottom plate of a $3^{5}/_{8}$-inch wall is laid out for both centers and soft sides.

***Figure 1–60.*** As this exterior wall is built, we see a stud being tilted diagonally and stuffed in the top and bottom plate. Then the stud will be stood upright, and set on layout.

## Stuffing Studs

Stuffing the stud is a simple, fast-paced step of the framing process. The stuffing process consists of three quick steps. First, insert the stud into the plate diagonally (Figure 1–60), then stand it upright with the stud turned sideways in the plate. Next, slide the stud close to the layout mark, and turn it into place with the soft side (open side) of the stud facing the direction from which the layout was pulled. Finally, tap it into position, exactly on the layout mark, and screw it off.

As you pull the studs out of the bundles and skids (large pallets with several bundles) they'll often be stuck together in pairs. To get them apart quickly and easily, slam the pair of studs on the floor a couple of times. Slamming the studs will jar them apart.

When stuffing studs in a soffit or anyplace the bottom plate will be set to a specific elevation later, cut the studs 3/8 inch short, and shove them tight up into the top plate. Soffits and suspension walls are often begun by running the studs wild. They're stuffed in the top plate, then cut to length and plated later. In these situations, it's essential to clamp each stud in place as it's set on layout until they're screwed off.

You've also got to consider cold-rolled channel (CRC) while stuffing studs. CRC is a 16-gauge channel that runs through the stud holes to provide added rigidity or weight support. The stud holes must line up in walls which will receive CRC through the studs, as shown in Figure 1–61. Not all walls require CRC, but always check it out before you start the layout. CRC helps keep the wall straight and resist wind shear. Walls that commonly require CRC are structural stud walls or suspended walls, as well as soffits and wall expansions.

As you stuff walls with CRC, you'll have to lace the CRC as you go. The ends of the CRC need to overlap by 16 inches, as in Figure 1–62. As you stuff the last four to six studs, slide the last stick of CRC loosely into the studs already in place. Once the last studs are stuffed, pull the last stick of CRC through these studs and turn it flat in the stud holes (Figure 1–63). Exterior walls commonly require rows of CRC spaced 4 feet apart, starting at 4 feet above the floor.

In walls where the CRC will carry the weight of the wall via suspension wires, run the CRC through the studs on its edge (Figure 1–64). Under these conditions, the smaller of the two tier stud holes punched in light gauge studs must be up. These holes are designed for the CRC to slide through, to prevent it from sliding around. In suspension work, any movement of the CRC or the suspension wires will affect the elevation of the bottom plate.

***Figure 1–61.*** Here's a typical 3 5/8-inch wall framed up, with all the stud holes lined up.

***Figure 1–62.*** You can see the cold-rolled channel run just over a window header (box beam). The CRC joint is overlapped by well over 16 inches, and turned flat in the stud holes.

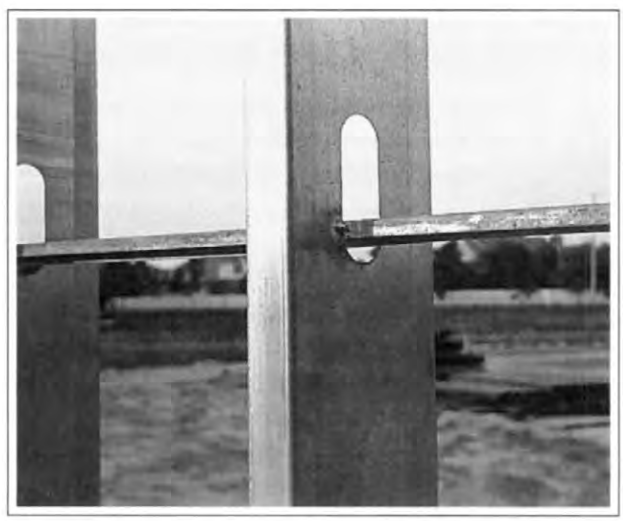

***Figure 1–63.*** Here the CRC is turned flat in the holes of structural studs and welded to the studs — a common practice.

## Slap Studs and Sliders

Slap studs (or *sliders,* as they're also called) are used in metal stud framing to form an inside corner where two walls intersect. They allow you to build a solid corner using fewer studs by tying the slap stud of one wall to the drywall of

another. I'll cover the "tying in" process in Chapter 13, *Drywall Methods.*

Regardless of the direction of the layout, the hard side of the slider always faces the wall it will later tie into. In Figure 1–65, the first stud of this partition wall is a slider that will tie into a corridor wall. Notice that the slider saves two studs, compared to the same corner framed with wood studs.

I recommend positioning the hard side of the slider $^3/_4$ inch off of the intersecting wall, and fasten it in place with a single framing screw at the top plate. This prevents the slider from falling out of the wall and becoming damaged beyond use.

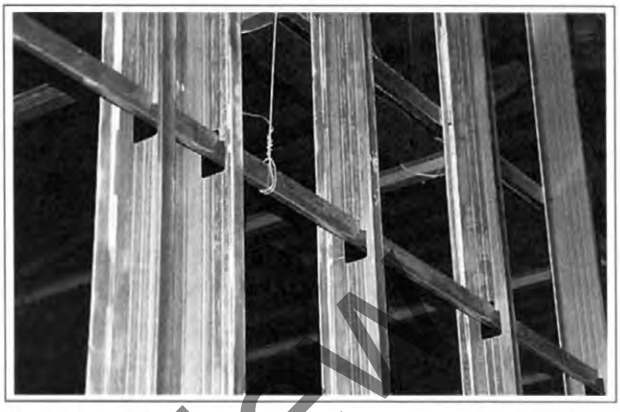

***Figure 1–64.*** Notice the $3^5/_8$-inch studs of a large soffit supported by CRC and suspension wires. The small holes on top lock the CRC in place, helping to maintain the elevation and rigidity of the wall.

## Notching Plate and Studs for Obstacles

In some framing situations, you'll have to notch the plate or studs for obstacles such as plumbing lines and the red iron of the superstructure. Cut the notches with your snips on light gauge material. Notch heavy gauge material with a chop saw, a Quickie Saw (a chain saw with a chop saw blade), or torch. Any time you've got to notch the framing material for more than a couple of obstacles, notify your foreman. Ideally (which is rare), the studs should run from plate to plate uninterrupted. If a lot of notching is needed, there's most likely a problem that your foreman may need to write an extra work order for.

Use this process to notch either stud or plate:

- To begin the notch in light gauge material, mark the outside points of the cut with your snips, as shown in Figure 1–66.
- Next, cut relief cuts approximately 1 inch apart between the marks for the notch (Figure 1–67).
- At one end of the notch, cut into the hard side of the stud to the required depth, forcing the scrap of the cut up and out of the way, as shown in Figure 1–68.
- Turn the corner of the notch by simply forcing the snips to turn while cutting. Continue the cut, cutting lengthwise down the hard side of the stud. The relief cuts made earlier will allow the scrap to simply fold out of the way (Figure 1–69).

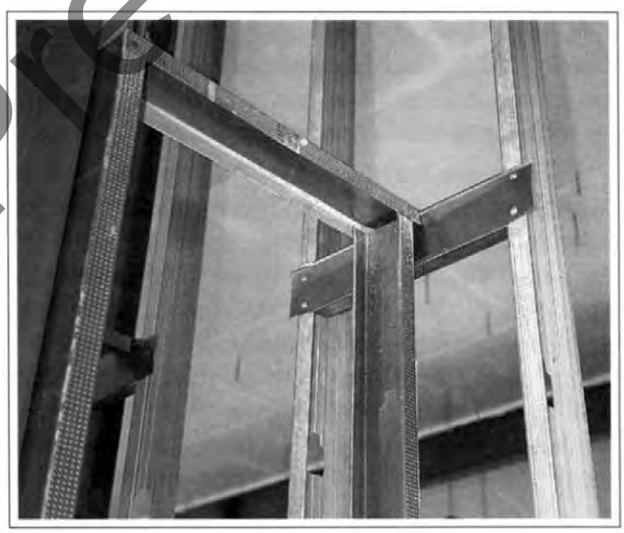

***Figure 1–65.*** Here a short wall is tied to a tall wall using a spreader; the first stud of the short wall is the slider. The slider is turned hard side to the tall wall and left unscrewed.

***Figure 1–66.*** Marking the notch with your snips, as shown here, is much faster than measuring and marking the cut with your tape and marker.

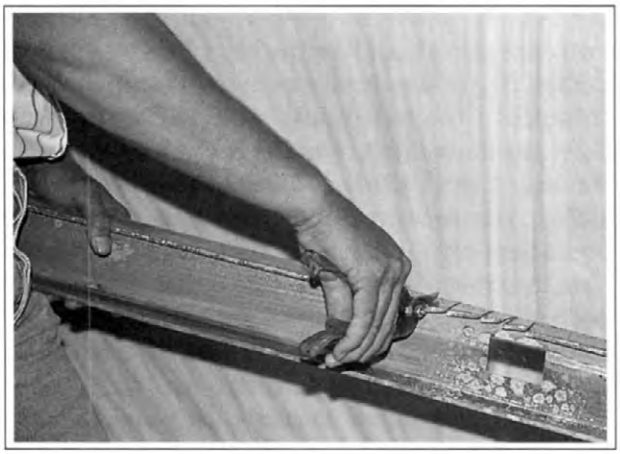

***Figure 1–67.*** Make the relief cuts in the leg of the stud between the two notch cuts.

- As you reach the end of the notch, make the second turn and cut back to the outside of the stud to complete the notch. Figure 1–70 shows a completed notch.

To cut structural studs, follow about the same procedure. Mark the notch with a pencil or marker. Then cut the notch using a chop saw or quickie saw. At the two outside points of the notch, cut the stud to the desired depth (Figure 1–71). With these cuts made, bend the scrap over and out of the way, as shown in Figure 1–72. In Figure 1–73, a quickie saw is used to cut the notch lengthwise down the stud, to completely remove the scrap.

***Figure 1–68.*** Cutting into the hard side of the stud, beginning at the bottom notch mark.

***Figure 1–70.*** The second turn made cutting back out to the edge of the stud to complete the notch.

***Figure 1–69.*** The relief cuts allow the scrap stud to roll up out of the way as the notch is cut out of the stud.

***Figure 1–71.*** Using a Quickie Saw to make the first two cuts of the notch in a structural stud.

## Deflection Plate

In this unit we'll discuss two styles of deflection plate, their uses, and their framing methods. The deflection plate is designed to allow the roof or deck of a building to move slightly up or down without damaging the wall.

***Figure 1–72.*** Once the first two cuts of the notch in this bottom plate were made, the notch was beaten over with a hammer.

***Figure 1–73.*** Cutting down the hard side of a structural stud using a Quickie Saw.

*Deep leg plate,* shown in Figure 1–74, is installed just about like the top plate we covered earlier. There are, however, a few significant differences in the techniques used in framing with deep leg plate. First, you'll cut the studs used in the wall 1 to $1^1/2$ inches short of the deck (Figure 1–75). The second important issue is the way you screw off the studs to the plate. It's acceptable to screw off only one side of the studs to the deflection plate. Whether you're screwing off one or both sides of the studs, the framing screws will be removed as the wall is "topped out." That's essential to allow the plate to lower without damaging the wall. The drywall is also

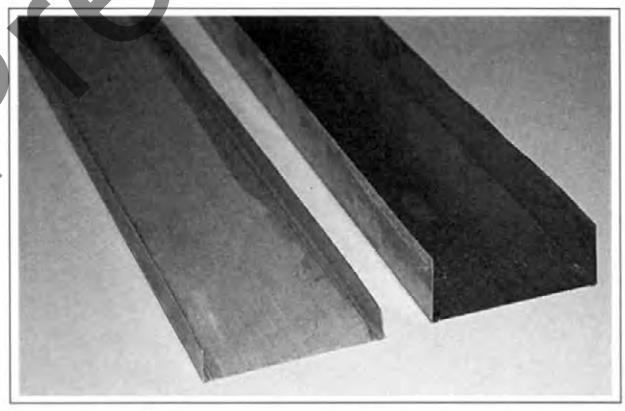

***Figure 1–74.*** Compare the 6-inch deep leg plate (right) with the standard 6-inch plate (left).

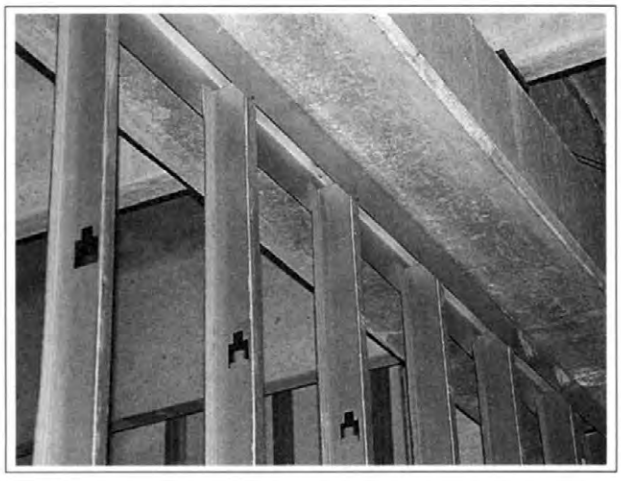

***Figure 1–75.*** Studs are cut leaving a 1-inch gap in the top plate. The studs are screwed off on only one side. Those screws will be removed as the wall is rocked.

cut 1 1/2 inches short of the deck, and isn't screwed to the deep leg plate.

The deep leg plate is used in combination with standard plate when called for in the plans. You plate the deck with the deep leg plate, and then slide standard plate up into the deep leg to carry the studs. Fasten the deep leg plate to the deck. Then slide a stick of standard plate the same width as the deep leg, but with 6 inches cut off the length, up into the deep leg plate (Figure 1–76). The 6 inches you cut off the standard plate will stagger the joints of the plate, making it easier to splice the ends together. Slide the standard plate into the deep leg plate, leaving approximately 1/2 inch exposed, and clamp the standard plate in place. Now tack the standard plate to the deep leg plate using the appropriate framing screws. You only need two framing screws per side near each end for each stick of standard plate. Splice both types of plate together as you work down the wall.

In many fire walls using this deflection technique, you'll lay safing insulation (dense fire-rated insulation) in between the two types of plate. Cut the safing insulation into strips that are 1/4 inch wider than the plate you're using and approximately 1 inch thick. An old filet knife works great to cut the safing. Slide the strips of safing tightly up into the deep leg plate (Figure 1–77). Insulate only as much of the deep leg plate as you can immediately cover by the standard plate. This keeps the dense heavy insulation in place. Once the safing is in place, slide the standard plate in place and work it like regular plate.

Whether you're installing insulation or not, pull the stud layout, marking it to the exposed lip of the standard plate. Cut the studs to allow 1/4 to 3/8 inch play between the studs and standard plate. Then stuff the studs on layout and screw them off on both sides (Figure 1–78). The framing screws connecting the two types of plate will be removed by the rockers as the wall is topped out, and no drywall screws will be run into the deep leg plate.

*Accordion plate,* shown in Figure 1–79, can be used in any framing that requires deflection. It's specifically designed to give as the deck settles with the added weight of snow and ice. Work the accordion plate following the same procedures

***Figure 1–76.*** This wall is framed to the bar joist using deep leg and standard plate to form a deflection condition. Both sections are spliced, and the lower section is laid out to receive studs.

***Figure 1–77.*** The 3 5/8-inch-deep leg plate fastened to the bar joist has the safing installed. The second stick of the deflection plate is being installed to hold the dense, heavy insulation in place.

***Figure 1–78.*** Here the deflection plate is formed using deep leg plate for both sections of top plate. The layout studs are screwed off to only the lower section of top plate.

outlined in this chapter for shooting up the top plate. Cut the studs to within 1/4 to 3/8 inch of the first bend in the plate. Once you've stuffed the studs, screw them off on both sides of the plate, using the appropriate framing screws. The framing screws won't be removed with this type of expansion plate.

Both the *deep leg* and *accordion* plate come in 10-foot lengths and are available in various widths.

***Figure 1–79.*** This is an end view of a stick of 2 1/2-inch accordion plate. The edge of this style of top plate is set to the wall line at the deck just as with any other top plate. Cut the studs to the first bend in the plate and leave the framing screws in as the wall is rocked. The fold in the plate will allow the deflection.

## Radius Plate

Radius plate is available precut, but you're more likely to cut it from standard plate on the job site, using a chop saw. You can gauge both the depth and spacing of the relief cuts by eye. The relief cuts should come within about 1/8 inch from cutting completely through the hard side of the plate. Space the relief cuts approximately 2 inches apart. The 2-inch spacing allows the plate to conform to nearly all radius wall conditions you'll encounter in metal stud framing.

Use the radius plate alone when plating the bottom of radius walls (Figure 1–80). When plating the deck, cut patterns from plywood or drywall (Figure 1–81). The patterns form sections of the radius, which you'll match at the deck to two plumb points per section of plate. Patterns are also a common method of forming radius soffits and suspension walls. We'll discuss them in detail in Chapter 5.

***Figure 1–80.*** A standard 3 5/8-inch plate with relief cuts made approximately every 2 inches is shot to the floor.

***Figure 1–81.*** In this picture, my partner Kelly is clamping the radius plate to the drywall pattern before screwing it off. The pattern will hold the plate in the form of the radius as it's fastened in place to form the top or bottom plate of a drop.

You form radius plate for arches in much the same way. Perforate the standard plate with relief cuts, but you'll cut both legs of the plate and not the back, as shown in Figure 1–82. Cut the radius plate from either structural or light gauge plate with a chop saw. Again, leave about 2 inches between the relief cuts. Make the cuts square across the plate. If they aren't square, the arch will form a twist in it. In Chapter 6 we'll discuss this process in more depth. Making the relief cuts for either of these methods may require rolling the plate up into the blade. To make the relief cuts, keep the material tight to the fence to keep it square with the blade, and move the plate slowly into the spinning blade to avoid the material kicking back.

# Fastening the Framing Members

One of the big advantages to building with metal studs, for the carpenter, is the speed and ease of connecting the framing members to each other. Often, a couple of quick cuts with your snips and a few framing screws are all it takes. Here we'll look at three commonly-used methods of fastening the materials together.

You can also use this discussion as a reference for other methods that we'll cover in later chapters. As you work to master these cuts, take your time and be patient. The cuts can be tricky, and are often full of sharp edges. Getting in a hurry or getting mad can get you a nasty cut.

## Shoes

Cut shoes approximately 3 inches from the end on both stud and plate material. Form the shoe by cutting only the legs of the material and then folding back the end (Figure 1–83). In most cases, you can cut the shoe by eyeballing back the 3 inches from the end of the plate and cutting one leg. But if you're cutting shoes on items like headers, the cuts must be square from side to side. If the cuts aren't square across the hard side of the plate, the shoe will cause the header to twist on the stud it's fastened to. For situations like that, square the cut across the hard side of the plate and cut the other leg. Then fold the end of the plate back to form the shoe.

When you're cutting shoes, more often than not there'll be a shoe at both ends of the material you're using. It's common to give and receive measurements for these cuts as "in-between." For example, the direction "40 inches in between" tells you to cut a shoe, then measure 40 inches and cut another shoe.

## Tabs

Tabs are another way you can cut the metal stud material so two pieces can be fastened together (Figure 1–84). Tabs are common on box beam headers, and also to join the intersecting plate of freestanding and suspended wall systems. The length of the tabs will vary, but a $1^1/_4$-inch tab will do the trick in most situations.

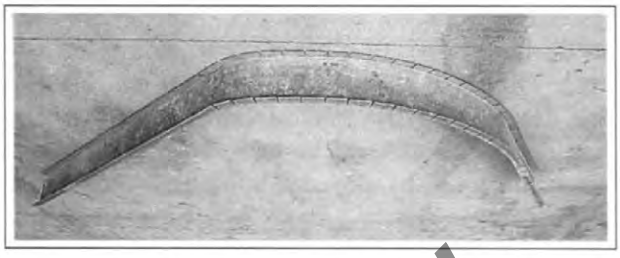

***Figure 1–82.*** You can see a stick of 6-inch plate with relief cuts made in the legs of the plate, allowing it to bend and form an arch. The relief cuts were made on a chop saw to keep the cuts square across the plate.

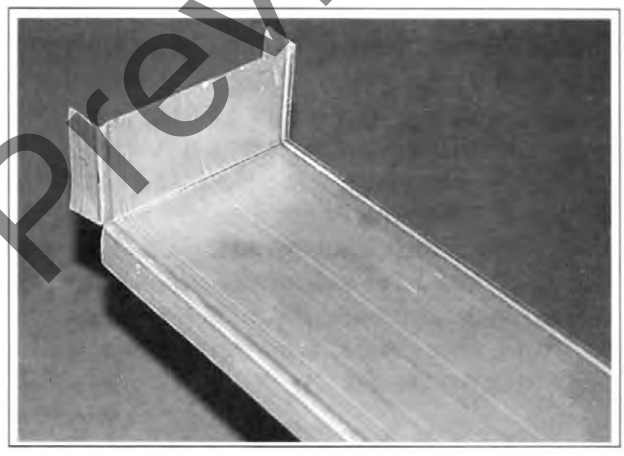

***Figure 1–83.*** A shoe cut on the end of a stick of 25 gauge 6-inch plate. Shoes are used on common headers and kickers.

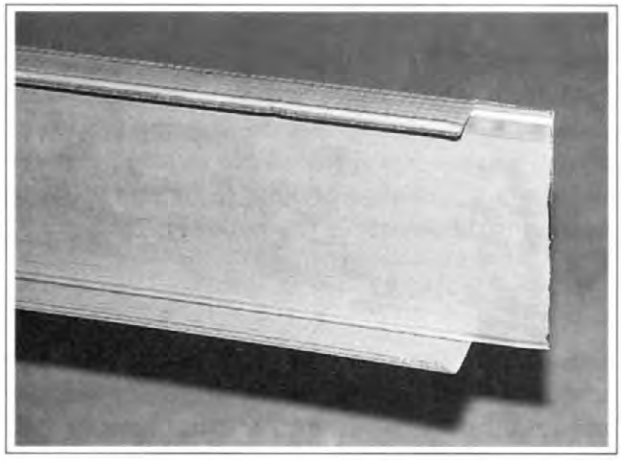

***Figure 1–84.*** Here's a tab cut to the end of a 6-inch stud, which is a common fastening point for spreaders and box beam headers.

To cut the tabs, cut through both legs of the material approximately $1^1/_4$ inches from the end. Then reposition the material so you can cut down from the end of the material to the first cuts you made in the legs. Cut the tabs with your snips on light gauge material, and use a chop saw on heavy gauge structural material. To make the first cuts $1^1/_4$ inches back from the end, set the material in the saw's table and roll it slowly *up into* the spinning chop saw blade. To make the next cuts, reposition either the saw or the material so the saw can cut down the material lengthwise.

### Ears

Ears, sometimes used on headers, work the same as a shoe. Cut the ears exactly backwards from a tab: Leave the legs intact and cut away the hard side of the plate (Figure 1–85). To cut the ears, start at the end of the plate and cut down the break (fold) line approximately $1^1/_4$ inches. Now, while slowly cutting, turn your snips and cut across the hard side of the plate. Once the cut across the hard side is complete, make a second turn and cut back out to the end of the plate to finish the ear.

## Kickers and Other Braces

Here we'll cover three commonly-used braces, some of their uses, and how to cut them. These braces are used for everything from supporting to straightening the framing. Knowing without hesitation which brace to use in a given situation is important. Make sure that the kickers or braces you use are either above ceiling height or inside the framing if you're bracing off of another wall or part of the building.

### Kickers

Kickers, like the one shown in Figure 1–86, are useful in countless situations. Use them to brace up freestanding walls, and to straighten as well as strengthen soffits. Cut kickers from stud material, with either one and two shoes cut at the ends. The shoes are often flattened out, with an additional 45-degree bevel cut made to the end of the stud at the base of the shoe (also visible in Figure 1–86). This bevel cut allows the shoe to sit flat against another surface, such as the top plate of a freestanding wall, or the deck.

When figuring the length of a kicker, it's important to consider the angle the kicker will run at. In order to get the maximum strength from a kicker, it must be set as close to a 45-degree angle as possible. The strength of a kicker is also increased by twisting the kicker, as shown in Figure 1–87. Once you've shot the kicker in place, twist it, then fasten the other end to the framing. Another way to increase the strength of the kicker is by screwing the shoe back together at the 3-inch cut points (Figure 1–88). This little spot is hard to get a screw in. The easiest way to fasten it is to set the shoe at the desired angle and clamp it. Then you'll be able to get a screw in it. It's best to do all of this after the kicker's been fastened in place. Which brings up another point: As you fasten the kicker with either screws or powder-actuated pins, place the screws or pins as close as possible to the fold point of the shoe.

***Figure 1–85.*** This shows ears cut on the end of a stick of 6-inch plate. Ears have many uses, but the most common is on common headers on structural framing.

***Figure 1–86.*** A simple kicker cut from $3^5/_8$-inch stud. One shoe has been flattened out and beveled to fit flat to the surface it's fastened to.

## Gussets

Gussets are another common style of brace used in the trade. As you can see in Figure 1–89, the gusset is the same as a shoe on the end of a kicker. Gussets are often used to brace furred walls that are built as close as possible to preexisting masonry and precast walls. Cut gussets from scrap stud to whatever size you need. The only side that matters is the one that'll be fastened to the framing. Here's the quickest way to figure it. Push the end of the scrap stud up against the preexisting wall, then use your snips to cut both legs at about the center of one of the wall studs, or the bottom plate. The other half of the gusset only has to be long enough to fasten to the preexisting wall. Like the shoe on a kicker, screwing the cut points of the shoe on a gusset will make it a lot stronger. If a stronger gusset is required, cut a short piece of stud with ears and screw it off, running it diagonally inside the gusset (Figure 1–90).

***Figure 1–87.*** Here's a $3^{5}/_{8}$-inch stud used as a kicker. The stud has been twisted before it was clamped to the wall stud to make it stiffer. In contrast, the kicker next to it hasn't been twisted. Both are shot to the bottom of the bar joist.

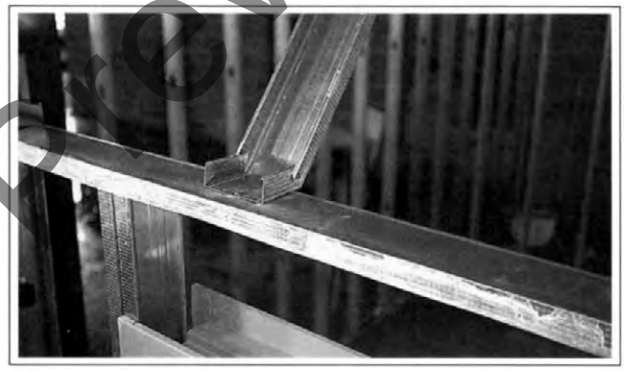

***Figure 1–88.*** Here you see the cut points on the shoe of a kicker screwed back together to make the kicker stronger above a door jamb.

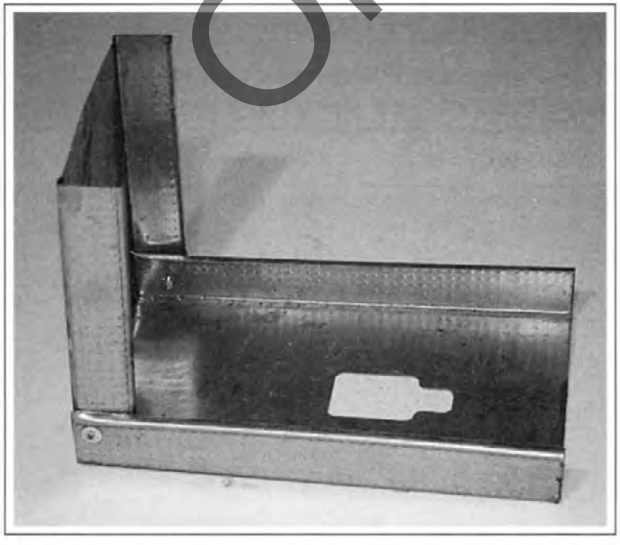

***Figure 1–89.*** A common gusset cut from 6-inch stud. Rescrewing the legs of the gusset at the cut points will make the brace much stronger.

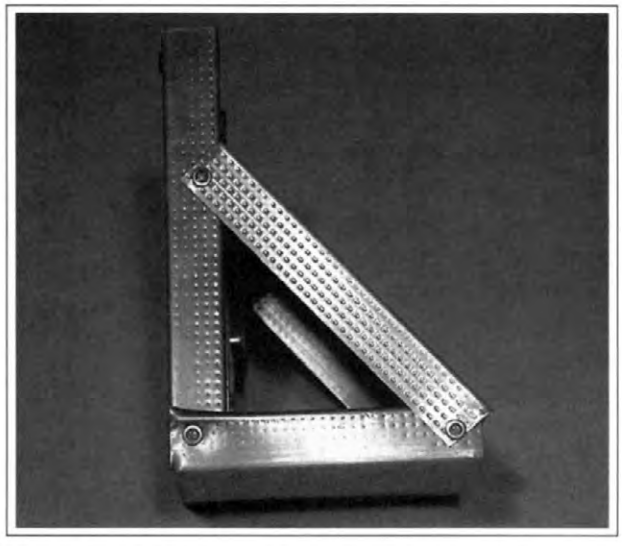

***Figure 1–90.*** Here the gusset itself is braced, making it as strong as a tank. I use this brace on lease (store) walls that will be carry shelves full of heavy merchandise.

## The Simple Stud Brace

A simple stud brace is a quick brace that does about the same job as a gusset (Figure 1–91). Cut it from stud material (scrap when possible), then flatten one leg of the stud by hand or with your drywall axe. This allows room to use a shotgun or a screw gun to fasten the brace to the existing wall. The stud brace doesn't provide the strength of a gusset, but it'll make a wall rigid enough for most situations. The biggest drawback of the stud brace is that it's limited to the width of the material it's made from. If there's a 5-inch gap between the new framing and the preexisting construction, a stud brace made from $3^{5}/_{8}$ inch stud won't work. Large commercial jobs usually have a wide variety of material sizes available, so you won't have much trouble finding what you need. But don't waste too much time looking around. If you can't find what you need quickly, just cut up a stud and move on!

## Wall Expansions

Wall expansions are a common part of commercial metal stud framing. They're designed to allow a wall to expand and contract without damaging the wall's finish. At the expansion joint, the wall stops and starts again on the other side of a $^{3}/_{4}$-inch gap in the framing. You'll lay out the expansion joint as you snap the wall lines, and square it across the corridor when working in a hallway. If this work wasn't done in advance, you should know that an expansion joint is required:

- every 30 linear feet in walls framed from the floor to the deck
- every 50 feet on ceilings

If you're working in a hallway, use the 3-4-5 squaring method to make sure the expansions are straight across from each other. Expansions that aren't square are hardly noticeable — *until* the walls are completed and the grid ceiling is installed. Then, after it's too late, it stands out like a sore thumb!

To frame the expansion, first establish the center of the expansion (if it wasn't done in advance) and measure $^{3}/_{8}$ inch each way. Plumb these points to the deck, then stop and restart both top and bottom plates at these points. Look at Figure 1–92. The stud layout will also stop and restart at the expansion. Burning 4 inches when reestablishing the stud layout will eliminate a recessed edge of the drywall at the expansion joint. That'll help the trades that follow you.

Set the two expansion studs in the plate, one on each side of the expansion, with the hard side of the studs on

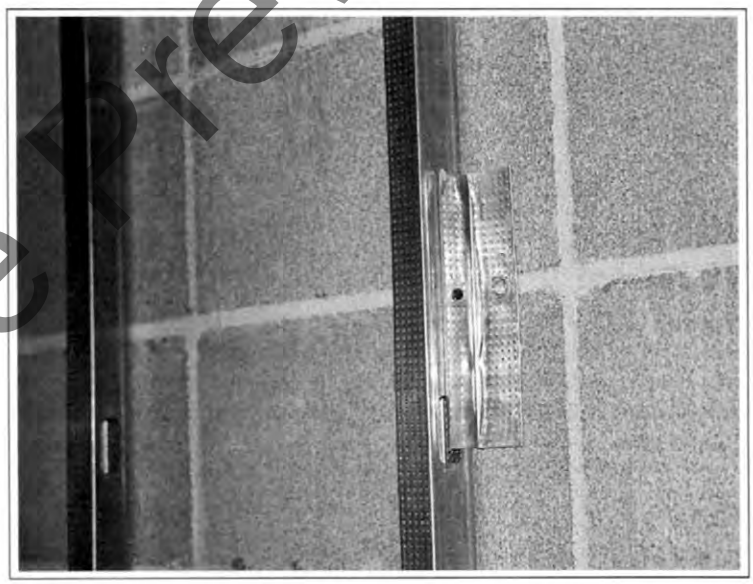

***Figure 1–91.*** A scrap piece of $1^{5}/_{8}$-inch stud used to form a simple stud brace. Notice that the brace is shot off right into the mortar joint.

***Figure 1–92.*** Here's the center of the expansion established at the bottom plate, with the plate stopped $^{3}/_{8}$ inch short of the expansion center. The studs will be set hard side to hard side, with the studs right at the ends of the plate.

*Figure 1–93.* With the expansion studs stood up and the layout studs in place, pieces of CRC have been cut to span two layout studs on either side of the expansion. The CRC keeps the wall solid at the expansion.

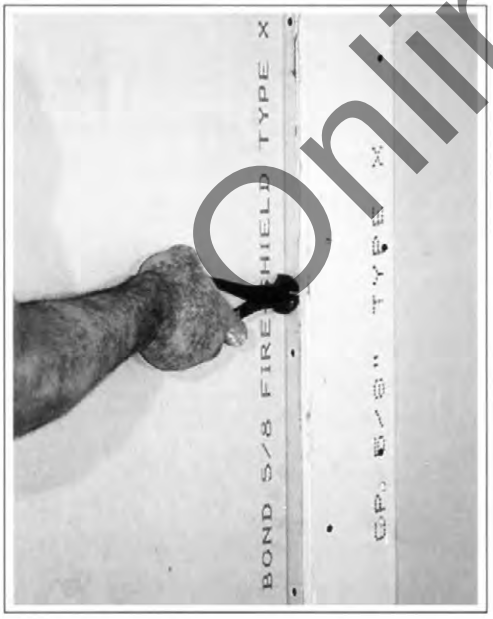


*Figure 1–94.* Here we see the factory edge of a drywall rip set against the outside corner of a column. Then you can grab a drywall screw left sticking out with a pair of end nippers and use it to pull the column out against the rip. Once set, the opposite side of the column corner is screwed off to lock it in place.

the $^{3}/_{8}$-inch expansion layout marks. Then stand up two more studs on the layout. Now cut some pieces of CRC, 5 feet long. Slide the CRC through the stud holes, and stop it when it's through the expansion studs and a layout stud on each side. Lace the CRC through the studs every 4 feet, starting at 4 feet off of the other floor, up to the ceiling height. See Figure 1–93. Get the studs screwed off and the CRC turned flat in the stud holes and you're finished. On fire walls, cut strips of fire-rated safing insulation the width of the framing and stuff it in between the expansion studs.

This wall expansion is a great example of why the stud holes should always line up. Imagine trying to install the CRC if they didn't! Now imagine your job site foreman walking by while you're scratching your head. Keep in mind that even though the expansions are an industry standard, they aren't always framed in. The expansions take extra time to frame in, and once one is done, you're committed. So before you take it upon yourself to correct an obvious oversight, consult your job site foreman.

## Straightedging

Straightedging is a commonly-used and widely-acceptable method of transferring a point or wall line quickly and efficiently. A straightedge has many uses, including setting columns and other outside corners as well as finding bumps and dips in walls.

Figure 1–94 shows a drywall rip (the recessed factory edge of a sheet) used as a straightedge to set the outside corner of a column. In Figure 1–95, a level is used as a

*Figure 1–95.* Using a level to transfer the wall line of a wall framed to the bar joist on up to the deck.

straightedge to transfer the wall line of a wall framed to the bottom of the bar joist, on up to the metal roofing. When straightedging on framing material, it's important to watch for one of the two ends of the straightedge resting on a framing screw. Of course, this would throw your point off considerably. As shown in these examples, the factory edges of a sheet of drywall, and levels, make good straightedges. A metal stud also makes a good one. These are just a few examples of straightedging. Given a little time on the job, I imagine you'll find uses I haven't even thought of yet!

# INDEX

## D



## E



## F

## M



## N



## O



## P



## Q



## R

## T



## U



## V



## W



## X



## Y



## Z