Forming Concrete Walls

Building forms stick by stick can save on labor and materials

by Arne Waldstein

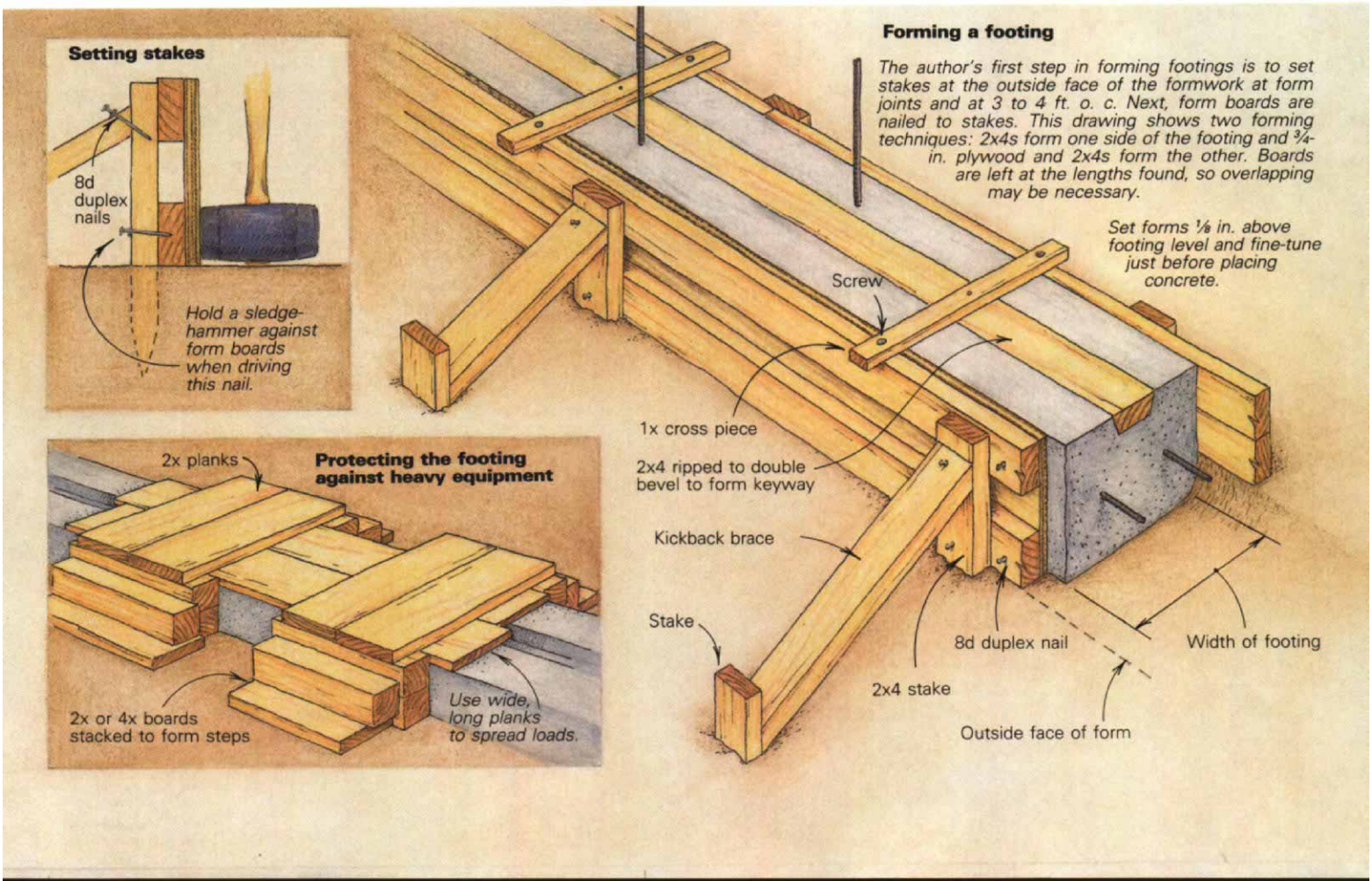
These days most builders choose to sub out foundation work to a specialist. The foundation contractor, with his crane, modular forms and experienced crew, can accomplish quickly and accurately what a carpentry crew would find to be a labor-intensive and basically unpleasant task. By the time you pay the labor bill, the money saved by building your own forms just might not seem worth the effort. In some cases you might even lose money. On the other hand, when the primary cost of the project is in the materials—in the case of the small builder or owner/builder, for example—building your own forms can be advantageous. If you have more time, energy and friends than cold cash, building forms is the way to go.

Reading Dan Rockhill's article on form-building *(FHB* #44, pp. 32-37) took me back to the early 70s when I worked for a company that built banks. We used wood forms for all our foundation walls. Form-building is labor intensive, so it was important for us to minimize the time spent both installing and dismantling the forms. The methods my old crew employed strike me as more efficient than Rockhill's.

Keeping it simple—Rockhill's article explains snap-tie wall construction. The primary difference between his approach and mine is his decision to prefabricate form panels. Nailing together a modular unit, only to tear it apart later, strikes me as inherently wasteful of both time and material. I prefer to install the forms one stick at a time with hardly any nails. This method is quick, easy and yields good results. Heavy lifting is minimized and two people can easily handle the job; in fact, I've written this article assuming that to be the case. (Of course, a larger crew will speed the job considerably, as various steps can be accomplished either simultaneously or by teams on the heels of each other.) Just as installation is simplified, the forms also come apart easily with minimal damage to the material. This is significant because the ease with which you can recycle your lumber is an important consideration.

Incidentally, I'd never heard the term "stem-wall" before reading Rockhill's article. I've poured some 4-ft. retaining walls, usually for landscaping purposes, but when it comes to houses, I'm a big fan of full basements. That may be due partly to the fact that I grew up in tornado country, but I also regard the extra space as far too valuable to pass up. Unlike a framed addition, a basement is not something that can be easily added later. If a choice were necessary, I'd skimp on my fixtures or finish materials before I'd eliminate the basement.

I should point out that this is not "my" method in the sense that I developed it. I



learned the technique from others, and there are undoubtedly many builders out there who are familiar with this approach.

Start with level footings–In building footing forms, use whatever method you are comfortable with. Lapped 2x8s or 2x10s are quick and sturdy. The problems with this approach are heavy lifting (you should avoid cutting this expensive lumber) and the fact that the top edge of the form is usually crowned and sitting higher than you want. This necessitates pouring more concrete or floating concrete to nails or a line snapped on the inside of the form, which slows the pour and is inherently inaccurate. I prefer to use materials that I can set to the correct height and screed off. I like to stack 2x4s edge to edge because they have some lateral strength, yet a slight crown can still be straightened out quite easily (drawing previous page). Also, you'll be able to use the 2x4s again. Narrow pieces of ¾-in. plywood and/or 1xs work well, too, although thinner material will obviously require more bracing. Feel free to use anything that is handy, as long as one edge is fairly straight.

I should mention that level footings are even more important if you want to screed off the top of your wall form. Stick-built forms cannot be shimmed as easily as form panels. I prefer to avoid shimming by pouring level footings in the first place. Level footings allow you to simply set the plywood, secure it and screed off the top of the form. Because plywood is a standardized off-the-shelf material, accuracy at footing level will be transferred automatically to the top of the wall. Another advantage of level footings is that the standard 4x8 sheet of plywood can become the unit of reference and measurement in building an 8-ft., or higher, wall. If floating concrete to a line is something you are comfortable with, you can relax on footing accuracy and snap lines at the top of the wall forms.

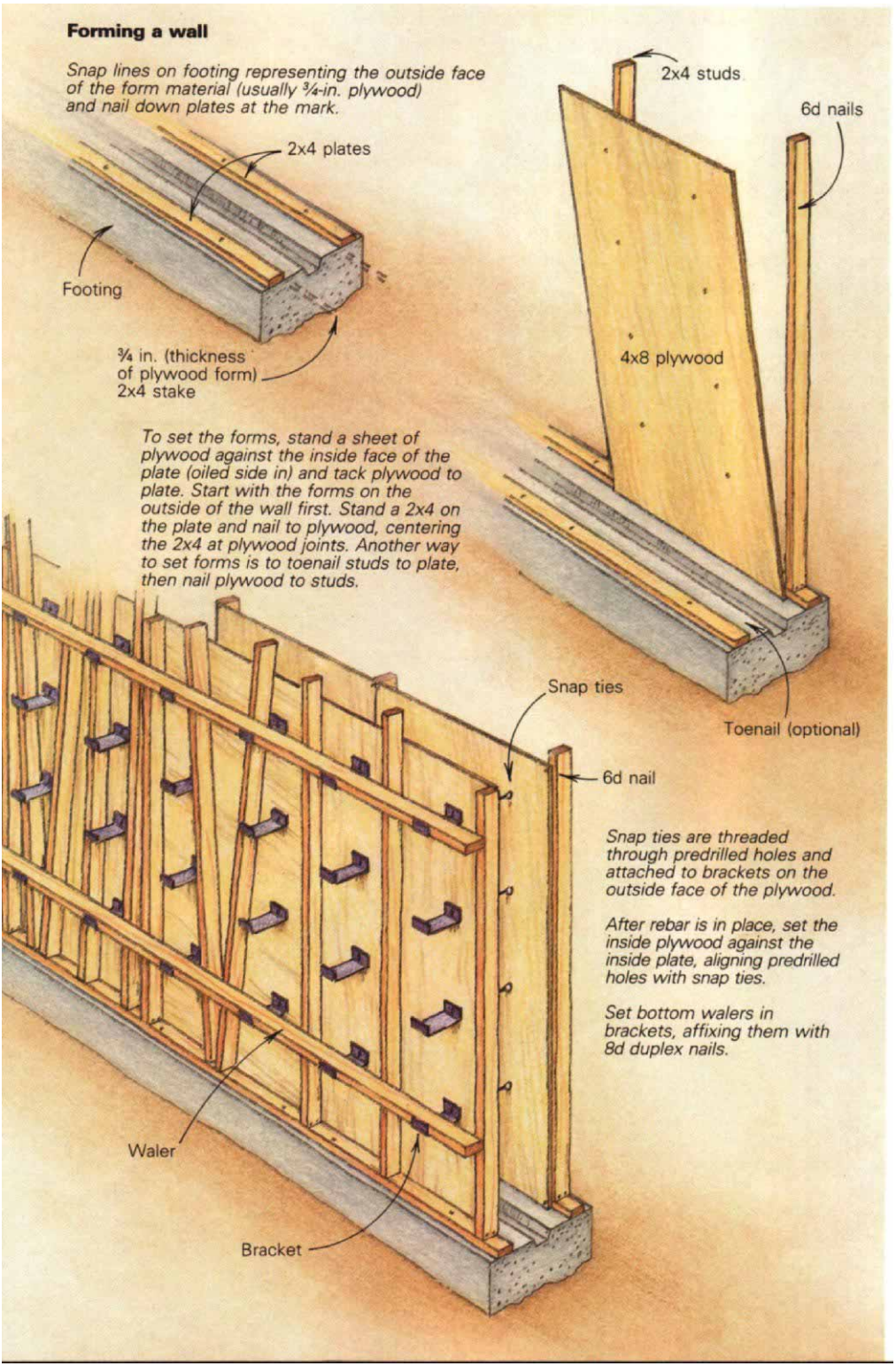
Achieving level footings is not difficult, but it does require the availability of an expensive precision instrument–the builder's level or transit (see *FHB* #37, pp. 39-45, on how to lay out a foundation). First, lay out your footings by pulling a Stringline at the centerline of the wall. Next, lay out stakes and form boards along both sides of the string.

Now set the transit in the middle of your layout and start setting forms. From the stringline, measure a distance equal to half the footing width plus the thickness of the form board and set stakes at this distance, placing them at every joint where the boards meet. Fill in with stakes between joints so that you have a stake every 3 or 4 feet. Pound in the stakes until, as indicated by the transit, the tops are about ⅛ in. higher than the level of the finished footing. Nail and brace the boards as you go. Set the forms slightly higher than the tops of the stakes. Hold the sledgehammer snugly against the inside of the form board as you drive a duplex nail through the stake. That will make nailing easier and more accurate.

I recommend leaving the standard transit rod in the truck. Simply use a clean, straight stick with a single pencil line on it and you'll have fewer lines to decipher. To help you hold the stick plumb, attach a torpedo level to it with a rubber band cut from an old bicycle inner tube. A plumb stick is especially important with respect to leaning toward or away from the transit. Side to side plumb can be recognized by the transit operator as he compares the pencil line to the cross hair.

Once one side of the form is installed, you should make the circuit one more time and set the forms to their precise level. Set the measuring stick on the form itself and pound on the stake. For that last ⅛ in., a standard 16-oz, hammer should be all you need. Now set the other side of the form, using a spirit level. A 2-ft. level with a top-reading center vial is handy for this job. (Check the accuracy of the level before you begin. It is surprising how many people buy levels with adjustable vials, yet never get around to adjusting them. I've seen plenty of arrows and scribbled notes on the sides of levels indicating the "good" side.)

Brace the forms at the stakes with anything that will hold the sides. Perfectly straight sides aren't crucial, so there's no need to get carried away with your bracing. A slight bulge here or an ooze there is no cause for panic. Remember, 30 years from now no one is going to be standing around admiring your footings. Pour the



Drawings: Christopher Clapp

concrete fairly dry, as you should anyway for maximum strength, and you won't waste much. As long as you have the proper mass and reinforcement, you're all set, and so's the concrete.

Forming a keyway—Rockhill's suggestion that keyways can be eliminated if vertical rebar is embedded in the footing on 4-ft. centers certainly sounds like a timesaver. I prefer keyways, however. Put a slight angle on a table saw and rip 2xs into strips with double bevels to allow easy removal from the footing (drawing, p. 55). After laying the reinforcing steel, nail the keyway strips to 1x crosspieces slightly longer than the width of the formed footing. Then attach the crosspieces to the form using screws and a screwgun—a good way to attach the material without pounding the forms out of level. After you've poured and screeded the footing, gently install vertical rebars next to the keyway form on alternating sides.

One technique I do not recommend for making keyways is jabbing or dragging a board through the wet concrete after it has been screeded. I've seen this done many times, but you will have wasted your earlier precision because the concrete will bulge all over the place. If you are saving your precision for later, then by all means, jab away.

Forming the walls—After you've stripped the footings and saved the wood, you're ready to build walls. Before you start on the walls, however, you might want to check for the proper grade of the basement. If you have a lot of material either to add or to remove, now's a good time to do it, while you can still get a machine in. It is a wonderful feeling to lean against your shovel and watch a machine move around gravel or sand that you would otherwise be shoveling by hand. Be sure to protect the footings where the machine must drive over them. Lay planks on top of the footing and build up both sides with timbers or more planks (drawing, p. 55). Laying plywood on top of that will also help distribute the load. You may have to temporarily bend over a couple of the vertical rebars.

The first step in building walls is to spray the plywood with form oil. Don't wait until the forms and steel are installed, as it is slower and you risk oiling the rebar and the top of the footing. As you oil each sheet, stack it neatly face to face, corners and edges perfectly aligned. Then, using a long bit or an extension, drill all the snap-tie holes at once. No jigs are necessary; simply mark the top sheet and clamp it to the sheets below. Of course, you can drill first, then oil if that's more convenient. If you haul the plywood on your truck, you can drill the stack right on the truck and oil them as you unload them.

Next, determine the width of your concrete wall and snap lines ¾ in. wider (that's the thickness of your form material, usually ¾-in. plywood) to indicate the location of the plates. Nail down some straight 2x4 plates with concrete nails (drawing facing page). Now you're ready to start setting forms. My example assumes a wall height of 8 ft., but that can easily be varied with no basic change in technique. Eight feet is handy because that's how tall plywood is. But if, for example, you want a 10-ft. high wall, you can rip plywood in half lengthwise and run those 2-ft. pieces horizontally above the lower plywood forms.

To set the forms, stand a sheet of plywood up against the inside edge of the plate, oiled side in, and tack the bottom corners of the plywood to the plate with 6d nails (drawing facing page). Now stand a 2x4 on top of the plate with half of one edge abutting the plywood, and nail the plywood to the 2x4 with two more 6ds, one at the top and one at the bottom. If the stud is really crooked, you can straighten it with another nail about halfway up. You can lightly toenail the stud to the plate if you wish, but it isn't necessary. In fact, if you set the stud first and toenail it to the plate (6ds work fine), you don't really need to nail the plywood to the plate. Just stand it up and tack it to the stud. In either case, if you're not working in a windstorm, the plywood will stand by itself. If you opted for "quick and dirty" footings, you must plumb the first sheet of plywood to keep your seams tight.

Now simply repeat this procedure. Every four feet you will have a plywood seam backed by a 2x4. Plumb and brace the whole thing every so often. You can forget about all that cutting, measuring and nailing of studs to plywood at 16 in. o. c. You'll be doing enough of that ritual once you're above ground, but it's not necessary for formwork.

Once all the outside forms are up, you are ready to hang the snap ties and steel. Refer to Rockhill's article for good rules of thumb for reinforcing steel and an illustration of a snap-tie rod. My experience is with U-shaped brackets, rather than with the wedges shown in Rockhill's drawing.

I prefer to install the forms for the outside of the foundation wall first because it is generally easier to install the rebar from the interior of the basement excavation where there is plenty of room, rather than stumble around at the edge of the embankment. One person pokes a snap tie through each hole in the plywood and another person hangs a bracket on the snap-tie stem. With all the snap ties in place, lay and tie the rebar.

With the steel in place, set the inside plywood on the inside of the plate, aligning the predrilled holes in the plywood with the protruding snap-tie stems. This time around, because you can't really stand inside the wall cavity and nail through the face of the plywood, you'll have to toenail one of the plywood bottom corners to the plate from the back side. You will also need a stepladder in order to nail the top corners to the studs. As a practical matter you don't even need to nail that lower inside corner. As long as the plywood is sitting securely on the footing and the seam is tight, the other three nails will do the job. (Those of you with arms 8 ft. long can go ahead and nail that inside corner.) Hang and secure the brackets on the face of the form as you go, and that will hold everything together.

With all the plywood up, your next step is to set the bottom walers in the brackets and begin setting studs (drawing facing page). The brackets have holes in them that allow you to secure the walers with 8d duplex nails. Set the studs against the plywood and add as many additional studs as you need. With the bottom waler in place, the studs will stand there all by themselves. There is no need to nail anything here.

One letter in *Fine Homebuilding* complained of bulging forms when Rockhill's method was used to form an 8-ft. wall, and Rockhill responded that his stemwall forms must be redesigned for a taller wall. Well, the commercial walls I've built were between 9 ft. and 10 ft. high (to allow for sizable ductwork and a suspended ceiling) and the only "designing" I ever did was to add some extra studs. You can space them 6 in. o. c. if it makes you feel comfortable (and you have enough lumber). The point I'm trying to make is that because beefing up the form doesn't involve any additional work, such as measuring, cutting and nailing, thus creating even more work at the dismantling end, there is no reason not to err on the safe side. Pack in lots of 2x4s. When all the studs are in place, install the rest of the walers.

An important point to note here is that there is no need for a top plate. It is wasteful to needlessly cut your lumber, so put a waler near the top and let the various length 2x4 studs you have on site protrude above the form. Even on a short wall, you can use 8 ft. and longer studs. Use your tallest sticks on the inside in order to allow room for the concrete chute on the outside. When it's time to pour, drive the truck parallel to the wall. Cut a block that can slide between the studs and ride on top of the plywood to screed off the top of the wall. After screeding, install the anchor bolts. One last thing: the absence of a top plate may cause the plywood to undulate a bit, but relax—the weight of the wet concrete will straighten it out in a big hurry.

Stripping the forms—The beauty of this system becomes apparent when it's time to strip the forms. Pull the duplex nails and remove the walers. When the last walers come off, your studs will simply drop to the ground (watch your head!). Your lumber is uncut and ready for action. The seam studs easily pry away because they are only held in place by a couple of 6ds. Now remove the bottom plates (because they are nailed to the footing, this might require a good lever and some elbow grease). That leaves only the plywood, which normally adheres slightly to the concrete. Actually, that is rather convenient, because as you pull the plywood off, one sheet at a time, you can clean it and stack it without having a mess of plywood all over the ground. (Of course, if you didn't oil the plywood adequately, concrete may adhere more than slightly.) Stack your lumber, and when the concrete cures you'll be ready to start framing the walls. □

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