

Tying in an Addition

Tips and tricks for matching new floor heights to old and getting everything square

BY JOHN WHRITNER

For a lot of reasons, building an addition can be trickier than building a new house. On this project, we needed to match the height of the new floor to that of the main floor of the existing structure, and the new foundation jogged and stepped, resulting in two different cripple-wall heights. Any difference in elevation from new floor to old would telegraph, so everything had to be spot on.

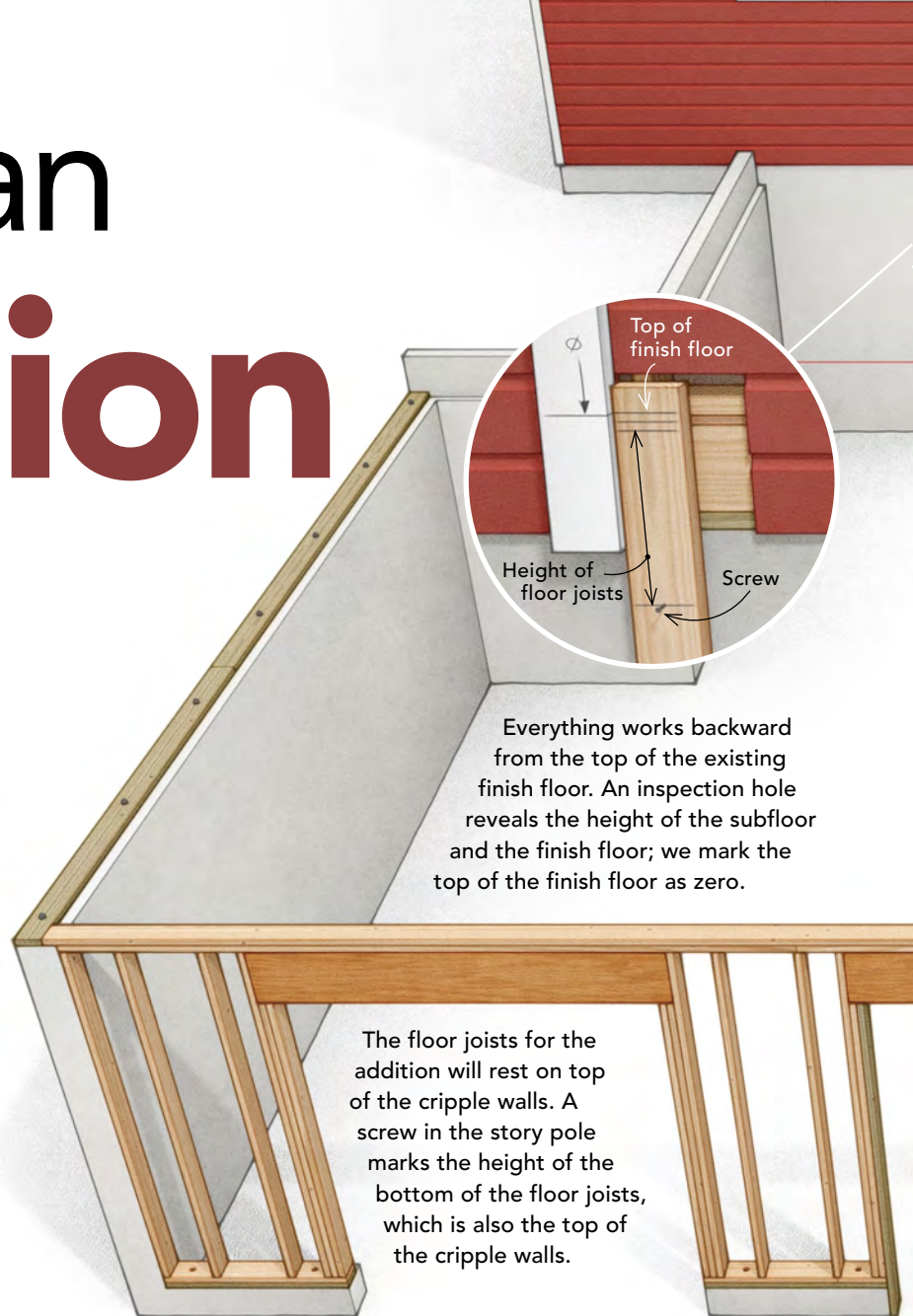
Stepped foundations are a bit harder to check for square. Even if they're good at the bottom, the walls may be out a bit at the top. Setting up stringlines or lasers to check takes time, and in the end only tells you what you have to deal with—they don't square it up for you.

Unless something is really out of square at the bottom, I don't bother squaring up the mudsills on the front end; I build the cripple walls so they can be adjusted after they're up. I also avoid math as much as possible, and rely on a story pole, a builder's level, and a tape measure to simplify finding the stud heights for the cripple walls. The setup for this is easy and nearly foolproof.

Story pole + builder's level

Site-made story poles help keep things consistent, whether it's the height of door and window trim, siding, or framing. In this case, a story pole helps me figure out the cripple-wall heights.

Since the old siding will be stripped, I cut an inspection hole through the side of the house to expose the existing floor and mark its elevation on a scrap of 2x that will stay screwed to the side of the house for reference. For a story pole, I pick a straight 2x4 that runs from the ground to above the finish-floor height. I attach it next to the more permanent block and transfer the floor height to it. Then, I measure down and mark the thickness of the new floor-



Check for square. Use a long tape to measure diagonally both directions across the foundation's rectangles to check for square. The diagonal measurements for each major section need to be within $\frac{3}{4}$ in.

USE A TAPE AND BUILDER'S LEVEL TO DETERMINE THE WALL HEIGHTS

The top of the cripple walls should be level with the bottom of the floor joists.

Story pole

Level's plane

These marks indicate the top of the stem walls. The distance from these marks to the bottom of the new floor joists gives you the height of the new cripple walls.

Stem walls

For stem walls taller than the builder's level, hook the end of the tape measure on top of the stem wall and pull down. The measurement in the level's crosshairs is the distance from the level's plane to the top of the wall.

For stem walls shorter than the builder's level, reverse the tape and measure up. In all cases, transfer measurements to the story pole, holding the tape in the same orientation as it was when measuring, and mark at the tape's hook.



Find the top. Pull a tape measure down from the top of the stem wall, and sight the tape in the crosshairs of the builder's level. Note that measurement, and swing the scope to the story pole.



Transfer to the story pole. Move the tape up until the measurement in the scope matches that from the stem wall, and mark the hook end of the tape, which is at the stem-wall height.

LAY OUT AND BUILD THE CRIPPLE WALLS

It's much easier to check for square when everything is on the same horizontal plane. As long as the foundation is close to square at the bottom and the concrete stem walls are close to plumb, we don't get too fussy, knowing that we can adjust and square up the cripple walls after they're in place.

Lay out the mudsills.

Snap lines $5\frac{5}{8}$ in. from the outside edges of the lower stem walls to position the 2x6 pressure-treated mudsills.



Bolt the mudsills.

Bore $\frac{3}{4}$ -in.-diameter holes in the mudsills for the $\frac{1}{2}$ -in. anchor bolts.

The extra room allows flexibility in adjusting the mudsills and cripple walls if something is out of square.



Build the walls. Bore $1\frac{1}{4}$ -in. holes in the bottom plates of the cripple walls at anchor locations. Use the measurements from the story pole to determine your stud heights, deducting the thickness of the plates and mudsill from the height difference between the bottom of the new joists and the top of the concrete stem wall.

ing and subfloor, and the depth of the new 14-in. I-joists, and drive a screw to mark where the new joists will land on the cripple walls to pull a tape from later. Then I turn to the builder's level.

A builder's level is similar to a transit, except that it can swing 360° in a horizontal plane. It's like a laser level in that respect, except it doesn't project a line. When you look through the level's scope, the horizontal crosshair maintains the same elevation while it's swung in any direction. It needs to be set on a solid tripod on a stable surface and leveled to work, and the leveling bubble shouldn't move from the center as you rotate the scope 360° .

Before figuring out the cripple-wall heights, we determine if the stem walls are level. A crew member hooks a tape measure to the

top of the stem wall and pulls straight down; whatever measurement is in the crosshairs of the level's scope is the vertical distance from the plane of the level to the top of the wall. Using this method, we pull at least three measurements on each wall section, one near each end and another in the middle. The longest measurement represents the highest point of the stem wall. (If the stem wall is below the level's line of sight, pull the tape from the stem wall straight up; in this case, the shortest measurement is the high point).

Here, the stem walls were level. If they hadn't been, we would have either shimmed between the mudsill and bottom plate to level the walls, or, if the discrepancy were really bad, cut the studs to different heights.

Next, we need to figure out the heights of our cripple walls. To do this, we do the

same thing we did to determine if they are level, hooking a tape on the top of the stem wall and pulling down (or if the stem wall is below the level's line of sight, we simply reverse the direction of the tape). Whatever measurement I see in the scope's crosshairs is the measurement I want to see when I swing the scope to the story pole. Let's say the measurement from the top of the stem wall is 24 in. I then swing the scope to the story pole, and a crew member extends his tape up until I see 24 in. in the crosshairs. Then he holds that position and marks the story pole at the hook end of the tape, which represents the top of the stem wall.

Once the stem wall's height is marked on the story pole, hook onto the screw and measure down to that mark. Whatever that measurement is will become the height of



Tip 'em up. After lifting the cripple walls, tack them to the mudsill and to each other with 3-in. construction screws.



Check your work. Tack a scrap of 2x on top of the cripple wall to represent the double top plate, then pull a tape down from it and sight the measurement with the builder's level. Then pull a measurement from the screw marking the joists on the story pole. The two measurements should match.

the cripple walls. I deduct 4½ in. for the bottom plate and double top plates, and another 1⅝ in. for the mudsill. Whatever's left is the stud height.

Build to adjust

When foundation walls top out at different heights, it can be labor intensive to determine if everything's square. Rather than taking hours to figure this out by setting up stringlines and trying to use a plumb bob on a blustery day, I plan to make it so everything can be adjusted if necessary once the cripple walls are in. If we get the cripple walls up and plumbed and discover something's out of square, we can adjust them in place.

But first, I need to make sure everything's close. There's only so much adjusting you can do with an out-of-square foundation.

We measure the distance between the ends of parallel walls to see if there are any obvious problems. To get a rough idea of the foundation's squareness, we check them for plumb with a long level, then pull diagonals using the highest point on the shortest walls as horizontal baselines. As long as they're pretty plumb and the diagonals are within ¾ in. or so, we should be safe. If everything's close, we may be able to make all of our adjustments on the tallest wall once we've built up to it, but that's not a guarantee.

Layout for the mudsills starts with lines snapped 5⅝ in. in from the outside edge of the foundation's lower-height walls. We cut the PT mudsills for the lower walls, and locate and drill ¾-in. holes for the ½-in. anchor bolts so they can be adjusted to the lines—or off the lines later if necessary. Ini-

tially, we install the mudsills right to the snapped lines, and tighten them down.

Next, we cut the top and bottom plates for the cripple walls. Before laying out the plates, we transfer all of the anchor-bolt locations to the bottom plate and drill them out with a 1¼-in. bit. Using the stud heights we determined from our story pole, we cut the studs on a miter saw, and assemble the cripple walls on a table or on parallel pieces of 2x laid on the ground and spaced to support the top and bottom plates.

We initially tack the cripple walls in place with 3-in. construction screws; we won't nail them off until we're sure everything's square. If we get the cripple walls up and plumbed and discover something's off, we can fine-tune the cripple walls on the mudsill, or we can loosen the mudsill and move the sill and



Work from short to tall. Start with short cripple walls, then move onto the taller ones. This way, the tall walls can be tied into the shorter ones without extra bracing to hold them up.

TIE IT ALL TOGETHER

The same procedure used on the taller stem walls is used to find the stud height needed on the shorter stem walls, except the tape gets turned around. Here, we measure up from the short stem walls, note the measurement, and transfer it to the story pole. The main difference is that the hook of the tape here is down; you still need to match the measurement when transferring it to the story pole, and mark the hook end of the tape.

cripple walls together. Once the first cripple wall is in, we double-check its height against the story pole by tacking a piece of 2x stock onto the top plate to represent the double top plate, and pulling a measurement down. The number in the crosshairs of the builder's level should exactly match the number pulled down from the screw representing the bottom of the joist on the story pole.

Once all of the cripple walls are up and similarly checked for height with the build-

er's level, we plumb and brace them and straighten them out. Without a floor to attach the braces to in what will become the garage, we cut pieces of 2x, jam them between post footings and the mudsill, and nail them to the mudsill. Then we attach another 2x to a stud, push the wall in or out as necessary, and nail the diagonal to the wedged horizontal.

Once all that work is done, we can check our diagonals on a level plane. On this job we were out $\frac{3}{8}$ in., and were able to adjust

the mudsill on the highest foundation wall, which didn't have a cripple wall, to compensate. But if we'd needed to adjust any of the cripple walls, it would have been relatively easy to back out the screws tacking them to the mudsills, make our adjustments, and reattach them, or loosen the nuts on the j-bolts if needed. □

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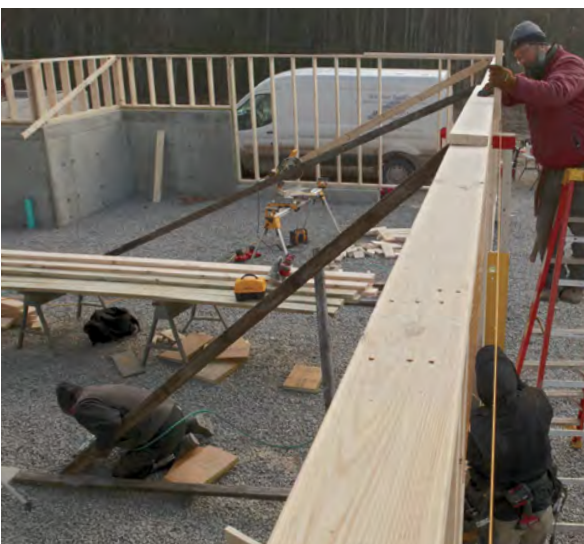
Tack them in place. Screw the taller walls to the mudsill and to the shorter walls. Use pressure-treated studs where they'll contact masonry, and use Sill Seal at this interface.



Plumb and brace. Use a plate level and muscle to plumb the wall sections and corners, and cross-brace with 2x material screwed to the inside of the walls so it doesn't interfere with sheathing.



Check for square. Once everything is built up to the same plane and the corners are plumb, pull diagonals to check for square.



Straighten and brace. Use a stringline and gauge block to straighten walls, and check for plumb with a plate level. Lumber wedged between footings and the mudsill and tacked in place provides nailers for bracing where the ground is too frozen or unstable for stakes.



Cap it off. After everything is plumb, square, and straight, add the double top plates to lock all the wall sections together.