Leveling the Deck

by Ron and Roger Whitaker

Taking the time to shim or scribe an out-of-level first-floor deck will pay for itself throughout the job

If you work with a foundation subcontractor who consistently produces level foundations, you probably don't need to scrutinize the accuracy of every foundation. But there are occasions where it's worth checking a new foundation for level *before* you start laying the sill plates. If your mason hollers out, "We had a little problem, and that far corner ended up a little low!" as he pulls away from the job site, it's time to get out the transit. If the homeowner's buddy built the foundation as a "favor," or you're working with a new foundation sub, checking for level should be standard procedure.

In a perfect world, every foundation would be dead level. In reality, though, you're eventually going to face a foundation that's so out of level that you'll have to take corrective measures. This article describes the methods that work for us in such situations.

How Close Is "Close Enough"?

When we "shoot" a foundation with a transit, we're looking for any variations in readings that exceed 1/4 inch. When you consider that lumber dimensions often vary by that much, it just doesn't make sense to demand closer tolerances.

If we discover any variations that exceed 1/4 inch, we carefully check the top of the foundation at 4-foot intervals. The person behind the transit jots down all the readings on the blueprint at the location they were taken, while the person with the rod marks the readings on top of the foundation. After we've taken all the readings, we put our heads together and decide on the quickest approach to correct the problem without compromising the quality of the floor framing.

Going Up or Down?

How we proceed is generally governed by how far out of level the foundation is. When faced with a foundation that is off

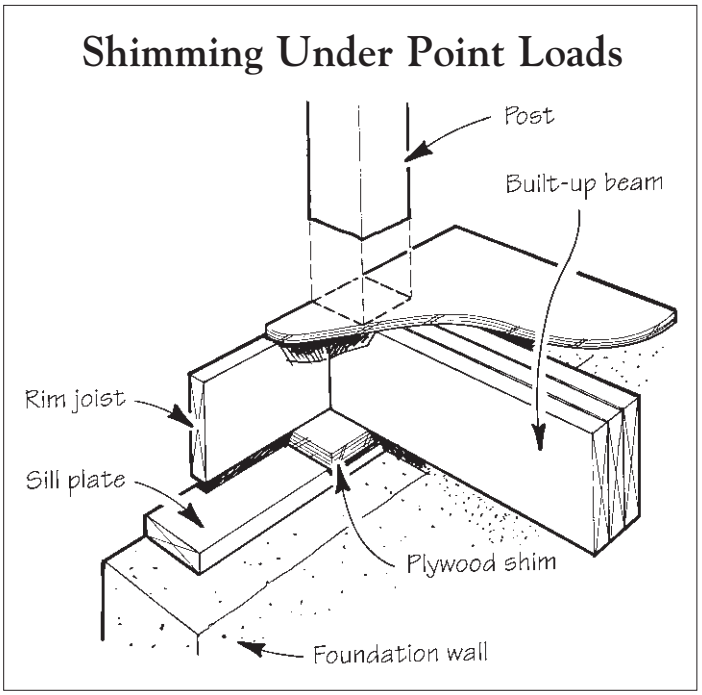

Figure 1. *Under point loads, plywood or OSB shims are better than cedar, which crushes easily.*

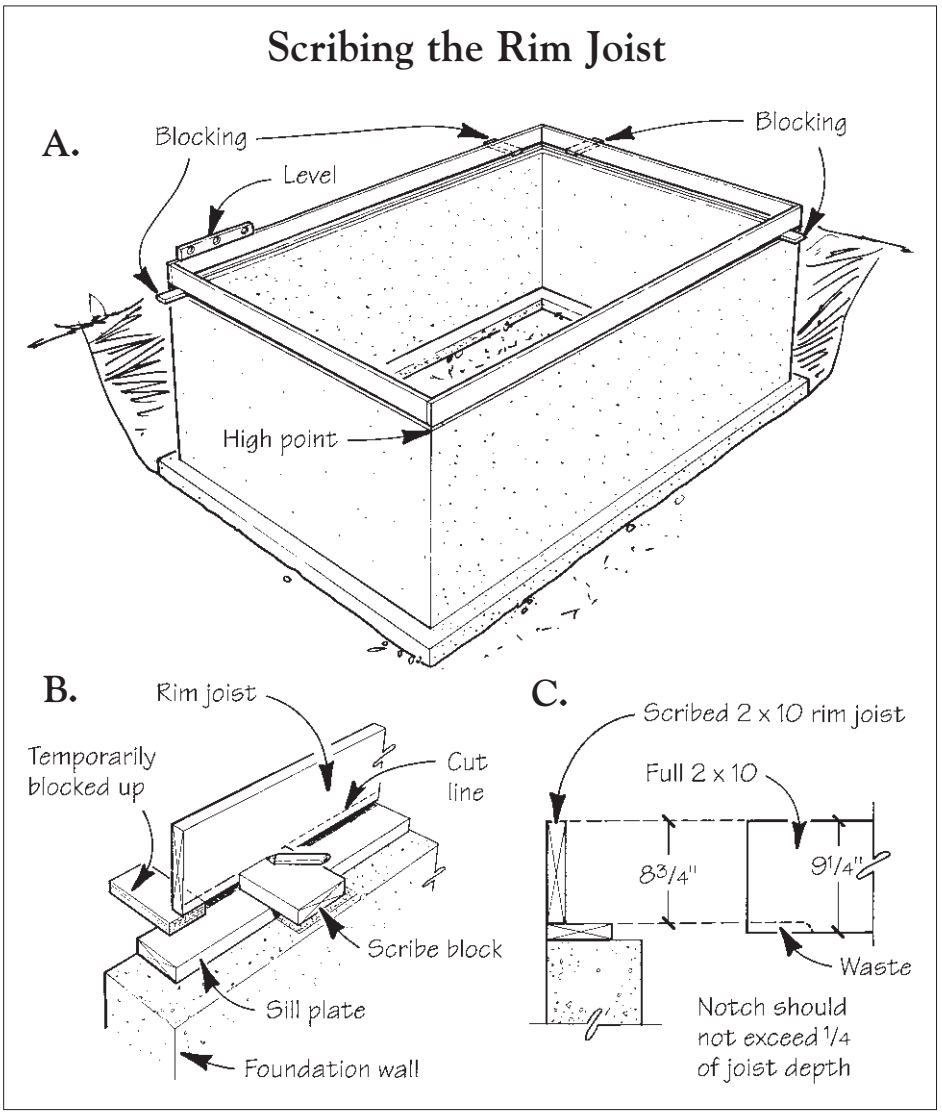

Figure 2. *To scribe the rim joists, the authors first tack and level them in place (A). Then, using a scribe block, they mark the cut line around the entire foundation (B). Floor joists are then notched flush to the rim (C).*

by 3/4 inch or less, shimming up the low spots is often the most sensible approach (unless you're matching an existing floor height, which we'll cover later).

All shims are not created equal. When using shims to level a floor system, it's important to consider any concentrated point loads that will be present after the house is completed. The cedar shims that most builders use are softer than typical framing lumber. For example, cedar will support only about 60% of the weight that SPF (Spruce-Pine-Fir) lumber is capable of supporting before the fibers start to crush. So in areas of concentrated loads, we use shims made of OSB or plywood of the appropriate thickness (see Figure 1).

Going down. When the variations in the foundation exceed 3/4 inch (in which case we shoot the mason after we shoot the foundation), we "scribe" the floor system to the out-of-level foundation. This is a labor-intensive process, but allows us to frame a level floor system without the use of shims.

To scribe the floor system, we determine the difference in height between the highest and lowest spots on the foundation, then cut a scrap block of equal thickness. Next, we cut and tack all the rim joists together, letting them sit loose on the sill plate.

Starting at the highest point of the foundation and working toward the lowest point, we block up the rim joists so they sit level (Figure 2). Using the scrap block as a gauge, we rest a pencil on top of the block, and slide it along the sill plate to mark the scribe line. We then disassemble the rim joists, make our cuts, and reinstall them, nailing them off as we go.

After the rim joists are in place, we "fit" each individual floor joist by cutting a notch at the end of the joist so it will sit flush with the top of the rim joist. By measuring from the sill plate to the top of the rim joist, we determine how much of the floor joist should be left "standing." Keep in mind that notches at the ends of floor joists should not exceed one-fourth the depth of the joist.

Hybrid approach. Occasionally it may make sense to use a hybrid approach, which combines shims and scribing. If, after shooting the top of a foundation, we discover that one 4-foot

section is 1/2 inch high and another 4-foot section is 1/2 inch low, we typically scribe the floor system at the high spot, and shim the floor system at the low spot.

Matching Existing Floor Heights

With additions, the new floor system usually has to finish out at the exact height of the existing floor. The first step is to establish the height of the existing finish floor in the area where the two floor systems will meet. Don't assume that the floor in an existing building is level, and if a doorway will be cut through to the existing building, take the transit reading at that point. Subtract the thickness of the floor system from this existing finished floor height (include the sill thickness, floor joist depth, subfloor, and finished floor thickness), and you'll have the desired height of the new foundation wall.

When New Meets Old

When building additions, we plan on spending an hour or two establishing the layout heights for excavations, footings, and finished wall heights. To avoid confusion, we drive concrete nails into existing walls that indicate the target height of the new wall.

To establish the target heights, we start by taking a transit reading of the existing finish floor at a point where the new will meet the old (Figure 3). At this stage, it pays to double-check your math; ten minutes with a pencil and calculator can save hours with a pick and shovel. A good operator can work to final depth tolerances of plus or minus an inch — even in the stony soil we encounter in northeastern Pennsylvania.

When matching an existing floor height, make sure your foundation sub understands that low is preferable to high. It's much easier to raise a floor system by ripping a 1/2-inch strip of plywood and nailing it on top of the sill plate than it is to lower the floor system by scribing the rim and notching all the joists.

Dealing with an out-of-level foundation is never any fun. And the longer it goes uncorrected, the more trouble it will cause. A smart builder will straighten it out right away and get on with the business of building. ■

Ron and Roger Whitaker are builders in Harford, Pa.

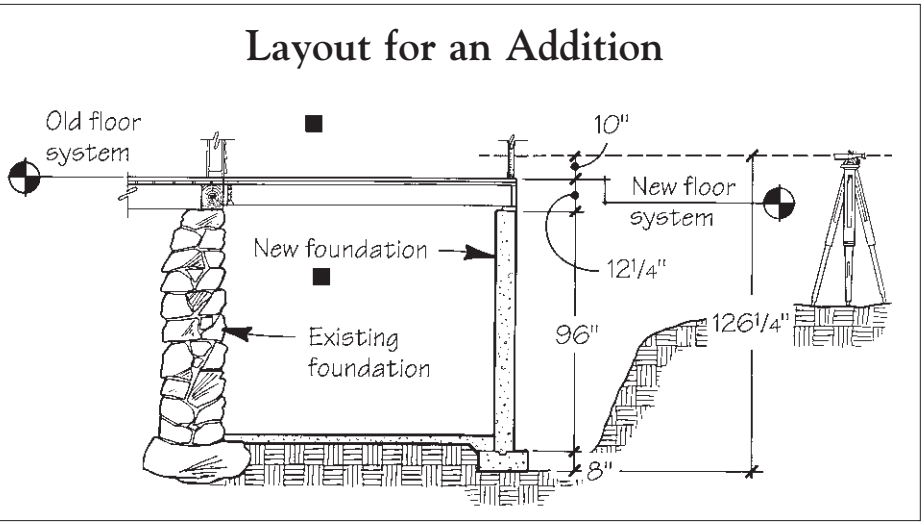

Figure 3. *Matching existing floor heights requires careful layout and an accurate foundation hole. Add the benchmark height (10 inches in this example), the thickness of the new floor system and sill plate, the height of the foundation wall, and the thickness of the footing to determine the excavation depth.*

Recipe for a Good Foundation

The accuracy of the excavation and footers sets the tone for the entire foundation and for the rest of the building. Modifying footing forms to accommodate an out-of-level excavation creates extra work for the footing crew and can stifle the pride that accompanies a job done quickly and accurately.

Avoid the Pick & Shovel

Foundation contractors who arrive at the job and are forced to perform a lot of pick and shovel work often develop a bad attitude (can you blame them?). If you won't bother to get the hole dug accurately, why should they bother to build the foundation accurately?

As the GCs, we always make an effort to be on site and available to take readings as the hole approaches final depth. Variations in level of up to 2 inches can be accommodated fairly easily when forming footers. Even in stony soils, there is seldom a good reason why the excavator can't work to these tolerances. We make good and sure we like the way the hole looks before the excavator and his machine leave the site.

If you're not comfortable directing the excavator as the hole is dug, arrange to have the foundation sub on site to answer any questions the excavator may have. Budget a few extra dollars to cover the sub's time, and as the machines run, use any slack time to go over foundation details like beam pockets and knockouts for water and septic lines.

Forming Footers

Though it may not be the solution for everyone, we've concluded over the years that forming our own footers is the best way to guarantee the accuracy of the foundation. It's not a job we particularly enjoy doing, but it places the final responsibility in our hands. In the past we've left the job to foundation subs, only to pull up to the job and find that they "subcontracted" the footings out. As a result, the footings were inaccurate and we had to scramble to make last-minute adjustments.

We always work with the same mason when forming footers. The process goes quickly, and it gives us an opportunity to discuss details of the foundation as we work. We typically budget 16 man-hours to cover layout and form time. If it takes longer than expected, we don't panic. Spending a few extra hours forming the footer sure beats shimming or scribing the first-floor system. When it comes to foundations, an ounce of prevention is worth a yard of cure.

— R.W. & R.W.