

## Chapter 1. Beam and Sill Plates

### 1.1 ESTABLISHING SQUARE SILL PLATE CHALK LINES

### 1.2 INSTALLING TREATED SILL PLATES

### 1.3 INSTALLING LAMINATE BEAM

#### Tools needed by volunteers:

Hammer  
Nail apron  
Tape measure  
Square  
Utility knife  
Pencil

#### Tools and equipment needed:

Generator  
Extension cord  
Circular saw  
Chop saw  
Reciprocating saw  
Drill with  $\frac{3}{4}$ " &  $1\frac{1}{2}$ " wood auger bit  
Drill with  $\frac{1}{2}$ " masonry bit  
Framing square  
String line  
Chalk line  
Wood chisel  
Caulk gun  
Ratchet wrench and socket  
30' tape measure  
50' tape measure  
6' level  
Stepladder  
Extension ladder

#### Materials needed:

2x6 treated lumber  
2x4 lumber  
Laminate beam  
Sill seal  
16d nails  
8d nails  
 $\frac{1}{4}$ " x  $1\frac{3}{4}$ " Tapcon® concrete screws  
[1/4" x 2 3/4" Tapcon® concrete screws](#)  
[3/8" x 2 3/4" Power/wedge bolts](#)  
1 5/8" Exterior screws  
5/16"x1 1/2" Lag screws  
1/2" Nuts  
5/16" Washers  
1/4"x1" Fender washers  
Metal shims  
[Air sealing](#) caulk  
Spray varnish

#### Personal Protection Equipment:

Safety glasses (required)  
Hard hat – below deck (required)  
Ear protection (recommended)

#### Reference Materials:

House Plan  
Manufacturer's Layout Plan

**Safety First! Review the Safety Checklist before performing tasks in this chapter.**

## 1.1. ESTABLISHING SQUARE SILL PLATE CHALK LINES

### 1.1.1. Checking the Foundation

1. Before marking the foundation, use a broom to remove any debris from the horizontal surfaces of all foundation walls.

### 1.1.2. For Square or Rectangular Foundations

1. At each corner of the foundation, measure in  $4\frac{1}{2}$ " from the outside wall of the foundation. Measure in from both sides of the corner and mark to create an intersecting initial corner mark.
2. With a long steel tape, "burn a foot" and measure the lengths (between marks) of the long walls. Record the measurements. If the two wall lengths differ by  $\frac{1}{8}$ " OR MORE, adjust the corner marks to equalize the lengths by adding one-half the difference at each end of the shorter wall. Verify that both long walls are now the same length.
3. Repeat Step 2 for the two short walls.
4. With a long steel tape, "burn a foot" and measure the diagonals between the corner marks to check for square (see Figure 1-1). If the measurements differ by  $\frac{1}{8}$ " OR MORE, adjust the corner marks at each end of the short diagonal by lengthening the corresponding long wall by one-half the difference. Verify the two diagonal measurements now differ by less than  $\frac{1}{8}$ ".

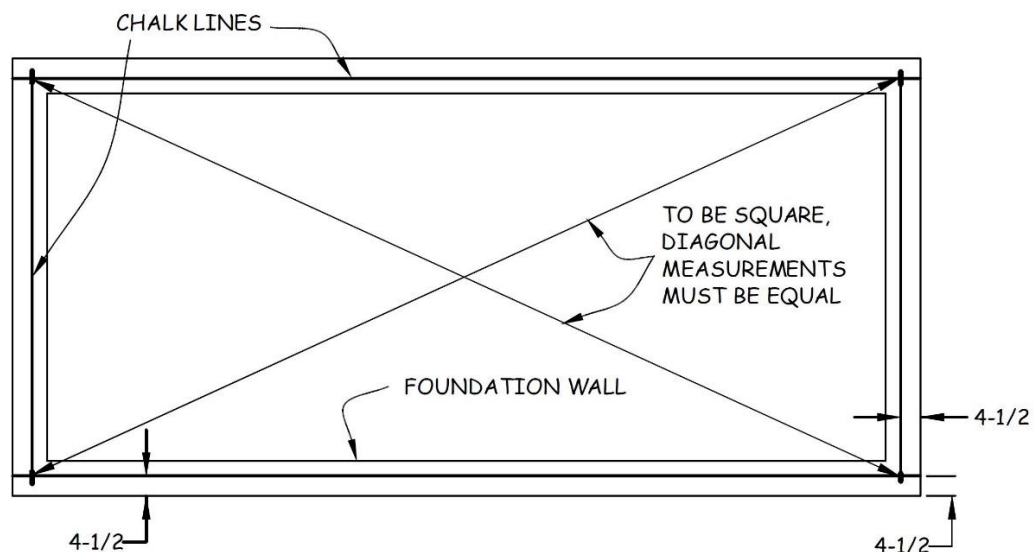


Figure 1-1. Squaring Foundation Lines.

5. Snap chalk lines on all four walls.

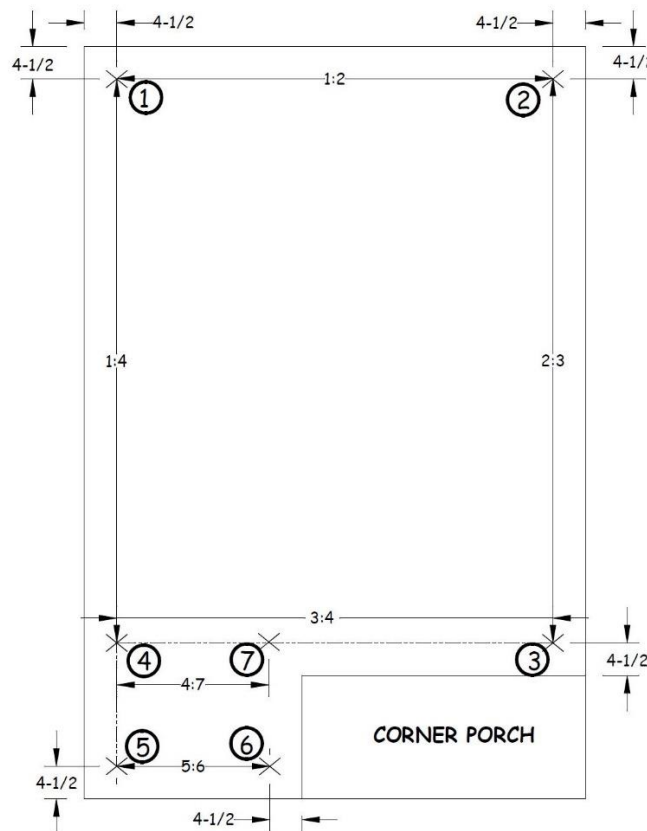
- Check each wall for bow every 5'-8' by measuring from the outside of the foundation to the chalk line. If the chalk line does not fall on the 4½" mark, move the entire line in or out as needed in a PARALLEL fashion (to maintain equal wall lengths) by adjusting the marks at the corners. Snap a new chalk line with a different color.

**NOTE:** The length of the wall being moved is unchanged, but the length of the perpendicular wall IS changed.

- Spray all chalk lines with clear varnish.

### 1.1.3. For L-Shaped or Irregularly-Shaped Foundations

- At all outside corners of the deck (Points 1, 5, 6, 3 and 2) measure in 4½" from the outside wall of the foundation. Measure in from both sides of the corner and mark to create intersecting initial corner marks.
- With a long steel tape, "burn a foot" and measure the distance between Points 1 and 2 (= Line 1-2) and between Points 3 and 2 (= Line 3-2). Using these measurements, locate and mark Point 4.



**Figure 1-2. Sill Plate Layout with Corner Porch.**

3. With a long steel tape, “burn a foot” and measure the diagonals between Points 1 and 3 and between points 4 and 2 to check for square. If the measurements differ by  $\frac{1}{8}$ ” OR MORE, adjust the corner marks at each end of the short diagonal by lengthening the long wall by one-half the difference. Verify the two diagonal measurements now differ by less than  $\frac{1}{8}$ ”.
4. Measure Line 5-6 and use this measurement to locate Point 7 on Line 4-3.
5. Measure Line 4-5 and Line 6-7. If not equal, adjust either Point 5 or Point 6 to ensure that Line 5-6 is parallel with Line 4-3.
6. In a similar manner, measure Lines 5-6 and 4-7. If not equal, adjust Point 6 or Point 7 to ensure that Line 6-7 is parallel with Line 1-5.
7. Snap chalk lines on all walls.
8. Check each wall for bow every 5’-8’ by measuring from the outside of the foundation to the chalk line. If the chalk line does not fall on the  $4\frac{1}{2}$ ” mark, move the entire line in or out as needed in a PARALLEL fashion (to maintain equal wall lengths) by adjusting the marks at the corners. Snap a new chalk line with a different color.

**NOTE:** The length of the wall being moved is unchanged, but the length of the perpendicular wall IS changed.

9. Spray all chalk lines with clear varnish.

## **1.2. INSTALLING TREATED SILL PLATES**

1. Trim any foamboard that extends above the top surface of the foundation so that it is flush with that surface. If the poly sheet is intact, do NOT remove it. Later, it will be extended over the outside of the rim board installed in Section 2.1.3.
2. Use a string line to check the straightness of the chalk lines created in Section 1.1. If any lines are not straight, re-snap them using a different color chalk.
3. Install sill plates on the short walls first. Notch sill plates at the beam pockets so they are flush with the edges of the pockets.
4. Check both long walls to see if any foundation bolts occur where an I-joist or LVL beam eventually will be installed, as specified in the Manufacturer’s Layout Plan. Measuring from the outside edge of the sill plate on the corresponding zero short wall, use a red crayon to mark any bolts that land where an I-joist or LVL beam will be installed. These will need special attention as described in Step 9 below.
5. Place foam Sill Seal on top the foundation, at least 1” back of the chalk lines. The Sill Seal should be about 4” wide. If the roll of Sill Seal is greater than 7” wide cut the roll in half yielding two discs.

6. To make sure that each sill plate member can be attached to at least two of the foundation bolts, determine the layout of 2x6 treated sill plate members for the entire foundation. Then, cut pieces for each wall to length.
7. Position the sill plate on top the foundation and against the exterior edges of the bolts. Ideally, the sill plate should be oriented so that any crown is up and any edge with wane (an edge with insufficient wood) is either positioned up and to the inside of the foundation or down and to the outside of the foundation.
8. Using a speed square, mark the location of foundation bolt clearance holes by drawing two parallel lines on the sill plate representing the outside edges of a bolt (see Figure 1-3.). Determine the distance from the chalk line to the center of the bolt. Measure that distance from the interior edge of the sill plate and draw a line between the two parallel lines.
9. Use a  $\frac{3}{4}$ " or  $\frac{7}{8}$ " bit to drill clearance holes in the middle of the short line created in the previous step. If a hole corresponds to a bolt highlighted in red from Step 4 above, **FIRST** use a  $1\frac{1}{2}$ " spade bit to **CAREFULLY** drill a counterbore deep enough so the nut and a round  $\frac{5}{16}$ " washer will sit below the surface of the sill plate.

**NOTE:** The diameter of the clearance hole is larger than the bolt diameter in order to facilitate the correct positioning of the plates on the foundation.

10. Place the predrilled 2x6 treated plate members over the foundation bolts. Align the interior of the sill plates with the chalk line. Secure sill plates by installing a round  $\frac{5}{16}$ " washer on top of a rectangular concrete form tab over each foundation bolt followed by a  $\frac{1}{2}$ " nut turned tight. If the hole has been counterbored, **ONLY** use a round  $\frac{5}{16}$ " washer; then, after attaching the  $\frac{1}{2}$ " nut, use a reciprocating saw with a metal blade to cut the protruding stem of the bolt off at the surface of the sill plate.

**NOTE:** Don't over-tighten the nuts to the point where the sill plate begins to sag or buckle as this creates problems when rim boards and floor joists are installed later.

11. Apply air sealing caulk between all sill plates where they abut and toenail the plates with 8d nails.
12. Sight along the top of the sill plates to ensure they are straight and there are no valleys or hills. To test, run a string line along all four sides. If necessary, use  $\frac{1}{4}$ "x $2\frac{3}{4}$ " Tapcon® concrete screws (or  $\frac{3}{8}$ "x $2\frac{3}{4}$ " power/wedge bolts, whichever is more appropriate) to flatten sill plates.



**Figure 1-3. Sill Plate Installation.**

13. Lay a thick bead of [air sealing](#) caulk on the interior side of the sill plate where it meets the foundation. Make sure there are no gaps in the caulk when the application is complete.

**NOTE:** Do NOT apply [air sealing](#) caulk if the temperature is below 40°F or if the foundation surface is wet. If either condition exists, the caulking must be postponed to the next build date.

### **1.3. INSTALLING LAMINATE BEAM**

1. Using the dimensions from the foundation wall to the beam as shown on the House Plan, mark the location of the beam on the concrete wall below the pocket.
2. Remove any protective covering that may encase the beam. Check the beam for any indication that a particular edge of the beam is designated as “UP”. If such a designation is found, be sure to position the beam in the correct orientation.
3. To determine the required beam length, measure from the back edge of the beam pockets on each end of the basement walls (take two independent measurements). Subtract 1” from the overall length and lay out that measurement on both sides of the beam. Double-check the length before cutting. Set the depth of the circular saw blade to ½” and SCORE both faces of the beam at the marked length.
4. Use 16d duplex nails to securely attach a temporary piece of 2x4 near the middle of the beam. This 2x4 must be sufficiently long (scab two pieces together, if necessary) to

extend from the beam to about 6” beyond the outside edge of the foundation. Assign one person to hold the end of the 2x4 nearest the foundation until the beam is securely in both foundation pockets.

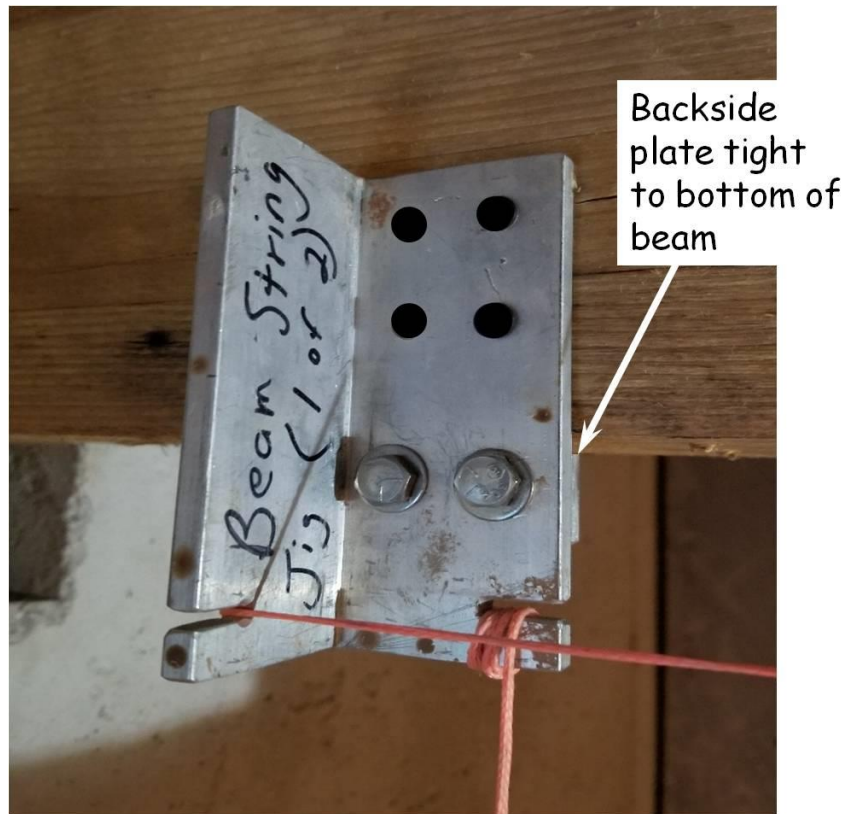
**WARNING:** It is critical that the person holding the long 2x4 maintain a secure grip to stabilize the beam as it is being installed in the foundation pockets and prevent it from swaying or falling over.

5. Install the beam in the foundation pockets by first positioning the beam on a long side wall so that both ends of the beam extend over the sill plates on the two short walls. Carefully slide the ends of the beam toward the pockets in the middle of the short walls. When both ends of the beam are positioned over the pocket, carefully move the beam forward until the end that is NOT scored drops into the pocket.
6. Elevate the scored end of the beam 6-12” above the level of the sill plate using 2x scrap. Trim the beam to length with a reciprocating saw, using the score lines as guides. Carefully remove the scrap 2x blocking, one piece at a time, and lower the beam into the pocket.
7. Place the beam so there is a ½” gap between each end of the beam and the back end of each pocket and so the beam is aligned with each of the marks on the concrete wall below the pockets that were established in Step 1 above.
8. Securely attach the temporary piece of 2x4 nailed to the beam in Step 4 by nailing it to the sill plate or by drilling a hole near the end and placing it over a foundation bolt. This will help stabilize the beam while support posts and I-joists are being installed.
9. Using metal shims, raise the beam until it is flush with the top of the sill plates on each of the end basement walls.
10. Wedge pre-cut treated lumber spacers (located in the Beam Bin) securely between the sides of the beam and the concrete in the beam pocket. Square the beam to the foundation wall by placing the long leg of a framing square on top the foundation wall and hang the short leg down against the face of the beam.
11. Attach support posts to the underside of the beam at proper locations according to the House Plan. Use four 5/16”x1½” lag screws and 5/16” washers to fasten the support post plate to the bottom of the lam beam making sure it is flush to the finished basement side of the beam. Set the bottoms of the posts on the concrete pads and roughly plumb them, but do not anchor at this time.

**REQUIREMENT:** The threaded adjustment screw and plate must rest on the concrete pad.

12. Approximately 6”-12” from one end of the beam, attach a Beam String Jig (located in the Beam Bin) to the bottom of the beam using four 1⅝” exterior screws. Repeat with the second jig at the other end of the beam. Attach a string line to the slot in one of the

jigs and pull it tightly through the slot in the jig at the other end of the beam. Secure the line by tying it to the remaining slot in the second Beam String Jig.



**Figure 1-4. Beam String Jig.**

13. If the beam is bowed, nail additional 2x4's from the beam to the sill plate, between floor joist locations, holding the end 2" back from the outside edge of the plate (to allow for later installation of the rim board). Confirm that the face of the beam is straight and parallel with the string using a scrap piece of 2x4 as a gauge block on the face of the beam along the entire length of the string.
14. Finish installing the posts. Plumb the posts and re-check that the beam is still straight. Attach each post to its concrete pad by first placing a 1/4"x1" fender washer over each of the holes in the bottom post flange and then securing with 1/4"x1 3/4" Tapcon® concrete screws through each washer into the pad.
15. Confirm that the bottom of the beam is straight and parallel with the string using a scrap piece of 2x4 as a gauge block on the bottom of the beam along the entire length of the string. Adjust the support posts vertically until the bottom of the beam is straight (these settings can be approximate at this point).
16. Check each I-joist above a post and the two end I-joists for crown by sight or use of a string line. If a crown is present, adjust the post heights accordingly. Verify that the top



of the beam at the pockets is flush with, or within  $\frac{1}{8}$ " of, the top of the sill plates. If not, consult with Construction Supervisor.

**EXAMPLE:** If one end of the beam is  $\frac{1}{4}$ " higher than the sill plates and the other end of the beam is  $\frac{1}{8}$ " lower than the sill plates, lower the higher end  $\frac{1}{8}$ " and raise the lower end  $\frac{1}{8}$ ". This reduces the height difference from  $\frac{3}{8}$ " to, a more acceptable,  $\frac{1}{8}$ ".

17. Remove the adjustment pins from the support posts.
18. Leave the string line in place. It will be used to confirm the beam location during I-joint installation.