

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

Materials needed:

Treated 2x6 [treated lumber](#)
Laminate beam
Sill seal
16d nails
8d nails
1½” Concrete nails
Washers and nuts
Metal shims
Acrylic caulk
Spray varnish

Tools and equipment needed:

Generator
Extension cords
Circular saw
Chop saw
Reciprocating saw
Drill with ¾” & 1½” wood auger bit
Drill with ½” masonry bit
Paslode nailer
Framing square
String line
Chalk box
Wood chisel
Caulk gun
Ratchet wrench and socket
30’ tape measure
50’ tape measure
6’ level
Stepladders
Extension ladder

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.
2. Measure the foundation to see how close it is to the blueprint dimensions. The sill plate may have to extend over or be pulled in from the foundation's edge depending on what the foundation measures.

EXAMPLE: If the blueprint dimensions call for one wall to be 40' and the foundation measures 39'11", extend the sill plate ½" over each end of the foundation. If the foundation is off more than 1", then the measurements on the blueprint will need to change.

1.1.2. For Square or Rectangular Foundations

1.1.2.1. Setting the Baseline

1. Establish a Baseline on the longest wall. Assuming the foundation and the blueprint dimensions match, make a pencil mark 4⁵/₈" from the outside edge of the foundation wall. Do this on both ends of the longest wall and snap a chalk line. **This Baseline is the chalk line used to establish all other chalk lines.** If the foundation and the blueprint dimensions do not match, adjust as stated above. Refer to Figure 1-1 for all steps in Section 1.1.2.

1.1.2.2. Setting the Parallel Line

1. Establish a Parallel Line on the foundation wall opposite the Baseline wall. One person holds the 9¹/₄" mark of a long tape on the chalk line at one end of the Baseline. Another person measures across the foundation and marks the width of the house on the opposite foundation wall.

EXAMPLE: The blueprint dimension for the width of the house is 28'. One person holds the end of a tape on the 9¹/₄" mark on the Baseline. The other person measures across the foundation to the 28' mark on the tape and makes a pencil mark on the wall.

2. Repeat Step 1 at the other end of the Baseline. Snap a chalk line between these two marks. This chalk line is referred to as the Parallel Line. Check measurements: the distance between the two lines should be 9¹/₄" less than the blueprint dimension of the house.

EXAMPLE: If the blueprint dimension for the width of the house is 28', the distance from the Baseline to the Parallel Line should measure 27'2³/₄" (28' - 9¹/₄" = 27'2³/₄").

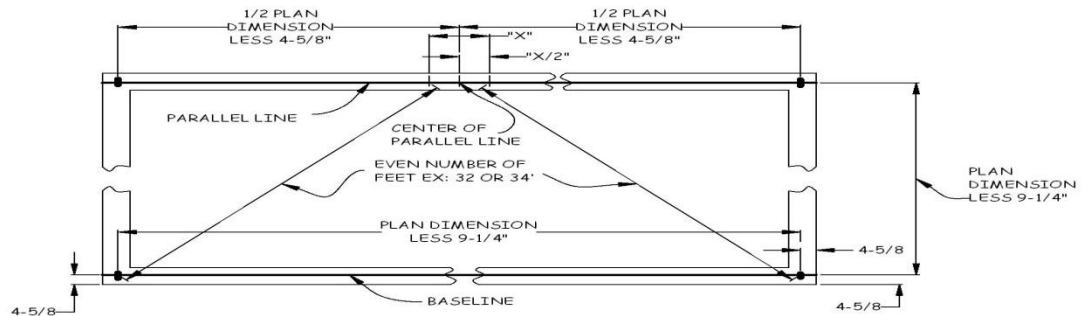


Figure 1-1. Sill Plate Chalk Lines.

1.1.2.3. Marking the Baseline corners

1. Start at one end of the Baseline and make a mark, perpendicular to the Baseline, $4\frac{5}{8}$ " in from the edge (assuming the blueprint and the foundation measurements are the same). This marks one corner of the Baseline. Next, one person holds the $9\frac{1}{4}$ " measurement of a tape on the mark just made. Another person measures along the Baseline and marks the length of the house at the other end of the Baseline. This marks the other corner of the Baseline.

EXAMPLE: The blueprint dimension for the length of the house is 40'. One person holds the $9\frac{1}{4}$ " mark end near the end of a tape on the corner mark of the Baseline. The other person measures along the Baseline to the 40' mark on the tape and makes a pencil mark on the wall.

1.1.2.4. Finding the center of the Parallel Line wall

1. Starting from one of the corner marks just made in Section 1.1.2.3, have one person hold the 1' measurement of a tape on that mark (remember that the measurement will read 1' longer than it actually is). Extend the tape over to a spot about the center of the Parallel line wall (estimating by eye is close enough) and make a mark on the Parallel chalk line at an even number of feet (e.g., 34' or 36').
2. Repeat Step 1 from the corner mark on the other end of the Baseline, being sure to measure the same number of feet (e.g., 34' or 36').
3. Measure along the Parallel chalk line between the two marks just made and make a mark exactly in the center of these two marks. This is the center of the Parallel line wall.

1.1.2.5. Marking the Parallel Line corners

1. Measure an equal distance to the right and left of the center point established in Section 1.1.2.4 that is exactly half the distance between the first two corners for the Baseline (Section 1.1.2.3), and mark each end.

EXAMPLE: If the distance between the two corner marks on the Baseline wall was 39', then measure 19'6" ($39'/2 = 19'6"$) to the right and left of the center point on the Parallel line and make pencil marks.

2. With a long tape take diagonal measurements of the corner marks to check for square. If it is out of square, adjust the Parallel line corner marks accordingly.
3. Now that the sill plate lines are square, check to make sure the short wall corner marks are the same distance (preferably $4\frac{5}{8}$ "; call it Distance A) from the outside edges of the short foundation walls. If necessary, adjust the floor box (see Figure 1-2) left or right along the long walls until Distance A on both short walls differs by less than $\frac{1}{8}$ ".

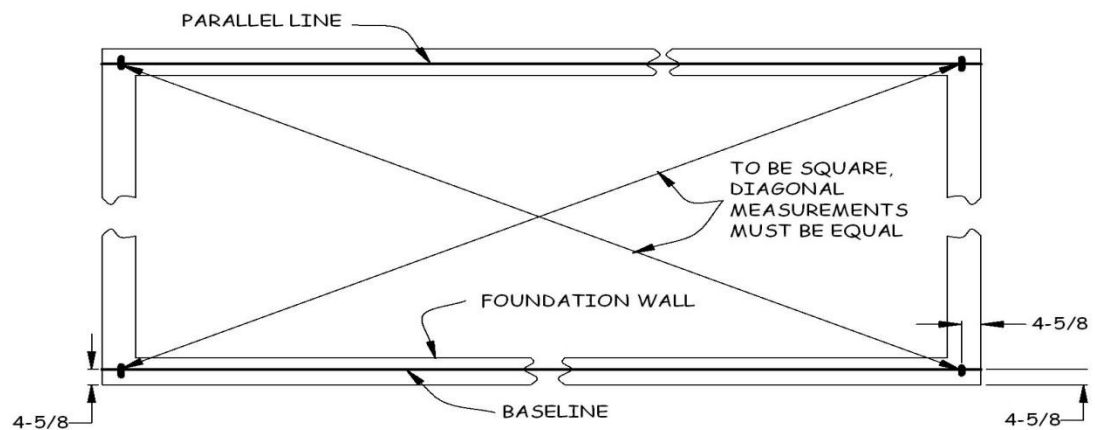


Figure 1-2. Squaring Foundation Lines.

4. When the diagonal measurements are the same and the corner marks are equidistant from the short walls, snap the remaining chalk lines on the short foundation walls perpendicular to the Baseline.
5. If a chalk line needs to be moved, re-snap with red chalk.
6. Spray all chalk lines with varnish spray.

1.1.3. For L-Shaped or Irregularly-Shaped Foundations

1.1.3.1. Setting the Baseline

1. Establish a Baseline on the longest wall. Assuming the foundation and the blueprint dimensions match, make a pencil mark $4\frac{5}{8}$ " from the edge of the foundation wall. Do this on both ends of the longest wall and snap a chalk line. If the foundation and the blueprint dimensions do not match, adjust as stated in Section 1.1.1 above.

1.1.3.2. Setting the Parallel Line

1. At one end of the Baseline have one person hold the $9\frac{1}{4}$ " mark of a long tape on the chalk line, measure across the foundation and mark the width of the house to establish one end of the Parallel Line.

EXAMPLE: The blueprint dimension for the width of the house is 28'. One person holds the $9\frac{1}{4}$ " mark of a tape on the Baseline. The other person measures across the foundation to the 28' mark on the tape and makes a pencil mark on the wall.

2. Move down along the Baseline until straight across from the corner of the foundation where the Parallel Line will start. Have one person hold the $9\frac{1}{4}$ " mark of a long tape on the chalk line, measure across the foundation and mark the width of the house to establish other end of the Parallel Line.
3. From those two marks snap a chalk line, this is a Parallel Line to the Baseline. Check the measurements.

EXAMPLE: If the blueprint dimension for the width of the house is 28', the distance from the Baseline to the Parallel Line should measure $27'2\frac{3}{4}"$ ($28' - 9\frac{1}{4}" = 27'2\frac{3}{4}"$).

1.1.3.3. Marking the Parallel Line corners

1. Start at one end of the Parallel line and mark $4\frac{5}{8}$ " in from the edge (assuming the blueprint and the foundation measurements are the same). This marks one corner of the Parallel line. Then, one person holds the $9\frac{1}{4}$ " measurement of a tape on the mark just made. Another person measures along the Parallel line and marks the length of the house at the other end of the Parallel line. This marks the other corner of the Parallel line.

EXAMPLE: If the blueprint dimension for the length of the house is 36', make a mark at $35'2\frac{3}{4}"$ ($36' - 9\frac{1}{4}" = 35'2\frac{3}{4}"$).

1.1.3.4. Finding the center of the Baseline wall

1. Starting from one of the corner marks just made (see Section 1.1.3.3), have one person hold the 1' mark of a tape on that mark. Extend the tape over to about the center of the Baseline wall (estimating by eye is close enough) and mark a spot on the chalk line at an even number of feet (e.g. 34' or 36').
2. Repeat Step 1 from the other corner mark on the other end of the Parallel line. Measure along the Baseline chalk line between the two marks just made and make a mark exactly in the center of these two marks. This is the center of the Baseline wall.

1.1.3.5. Marking the Baseline corners

1. Measure an equal distance to the right and left of the center point established in Section 1.1.3.4 that is exactly half the distance between the first two corners for the Parallel line (Section 1.1.3.3), and mark each end.

EXAMPLE: If the distance between the two corner marks on the Parallel line wall was 36', then measure 18' ($36'/2 = 18'$) to the right and left of the center point and make pencil marks.

2. With a long tape take diagonal measurements of the corner marks to check for square. If it is out of square, adjust the two Baseline corner marks accordingly.
3. Now that the sill plate lines are square, check to make sure the short wall corner marks are the same distance (preferably $4\frac{5}{8}"$; call it Distance A) from the outside edges of the foundation walls. If necessary, adjust the floor box (see Figure 1-2) left or right along the long walls until Distance A on both short walls differs by less than $\frac{1}{8}"$.
4. When the diagonal measurements are the same and the corner marks are equidistant from the short walls, snap the remaining chalk lines perpendicular to the Parallel Line.

1.1.3.6. Marking the remaining walls

1. There will be some remaining walls to mark. It may be a bump out or a section of wall that is pushed in from the main foundation footprint.
2. A square or rectangle footprint is already established on the foundation by Sections 1.1.3.1 through 1.1.3.5. Measure off the already established chalk lines to match the blueprint measurements and make marks accordingly. (If adjustments were made because the foundation and blueprint measurements do not match, continue to do the same.). Check for square and snap the remaining chalk lines.

3. If a chalk line needs to be moved, re-snap with red chalk.
4. Spray all chalk lines with varnish spray.

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 blue chalk lines created in Section 1.1. If any lines are not straight, re-snap them using red 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 3/4" or 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 1/2" spade bit to CAREFULLY drill a counterbore deep enough so the nut and a round 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 washer on top of a rectangular concrete form tab over each foundation bolt followed by a nut turned tight. If the hole has been counterbored, ONLY use a round washer; then, after attaching the nut, use a saws-all 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. If the edges of the sill plates do not align where they abut, toenail the sill plates with 8d nails.
12. Sight along the top of the sill plates to ensure they are level. To test, run a string line along all four sides. If necessary, use Tapcon® concrete screws to flatten sill plates.



Figure 1-3. Sill Plate Installation.

13. Lay a thick bead of exterior grade caulk on the interior side of the sill plate where it meets the foundation. Also, caulk between all butt and corner joints. Make sure there are no gaps in the caulk when the application is complete.

NOTE: Do NOT apply 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 that 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 ¼” 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. One person holds the end of the 2x4 nearest the foundation to stabilize the beam as it is being installed in the foundation pockets.
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 the end of the beam and the back end of the pockets and so the beam is aligned with the mark on the concrete wall below the pocket that was 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 drilling a hole near the end and placing it over a foundation bolt. This will help stabilize the beam while support posts are being installed and later when the basement floor is being poured.
9. Using metal shims, raise the beam until it is flush with the top of the sill plates on each end of the basement wall.
10. Cut scrap pieces of treated lumber and wedge them between the sides of the beam and the concrete in the beam pocket. These are a permanent part of the installation and must be anchored securely.

11. Attach support posts to the underside of the beam at proper locations according to the House Plan. Use four 1½” lag bolts and 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. Cut a piece of 2x scrap into three pieces of equal thickness. Nail one piece to the underside of the beam at each end. (The third piece will be used as a gauge block.) Stretch a string from the ends of the beam under the 2x blocks directly under one edge of the beam at each end.
13. If the beam is bowed, nail additional 2x4’s from the beam to one side wall sill plate, between floor joist locations, holding the end 2” back from the outside edge of the plate (to allow for installation of the rim joist).
14. Reconfirm beam placement dimensions from Step 6. Sighting along the string line and the edge of the beam, adjust the 2x4 supports until the beam is straight and parallel with the string. Using the 2x gauge block, adjust the support posts vertically until the beam is level to the string line (these settings can be approximate at this point).
15. Finish installing the posts. Plumb the posts, ensuring that the gauge block settings have not changed, and that the beam is still straight and level. Attach each post to its concrete pad by first placing a round washer (same as the ones used for securing the sill plate to the foundation) over each of the holes in the bottom post flange and then manually nailing a 1½” concrete nail through each washer into the pad.
16. Run a string line from the sill plates on each side wall across the beam above each post. If there is a significant difference that may cause problems with leveling the I-joists, adjust the post heights to minimize the problem.

EXAMPLE: If one end of the beam is ¼” higher than the sill plates and the other end of the beam is ⅛” lower than the sill plates, lower the higher end ⅛” and raise the lower end ⅛”. This reduces the height difference from ¾” to, a more acceptable, ⅛”.

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