

Chapter 16. Subfloor and Finish Stairs

16.1 INSTALLING MULTI-PLY SUBFLOOR

16.2 FINISHING STAIRS

Tools needed by volunteers:

Hammer
Nail apron
Tape measure

Tools and equipment needed:

Extension cord
Belt sander
Drill driver
Finish nailer
Table saw
Air compressor
Pneumatic stapler
Shop vac
Skirtboard Template
Sheetrock square
Putty knife
Utility knife
Broom
Adjustable bevel
Floor scraper
Red crayon

Materials needed:

¼" Subfloor
Staples
80 Grit sanding belts
1⅝" Exterior screws
2½" Exterior screws
2" #7 Trim screws
2½" Collated finish nails
2½" Finish nails
Tapered shims
¼"x3"x5" Shims
Weatherstripping
Scrap foamboard
Construction Adhesive
Spray foam
Pneumatic tool oil
Stair handrail, brackets, and screws
Stair skirtboards
Stair treads
Stair risers

Personal Protection Equipment:

Safety glasses (required)
Dust masks (recommended)
Ear plugs (recommended)

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

16.1. INSTALLING MULTI-PLY SUBFLOOR

16.1.1. Preparation

1. Check for floor squeaks. Where found, drive a 2½” exterior screw through the sub floor into the floor joists to eliminate the squeak.
2. Scrape the entire floor to remove any plaster, debris, or protruding nails or staples.
3. Using a belt sander, sand the OSB sub floor seams to ensure the seams are flush so the subfloor will lay flat.
4. Vacuum the floor.
5. Verify that all floor vents in the hard flooring areas (at a minimum) are nailed in place and air sealed per instructions in Section 12.3.3.
6. Wherever the subfloor will cover existing stud location marks on the floor, transfer the marks to the wall with a red crayon (no higher than 2” off the floor).
7. Snap a chalk line 47¾” out from the wall surface (plaster). Lay subfloor sheets tight to the chalk line, butted tightly against each other, and located slightly under the plaster wall. Adjust as required and tack first row in place.
8. If the subfloor provided does not contain x’s pre-marked on the sheet, mark lines ½” from each edge, then lines every 4” in both directions to layout a series of intersecting lines to use as stapling guide. Also, make marks every inch on the lines ½” from each edge.
9. Plug the compressor into an outside outlet WITHOUT using an extension cord (the compressor can draw high current). Tilt the compressor and close the pressure relief valve (horizontal position). Connect one or two compressor lines. Turn the compressor on and set the pressure to about 80 psi.

NOTE: At the end of the day, tilt the compressor and slowly open the pressure relief valve (vertical position) to release the air and drain any moisture from the tank. Set the compressor back down to ensure all moisture drains out.

10. Place a few drops of pneumatic oil into the air inlet of the pneumatic power stapler.

NOTE: This may have to be done a few times throughout the day or after encountering stapling issues like multiple staples being fired or staples suddenly not countersinking properly (and the air compressor pressure is fine).

11. Connect the power stapler to a compressor line.

16.1.2. Installation

1. Alternate rows of subfloor should be staggered 12"–24" in order to avoid a point with four corners. Multi-ply seams must be at least 6" from any parallel sub floor decking.
2. Plan the layout so a full sheet is placed in front of all doors.
3. Begin the second row with a half-sheet and tack pieces in place as they are laid. Gaps between sheets must be less than $\frac{1}{8}$ ".
4. Where an exterior door enters a carpeted area, the subfloor should extend 8" outside the arc of the door in both the open and closed positions, and the inside corner should be trimmed to a 24" radius. Install the sheet per the following instructions:
 - a. Place a sheet of subfloor on the floor in front of the front door, tight to the left and right door jambs. Position the sheet so it's 8" beyond the edge of the door. Mark the 8" position on the floor.
 - b. Make a mark on the sheet along the outside edge of each door jamb. (These marks will be used to realign the sheet after trimming.) Trim $\frac{1}{4}$ " off the sheet edge between these marks to allow the sheet to slide $\frac{1}{4}$ " under the adjacent sheetrock.
 - c. Open the door 90° and make a mark on the subfloor 8 $\frac{1}{4}$ " beyond the edge of the door. Use a T-square to extend this mark across the sheet and trim along this line.
 - d. Locate the center point for scribing a 24" arc on the transition corner of the subfloor. Make a mark 24" in from the corner on both sides. Use a T-square to extend these marks and tack in a nail at the intersection of the lines. Place the loop of a string on a pencil, place the pencil tip at the edge of the sheet, and wrap the string around the nail. Hold the pencil tight and draw the arc between the sheet edges. Trim the radius with a jig saw.
 - e. Re-install the sheet against the door jambs with the sheet edge under the sheetrock and the corner 8" beyond the edge of the closed door. Secure the sheet to the floor.
 - f. Fill in the space behind the door with a single piece of scrap subfloor.
5. Seams between hard flooring and carpeting should be midway under the bottom of a door when closed. Doors when closed are not located in the middle of the doorjamb. Use the edges of the jack stud as reference. For doors swinging inward, use the inside edge of the jack stud for the location of the end of the subfloor. For doors swinging outward, use the outside edge of the jack stud. (See Figure 16-1.)
6. Subfloor should extend under doorjambs to avoid open gaps.

7. Ensure all holes for registers are cut open.

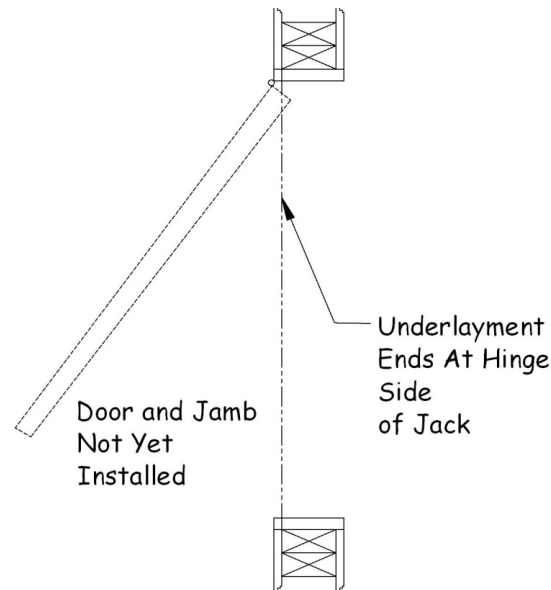


Figure 16-1. Subfloor in Interior Door Opening.

8. When stapling, constantly check to make sure the gun is loaded with staples and that the compressor air pressure is high enough to ensure staples are countersunk **below** the surface of the sheet (**otherwise each staple will have to be countersunk by hand**).

NOTE: Some of the power staplers have a depth adjustment feature that can be used to adjust the stapling depth.

9. Adjust the exhaust outlet of the power stapler to vent away from the finished wall surface. This is critical to avoid “staining” the plaster and making painting difficult.
10. Start the stapling process **at one end of the floor** by first “tacking” several sheets before completing the stapling process. Start at the center of each sheet and then staple vertically, horizontally, and then diagonally every three or four X’s.
11. When several sheets have been “tacked”, completely staple each sheet by again moving from the center toward the edges. **Do not staple edges of the floor before stapling the interior.** In the field of each sheet, place one staple at each “X” mark and one in the middle of every four “X” marks (this will make the average spacing of each staple about 3”).
12. At all seams, staple the edges at 1” intervals about $\frac{3}{8}$ ” from the edge of the sheet. At all other edges (against a wall, next to carpeting, in the doors, or along the tub or shower), staple only at the X’s. **Drive all staples parallel with the grain of the sheet.**

13. Quality check each subfloor sheet by verifying that all staples have been installed at the appropriate spacing and that they are set below the surface. Check with a putty knife or ice scraper. Set offending staples with a hammer.

NOTE: Shining a flashlight or treble light straight down on the surface helps to identify missing staples (indicated by no reflection).

16.2. FINISHING STAIRS

16.2.1. Installing the Handrail

1. All stairways with more than three risers require handrails.

NOTE: For safety reasons, it is recommended that the permanent handrail be installed before installing the skirtboard and permanent treads.

2. A handrail should be continuous for the entire length of the stairs except:
 - At an intermediate landing, or
 - At an intermediate wall where the horizontal offset between the two rails is less than 12”.
3. At the top and bottom stair treads, measure vertically 31” above the nose of the treads and mark the wall. Pull a string line very tight between these marks. This line represents the location of the bottom holes in the three handrail mounting brackets and will place the top of the handrail about 35” above the stairs. Adjust this level slightly up or down for special circumstances. The top of the handrail must be located at least 34” but no more than 36” above the nose of the stair treads.
4. Along this line, first mark the wall for locations of the top and bottom handrail brackets. Locate the top bracket 10-12” from the top end of the stairway wall and the bottom bracket 10-12” from the bottom end of the stairway wall, or from door trim if present (see Figure 16-2). Check for blocking or stud with an 8d or 2½” finish nail.

NOTE: Blocking has been installed for the handrail at the top, middle, and bottom of the stairs (see Section 10.6.5 and Figure 16-2).

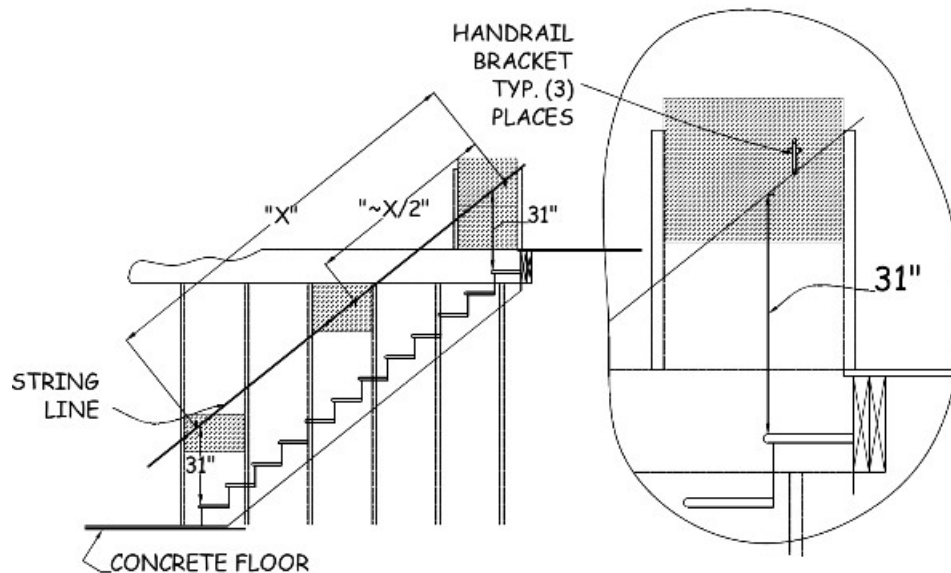


Figure 16-2. Handrail Bracket Installation.

5. Install handrail brackets at both top and bottom locations. The middle bracket will be installed after the handrail is cut to length.
6. Cut the handrail to a length such that each end will be 2"-3" from the end of the wall or door trim. Once the returns are installed (Steps 12 & 13 below) this will provide adequate room for hand grip without so much room that the railing flexes or moves.
7. With the flat side of the handrail firmly on the bed of the saw, cut opposite 45° miters on each end of the handrail (the miters will be perpendicular, not parallel, to each other). These mitered ends of the handrail provide a surface for installing a return back to the wall.
8. Before attaching the handrail to the top and bottom brackets, locate the center of the handrail and, using a 1/8" drill bit and the short brass screws provided, attach the middle bracket to the flat underside at this location. Once the rail is attached at the top and bottom, this bracket will be centered approximately half way between the top and bottom brackets - an exact location is not necessary.
9. Set the flat side of the handrail on the top and bottom handrail brackets in the position defined in Step 7 above. Again, using a 1/8" drill bit and the short brass screws provided, attach the handrail clip to the bottom of the handrail.
10. Standing at the top and bottom of the stairs, sight along the handrail and raise and lower the center bracket along the wall until any bow in the rail is minimized. Screw the bracket to the wall with the long brass screws provided.
11. Cut opposite 45° miters on a piece of handrail at least 20" long (this length will allow safely cutting short pieces off each end). Install the handrail and move the mounting brackets under the handrail to their farthest positions from the wall.

Measure from the long end of the miter to the wall at each end (the distances may not be the same). Carefully cut (square cut) two pieces these lengths from the short, mitered piece.

12. At each end of the rail, check the fit of the miters and if acceptable, apply wood glue to the miter cuts of both the handrail and the return piece. Set the return piece in place, and hold in place with a clamp. If necessary, wedge a tapered shim between the wall and the end of the return to ensure good contact at the glue joint.
13. Using a 1/8" drill, predrill the miter joint and screw the return to the rail using 2" #7 trim screws. Use one screw in each direction, with a slight vertical offset to avoid the second screw hitting the first. Wipe off any excess glue and putty the holes. If the return is not tight to the wall, loosen the screws holding the bracket to the rail, push the return tight to the wall, and retighten the screws. If necessary, insert a shim between the bracket and the underside of the rail to ensure a tight fit.

16.2.2. Installing Skirtboards

1. Scrape wall surfaces behind the stair stringers to ensure skirting will lay flat on the wall surface.
2. Clean off any dirt or plaster on the 2x4 on either side of the outside stringers. This will allow the skirtboard to sit firmly down on the 2x4.
3. On each side of the top of the stairway, cut a 1" wide notch in the subfloor overhang, flush with the header, so the skirtboard can rest tightly against the header. Using a square, draw a 4" long plumb line on the wall aligned with the face of the header. This represents the top end of the skirtboard.
4. At the bottom of the stairs, use a level to draw about an 8" plumb line 4" from the end of the stringer. Sometimes the wall ends there, or there is a door opening that will not allow you to go 4" past because of the trim that goes on the door; draw the line as far as possible up to 4".
5. Lay the 24" side of a framing square on the 2x4. Make two marks 11 1/2" up from the 2x4 (the width of the skirtboard) about 3' apart at each end of the stairway (see Figure 16-3). Repeat on the other side of the stairway.

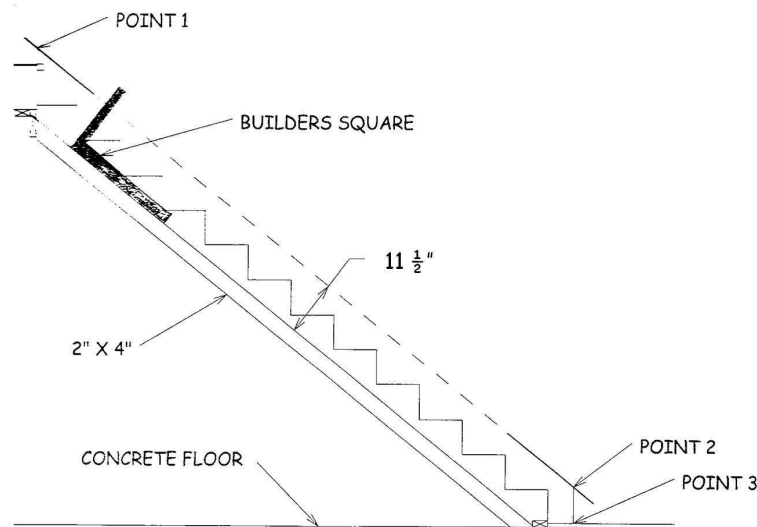


Figure 16-3. Skirtboard Installation.

6. Place a 6' level on the two marks at the top of the stairway (from Step 5) and scribe a line across the two marks to a point that intersects the plumb lines from Step 3. This creates Point 1, which must be at least 3" above the floor to be higher than the floor trim (see Figure 16-3). Then, using the two marks at the bottom of the stairway (from Step 5), draw a line to a point that intersects the plumb line. This intersection is Point 2 (see Figure 16-3). Repeat on the opposite side of the stairway.
7. Measure from Point 1 to Point 2; this is the total length of the top edge of the skirtboard. Then, measure from Point 2 (on the wall) straight down to the floor. This measurement minus $\frac{1}{4}$ " is the dimension to Point 3. Subtract another $\frac{1}{4}$ " if there will be hard flooring at the bottom.
8. Compare measurements from both sides of the stairway. If the 2x4s have not been installed exactly the same on each side, there may be small differences between the measurements of the two sides. If they are different, make the following adjustments until the measurements are the same (to allow cutting both skirtboards at the same time):
 - a. Measure up to Point 1 on both sides. Adjust the point as required so that both sides are at the highest measurement of the two sides, and a minimum of 3" above the subfloor.
 - b. At the bottom, measure up to Point 2 on both sides, and adjust as required so that both are at the highest measurement of the two sides.
 - c. Finally, measure the distance from the adjusted Point 1 to the adjusted Point 2 on both sides to get the length of the top of the two skirtboards. These measurements should be equal within $\frac{1}{4}$ ". If not, recheck measurements above.

9. If the bottom of the skirtboard ends close to an outside corner, adjust the length so that the skirtboard ends flush with the corner (base trim will end flush with the face of the skirt), or it ends at least 1" back from the corner to allow for base trim to wrap around the corner.
10. If the bottom of the skirtboard ends close to a door opening, the length may need to be adjusted so there is adequate room (1-2") to install base trim between the door casing and the end of the skirtboard. However, the end of the skirtboard (Point 2-to-Point 3 line) must be at least 4" past the end of the stringer. If there is insufficient space for both base trim and door trim, first eliminate base trim and second rip or notch the door trim to fit.
11. Locate the Skirtboard Template provided as a starting guide in cutting the two ends of the skirtboard. If the template is 2' or less in length, cut a new template and transfer the angles at the two ends from the old template to new template. The angles may be approximate only. However, plan to measure, mark, and cut the ends of the template to match the specific circumstance of the stairs being worked on. Once modified to fit, use the template to layout and cut both ends of the skirtboard.
12. To establish the correct angles, place the template at the top of the stairs, tight against the edge of the flooring, and exactly aligned with the line drawn on the wall in Step 5. If necessary, tack it to the wall with two 2½" finish nails to keep it in place.
 - a. If the vertical edge of the template is perfectly parallel with the plumb line on the wall, that angle should be used in laying out and cutting both ends of the template and the skirtboard.
 - b. If the vertical edge of the template is not parallel with the plumb line, set an adjustable bevel on the top of the template and align it with the plumb line and lock it. This will be the angle to be cut the template at both ends - at the top, with the adjustable bevel set on the top end of the template and at the bottom with the bevel square set on the bottom end of the template. These cut edges will then be parallel.
 - c. Move the template to the bottom of the stairs, again aligning with the lines drawn in Step 6. Confirm that the end is plumb. If not, recheck the top and bottom lines and adjust as necessary. Measure the distance from Point 2 to Point 3 and transfer that dimension to the template. Cut the bottom of the template 90° to the vertical at that point.
 - d. Move the template to the opposite side of the stairway and confirm angles and dimensions. Adjust as necessary to stay within ¼" tolerances.
13. Set the skirtboard on saw horses with the unfinished side up (any tear out from the circular saw will then be on the unfinished side). Lay the template on the board and orient it to establish the proper cut orientation at the top of the skirtboard. If the top

angle of the template is correct, use it to mark for cutting. If not, use the adjustable bevel angle established above. This will establish Point 1 (see Figure 16-2).

14. Measure along the top of the skirtboard to locate Point 2 at the distance measured in Step 6. With either the template or the adjustable bevel, as appropriate, mark the correct angle for the bottom end vertical cut. Check to be sure the top and bottom cuts will be parallel.
15. Transfer the Point 2-to-Point 3 measurement from Step 8 to the skirtboard (keep in mind that the skirtboard is held $\frac{1}{4}$ " off the floor) to locate Point 3. From Point 3 (on the skirtboard), create a 90° corner with a pencil line; this edge will run along the floor.
16. Before cutting the skirtboard, recheck all measurements for angles and lengths and adjust until correct. Cut the first skirtboard and test fit on both sides of the stairway. Use it as a template to cut the second piece by placing the unfinished sides together.
17. Before installing the skirtboards, stain both ends.
18. Prior to placing the skirtboard in position, measure from the final Point 1 to the floor and mark the upper edge of the skirtboard at this dimension down from the peak. Drive a $2\frac{1}{2}$ " finish nail into the end, leaving about $\frac{1}{2}$ " exposed. This will provide a "handle" to help lift the board into position.
19. Place the skirtboard in position, apply pressure from the bottom to seat it firmly in the notch in the floor, and lift it up at both ends to match with Points 1 and 2. Lift it enough to cover any layout pencil lines on the wall. If the basement is not to be finished, hold the skirtboard off the floor with a temporary $\frac{1}{4}$ "x3x5 shim. Nail the skirtboard to the wall, nailing into studs or blocking with $2\frac{1}{2}$ " collated finish nails. Putty the nail holes.
20. Repeat Steps 18 and 19 for the opposite skirtboard.

16.2.3. Installing Treads and Risers

1. Verify the stringer rise is $9\frac{3}{4}$ " and stair treads are $11\frac{1}{4}$ " to $11\frac{1}{2}$ " wide. This will ensure that the stair treads do not need to be ripped to width. Consult the Construction Supervisor if the dimensions are not as above.
2. Prepare a block 2" thick (e.g., a 2" long piece of 2x4). This will be used to ensure the treads have equal nose overhang of 2" from the stringer rise, resulting in $1\frac{1}{4}$ " tread overhang once the riser below it is installed.

NOTE: Refer to Figures 4-6 and 4-7 for identification of stringer rise and stringer run.

3. For safety reasons, only remove the temporary treads from one step at a time.

WARNING: Make certain that the stairway gap is never unattended during this process.

4. Install the bottom tread first. Measure between the skirtboards to get the length of the tread. If the stairs are going to be carpeted, cut the tread $\frac{1}{2}$ " short. If the stairs are not going to be carpeted, cut the tread $\frac{1}{8}$ " short.
5. With the 2" block from Step 2 above against the rise of one of the stringers and a tread placed on the run of one of the stringers just above it, verify the tread does not extend past the outside face of the 2" block. This ensures the treads will not need to be ripped to width.
6. Install the first tread, starting at the bottom of the stairs. Apply a bead of construction adhesive on the run of the three stringer sections. Place the tread on the stringers, align so the tread is centered between the skirtboards and the nose of the tread is flush with the 2" thick block held against one of the outside stringers. Drill one $\frac{5}{32}$ " pilot hole through the tread into the stringer about $3\frac{1}{2}$ " from the nose of the tread. Loosely secure the tread using a $2\frac{1}{2}$ " exterior screw.

NOTE: When drilling into the tread and stringer, insert the drill bit into the chuck so that $1\frac{3}{8}$ " of the bit is exposed. This will cause the drill to penetrate $\frac{1}{4}$ " into the stringer. Always ensure the drill and screw are penetrating the stringer at its centerline to avoid splitting the wood.

7. With the other outside stringer, check flushness with the 2" block and drill and secure using a $2\frac{1}{2}$ " exterior screw as described in Step 6 above.
8. Drill and insert screws as described in Step 6 above so that the tread is secured to each stringer section with three screws (one screw $3\frac{1}{2}$ " from the nose of the tread, one screw 1" from the back edge of the tread, and one screw centered between these two). All screws should be inserted until they are flush, or slightly below, the tread surface.
9. Install the bottom riser below the tread just installed. Establish and cut the length of the riser using the same process as the bottom tread (Step 4 above). Rip the width of the riser to $\frac{1}{8}$ " less than the height between the two treads.
10. Center the riser between the skirtboards and position the riser tight against the tread above it. This will leave a small gap between the riser and the tread below it. Secure the riser to the rise of the stringers with $1\frac{5}{8}$ " exterior screws: two in each stringer (six total). Ensure the screws are installed $1\frac{1}{2}$ " from the top and bottom of the riser and on the centerline of the stringers to avoid splitting the wood. Predrilling for these screws is not necessary.
11. After a tread and riser pair is installed, remove the temporary tread from the step immediately above it.

12. Repeat Steps 4-11 above for each tread and riser, proceeding up the stairway.

NOTE: Cut no more than 2-3 treads and risers to length at a time, in case distance between the skirtboards varies along the stairway.

13. For the topmost tread, measure from the beam at the top of the stairs to the stringer rise immediately below where the topmost tread will be placed and add 2". Rip the top tread to this width. Install the top tread as described in Steps 6-8 above.
14. Install a riser below the topmost tread using Steps 9-10, above.
15. No riser is required above the topmost tread.

TIP: An alternative sequence is to install all (or several) of the treads first, and then install the risers.