

Chapter 9. Windows and Exterior Doors

9.1 INSTALLING WINDOWS

9.2 INSTALLING EXTERIOR HOUSE DOORS

Tools needed by volunteers:

Hammer
Nail apron
Tape measure
Square
Utility knife

Tools and equipment needed:

Generator
Extension cord
Chop saw
Putty knife
Caulk gun
Nail set
6' level
Ladder

Materials needed:

Air sealing caulk
Flashing tape
Air sealing tape
Threshold seal tape
Orange floor tape
2½" Exterior screws
#8 3" Brass-colored construction screws
4" Timber screws
16d Galvanized finish nails
8d Galvanized finish nails
2½" Siding nails
1¼" Finish nails
Tapered shims
¼"x3"x5" Flat shims
¼"x3"x5" Flat shims
⅛"x1" Flat shims
¼"x1" Flat shims
1/16"x1½" Flat cardboard shims
Sill pans (if available)
Door hardware

Personal Protection Equipment:

Safety glasses (required)

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

9.1. INSTALLING WINDOWS

9.1.1. Window and Rough Opening Preparation

9.1.1.1. General Preparation

1. Unpack the windows and check for proper size and damage. Lattice windows are always installed in the front of the house. For each opening, verify the size and type – double-hung, sliding, grids – to be installed. Measure the rough opening dimensions and check for any obstructions. If any dimensions exceed the specifications by more than $\frac{5}{8}$ " , consider feasible corrections. However, any changes must maintain adequate nailing surface and keep the window top consistent with other windows for proper siding look.
2. Remove the screens and sashes from each window and set aside for later reinstallation.

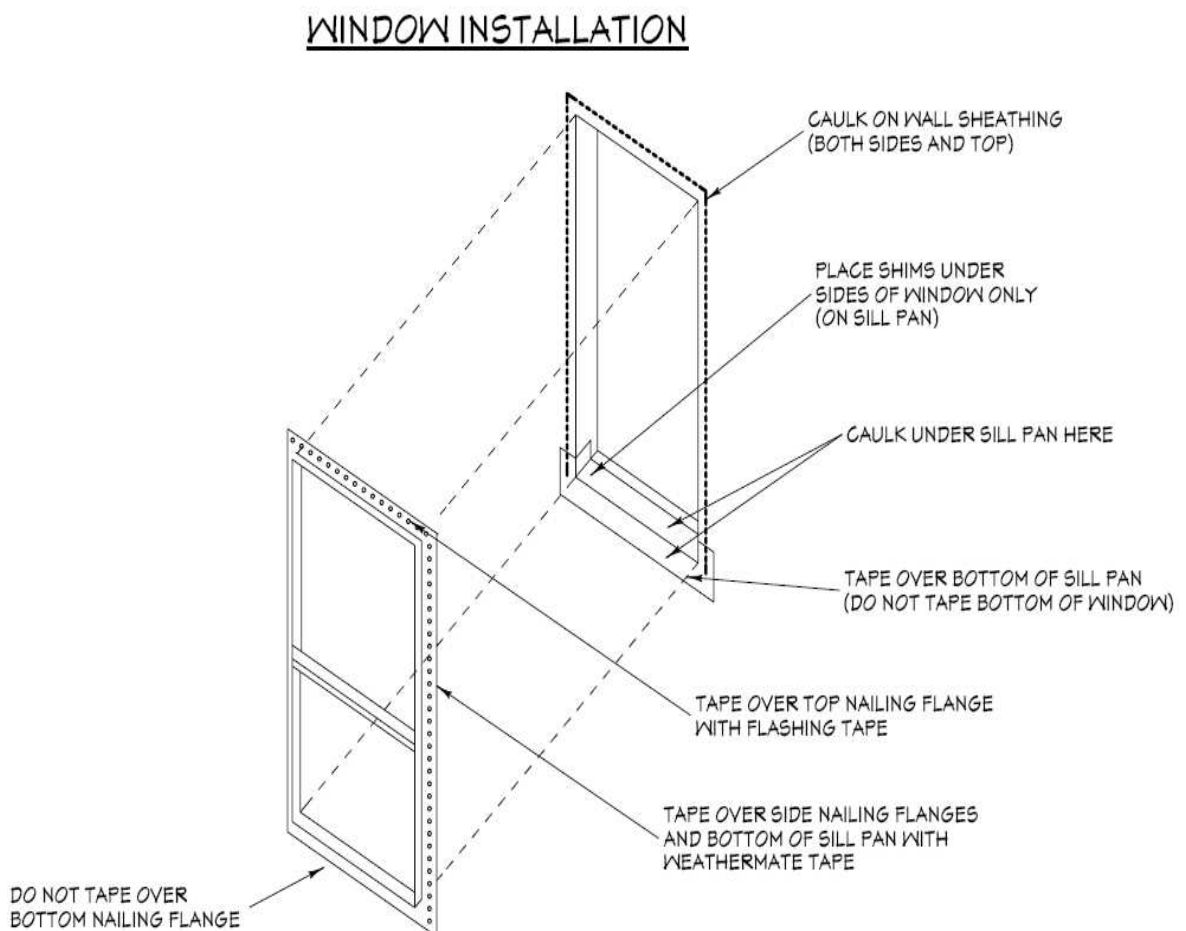


Figure 9-1. Window Installation

3. Trim any excess sheathing around the perimeter of the opening flush with the framing to allow centering the window in the frame horizontally and vertically.

4. From the trailer, obtain flat cardboard shims and 1/8"x1" and 1/4"x1" flat wood shims. Cut pieces 2-3" long for use under the windows.
5. Using the longest level that will fit within the opening, check the sill for level. Assemble enough flat cardboard shims, flat wood shims and tapered shims as necessary to level the window frame. Pieces must be sized to fit properly under the end and center frames of the window, inside the sill pan (if in use), and must be at least 1/8" thick in order to provide drainage clearance between the bottom of the window and the sill. Preferably, use at least one 1/8" or 1/4" flat shim plus a tapered shim, if needed. With all slider windows, include shims for the center frame as well.

9.1.1.2. Preparation Using Flashing Tape

1. Cut a length of flashing tape 8"-10" longer than the width of the window frame. Lay it on the sill with the inside edge approximately 2 1/2" from the outside edge of the sheathing and the inside edge of the tape at least 1/2" inside the window frame. Attach the tape to the sill and the sides of the frame. Cut at each corner and fold the tape down and out to the outside of the frame.
2. Starting and ending below the flashing tape, run a continuous bead of air sealing caulk on the exterior surface of the foamboard up both sides and over the top of the rough opening. Apply the caulk within 1/4" of the edge of the opening.
3. Place a flat and/or tapered shim combination (prepared in Section 9.1.1.1.5) on the sill at each end (directly under the end frame) and in the middle for windows equal to or greater than 36" wide.

9.1.1.3. Preparation Using Sill Pans.

1. Run a continuous bead of air sealing caulk on the sill and 3" up the sides. Apply the caulk 1/2" from the exterior edge of the sill framing (not the foamboard).
2. Run a continuous bead of air sealing caulk on the exterior surface of the foamboard under the window and extending roughly 6" up both sides of the rough opening. Apply the caulk 1/4" or less from the edge of the opening.
3. Install one half of a sill pan on the sill of the window opening. Be sure to seat the sill pan completely flat on the sill. Run a short bead of air sealing caulk along the center edge of the first half and then install the second half on top. Press both pieces tight to the sill.
4. Run a continuous bead of air sealing caulk on the exterior surface of the foamboard up both sides and over the top of the rough opening. Apply the caulk within 1/4" of the edge of the opening.

5. Place a shim (prepared in Section 9.1.1.1.5) within the sill pan at each end (directly under the end frame) and in the middle for windows equal to or greater than 36" wide.

9.1.2. Position and Temporarily Secure Window in Opening

1. Locate the top of the window by checking the labels, or by locating any weep holes (orient weep holes at the bottom of the window). Place window unit in the rough opening roughly centered left to right. Check that the spacers/shims are in place below the window frame, under the vertical frames. If not, lift the frame and put them back in place.

CAUTION: Be sure someone continues to support the window from the outside until it is secured with nails.

2. Center the window vertically by adding/removing 1"- and 1½"-wide shims below the right and left corners. Then center the TOP of the frame left and right. By centering the top now, the frame can be squared later by racking the top of the frame.
3. Place a level on the bottom frame and level the bottom of the window, adjusting shims as necessary. Push the sides of the shims tight to the inside of the window flange. Trim any protruding tapered shims flush with the frame.
4. Using 2½" siding nails, nail the bottom hole in each of the side flanges of the window. To protect the window frame when nailing, hold a shim, putty knife, or flat wrecking/pry bar flat against the frame. If the nail is missed, the hammer will hit the protective device and not the frame.

NOTE: Make sure to pound the nails in straight. If even slightly angled, they will push the frame of the window in toward the windowpane causing the window to become very hard to open and close (because the window frame is now too narrow).

5. Using 2½" siding nails, TACK nails in the center of the leftmost and rightmost slots in the top flange of the window.
6. While holding the frame in place from the outside, insert the top and bottom sashes into the frame and push them into place at top and bottom.

CAUTION: Hold the frame firmly in place while sashes are being inserted. They have to be pushed firmly to one side to insert them into the frame.

7. Raise the bottom sash just enough to create a small reveal with the bottom frame. Check to see if the reveal is uniform. If it is, this indicates the window is square. If it is not, rack the top of the window frame left or right until the reveal is uniform

and the window is square. To adjust the reveal, pry the top of the frame in the direction of the wider reveal.

NOTE: Before racking the window, place temporary shims in the lower corner opposite to where the pry bar will be inserted. This will prevent the lower frame from shifting as the top frame is racked. Be sure to remove these shims when the window is fully nailed.

8. Similarly, pull down the upper sash and check the reveal between it and the top frame. If the top sash reveal indicates a different adjustment than the bottom sash reveal, “average” the adjustment to the top frame and recheck the bottom reveal.
9. With slider windows, open both sashes slightly to see reveals on both sides. Using a small pry bar, lift the center of the bottom frame until reveals are equal. Check for proper sash movement and locking. Insert a shim to hold the frame in place and finish nailing.
10. Finish securing the nails in the leftmost and rightmost slots in the top flange of the window installed in Step 5.

9.1.3. Permanently Secure Window

1. Using a level held against the outside or inside of the window frame, verify that all four sides are straight. Draw a 4”-5” line on the foamboard above and below the center hole on each side. Holding the frame against that line, nail 2½” siding nails, snugly through the center hole of each flange to hold them straight. Use the lines on the sides to verify that the frame has not moved when nailing. Do a final re-check of the reveal and window operation and then nail the rest of the slots.
2. Seal the window frame to the wall.
 - a. When using FLASHING TAPE (see Section 9.1.1.2), apply air sealing tape to the side flanges, being sure to overlap the ends of the air sealing tape below the sill. Apply flashing tape to the top flange, being sure to overlap the top of both side tapes. DO NOT tape the bottom flange of the window to the foam board below the flange.
 - b. When using SILL PANS (see Section 9.1.1.3), tape the bottom of the sill pan to the foamboard with air sealing tape. Apply air sealing tape to each side flange, being sure to overlap the tape covering the bottom of the sill pan. Apply flashing tape to the top flange, being sure to overlap the top of both side tapes. DO NOT tape the bottom flange of the window to the foam board below the flange.
3. Reinstall the screen in the frame.

9.1.4. Installing Basement Windows and Screens

1. Clean debris from tracks.
2. Install window sashes with label right-side up.
3. Install the screen.

9.2. *INSTALLING EXTERIOR HOUSE DOORS*

9.2.1. Door and Rough Opening Preparation

1. Before removing packaging or shipping parts, inspect the door and frame. If there is any damage, notify the Site Leader or Construction Supervisor.
2. Remove bags of door accessory parts from the door frame and attach to one of the king studs for the door.
3. Verify correct door and size. Verify proper door swing according to the House Plan. Verify that the door has a hole for the deadbolt (a door without that hole is for the shed or the garage service door).
4. Using a 1/8" drill bit, pre-drill the brickmold where 16d galvanized casing nails will be placed (five on each side and three on top). Hold the holes near the upper mitered corners 3" away from the corner. Angle the holes slightly away from the jambs to ensure that the casing nails will hit the Jack stud.
5. If house wrap extends through the doorway, fold it down over the threshold area and staple it to the deck in the doorway.
6. If not already installed, cut and install a length of flashing tape sufficient to cover the width of the threshold and about 2" up each side of the Jack studs. Install with about half the width on the deck and half on the foamboard. Cut at the corners and fold and attach to the outside.
7. Install threshold seal tape snug to corners and flush to the outside edge of the threshold.
8. The following Steps 9 and 10 are designed to reduce the difference between the width of the door frame and the width of the rough opening at the hinge locations to 3/8" or less. Doing so helps to
 - Center the door in the rough opening;
 - Avoid trying to install spacers and/or thick shims once the door is in place; and,
 - Equalize the overlap of the interior trim.

9. Adjust hinge side Jack stud.
 - a. Mark the location of the hinges on the hinge side Jack stud.
 - b. In all cases in this section, install **3"x5" flat shims** (using **1/4" finish** nails) with their 5" dimension vertical.
 - c. Measure the width of the door frame at the head jamb and the width of the rough opening at the top and bottom hinge locations.
 - i. If the difference between the door frame and the rough opening at either location is **LESS THAN OR EQUAL** to $\frac{5}{8}$ " add a $\frac{1}{8}$ " 3"x5" **flat shim** to all three hinge locations. Go to Step d below.
 - ii. If the difference between the door frame and the rough opening at either location is **GREATER** than $\frac{5}{8}$ ", attach a combination of $\frac{1}{8}$ " and $\frac{1}{4}$ " 3"x5" **flat shims** to the hinge side Jack stud at the top and bottom hinge locations until the difference is less than $\frac{5}{8}$ " at both locations. At a minimum, each Jack stud hinge location should have a $\frac{1}{8}$ " **flat shim**.
 - d. Using a 6' level, check if the Jack stud is plumb. If **NOT PLUMB**, shim the top or bottom hinge areas until it is plumb.
 - e. Keeping the 6' level against the top and bottom **shims**, attach $\frac{1}{8}$ " and $\frac{1}{4}$ " 3"x5" **flat shims** and/or **tapered** shims at the middle hinge area until flush with the level.
10. Adjust strike side Jack stud.
 - a. Add a combination of $\frac{1}{8}$ " and $\frac{1}{4}$ " 3"x5" **flat shims** to the strike side Jack stud at the top and bottom hinge locations until the differences in opening width is less than $\frac{3}{8}$ " at both locations.
 - b. Place the 6' level against the **shims** and install a combination of $\frac{1}{8}$ " and $\frac{1}{4}$ " 3"x5" **flat shims** and/or **tapered** shims at the middle hinge area until flush with the level.

9.2.2. Position and Temporarily Secure Door in Opening

1. Set door into the rough opening, tight to the foamboard and hinge side Jack stud.
2. Temporarily secure the door in the rough opening by installing shims at the very top of the strike jamb (even with the head jamb) **AND** at the very bottom of the strike jamb (even with the threshold). Wedge these shims in **TIGHTLY** (do NOT nail so they can be adjusted later).

NOTE: This process is designed to apply horizontal pressure to hold the hinge jamb tight against the hinge side Jack stud. The top of the

door may rub on the strike jamb at this stage, but this is normal and will be corrected later.

3. Check the reveal between the top of the door and the head jamb at the left and right corners of the door. If necessary, shim under the strike jamb or hinge jamb until these reveals are equal.
4. Re-check that the hinge side is still plumb (set level on hinges or hinge plates).
5. Tack four 16d galvanized finish nails into pre-drilled holes in brickmold, two on each side near top and bottom to hold door tight to foamboard (be sure someone is on the exterior holding the door in place).

9.2.3. Permanently Secure Door

1. With the door still held tight to the foamboard and the hinge side Jack stud, secure the hinge side jamb with 2½” exterior screws behind the weatherstripping at the top, middle and bottom hinges.
2. Check that the hinge side of the door is still plumb. Adjust shims as needed.
3. At the top door hinge, replace the two screws closest to the doorstop with #8 3” brass-colored construction screws to secure the top hinge to the Jack stud and ensure the door does not sag.

NOTE: The tightness of the 3” brass-colored screws in the top hinge can affect the reveals at either end of the head jamb. Tighten or loosen the screws, adjust shims, or adjust the strike side jamb up or down as needed to adjust the reveals.

4. Check complete door operation and verify that contact between the door and the weatherstripping is consistent (no gaps or light visible) along the head jamb and the strike jamb. It may be necessary to adjust one or both side jambs and brickmold slightly away from the foamboard to ensure proper contact with the weatherstripping (a maximum of ⅛” gap). Shim behind the brickmold to hold it in place. Confirm that the latch and strike are aligned.
5. Check the reveal on the top and the bottom of the hinge jamb. If necessary, adjust the shims against the head jamb until the top hinge jamb reveal matches the reveal just below the top hinge. If necessary, adjust and shim the bottom of the hinge jamb to match the reveal at the top, shim as needed, and secure with a 2½” exterior screw behind the weatherstripping.

NOTE: Adjusting the reveal at the top of the hinge jamb will affect the reveal at the top of the strike jamb. Check to be sure the reveal at the top of the strike jamb is ⅛” or greater. If not, it may be necessary to “split the difference”.

6. Check the reveal at the top and the bottom of the strike jamb. If necessary, adjust the shims at the bottom of the strike jamb until there is a consistent reveal at both locations.
7. While keeping consistent reveals top to bottom, install all remaining shims (using 2½” exterior screws behind the weatherstripping) in the following strike side locations: across from the top and bottom hinges as well as above and below the dead bolt location.
8. Install shims in the center of the head jamb, adjusting for a consistent reveal across the jamb. Secure the shims with a 2½” exterior screw behind the weatherstripping.
9. Recheck the complete door operation, ensuring that contact with the weatherstripping is uniform (no gaps or light visible). Adjust as needed.
10. To ensure consistent reveals along both side jambs, install additional shims on the hinge side about halfway between hinges and similarly on the strike side. This should result in five sets of shims per side (plus one extra set above the deadbolt). Secure the jambs with 2½” exterior screws behind the weatherstripping.
11. Finish securing the door on all three jambs at each shim location by nailing a 16d galvanized casing nail through the jambs about 1½”-2” from the outside edge of each jamb (between the doorstop and brickmold). Make sure all nails hit a Jack stud or the header.
12. Conduct a final verification of the complete door operation, ensuring there is uniform contact with the weatherstripping and that all reveals are consistent. Adjust as needed.
13. Nail the brickmold using 16d galvanized casing nails in the thirteen pre-drilled holes. Make sure all nails hit a Jack stud or the header.
14. Set and caulk all nails.
15. Cut a piece of 2x4 or 2x6 the length of the threshold to serve as a temporary threshold support. Position it under the threshold. Lift it up tight to the threshold and secure to the rim board with three 4” timber screws.

9.2.4. Installing Hardware and Window Trim Caps

1. Install lockset and strike plate per instructions provided. Be sure the door latches easily but tightly with little or no rattle. If it rattles, bend the tab inside the strike plate with a flat blade screwdriver until the door closes tightly.

2. Install the deadbolt. Use the specially provided security deadbolt strike plates rather than the one provided with the lockset. Set the strike plate in place, predrill into the Jack stud with a 3/16" bit, and secure with the two long screws provided.

NOTE: Make sure the deadbolt is installed so that the top of the lever turns in the direction of the bolt travel. If it does not, remove the deadbolt from the door, rotate it 180° and reinstall.

3. Make sure both the lockset and deadbolt are installed so the key direction (notches up) is the same. If necessary, the lockset can be changed to place the notches up, as follows (see Figure 9-2). Unlock the installed lock. Insert the key **half-way** (do not insert completely). Push in the retainer pin (H) on the neck of the knob and pull the knob just past the pin. Continue holding the knob and use the half-way inserted key to rotate the cylinder (J) to the correct orientation. Push in the retainer pin and push the knob back into place. **Do NOT** pull the knob and cylinder off the shaft while doing this.

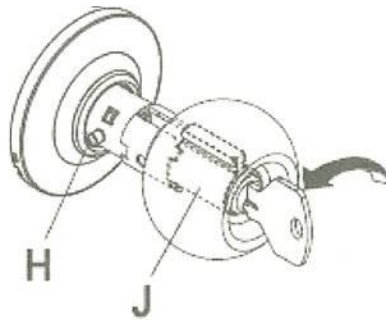


Figure 9-2. Door Lockset.

4. Verify lockset and deadbolt operation. Adjust as needed for easy operation (door closes snugly to weatherstripping and latches with little effort, the deadbolt easily engages and disengages when door is closed, and the deadbolt moves in the same direction as the top of the lever).
5. For doors with a window, install the white plastic trim caps, being careful to install them in the correct orientation. Install by hand until almost flush, or as far as possible, then use a wood shim and hammer to tap until the cover is flush with the trim surface.

9.2.5. Weatherproof/Air Seal Doors

1. If threshold covers are not available, temporarily protect the **wood** (not the aluminum) portion of the threshold with two or three layers of orange floor tape.

NOTE: NEVER use any other tape for this task. All other tapes leave a residue difficult to remove.

2. Apply flashing tape to the foamboard and the side of the brickmold making sure the tape does not extend more than $\frac{3}{4}$ " onto the brickmold (so that it will be completely covered by the siding J-channel). To facilitate attaching this tape to the foamboard and brickmold, use a 2x4 (for 4" wide tape) or 2x6 (for 6" wide tape) as a template to mark a line on the wall $3\frac{1}{2}$ " or $5\frac{1}{2}$ " from the brickmold. While gradually peeling back the release paper, align the edge of the tape to the line, and stick the edge to the foamboard. While progressing down the wall, use a speed square or wide putty knife to evenly press the tape to the foamboard, pushing the tape into the corner between the foamboard and the brickmold. Finally, press the edge of the tape to the brickmold, making sure it is tightly attached all over and is tucked tightly into the corner (radius smaller than the J-corner radius). The result will be about $\frac{1}{2}$ " of tape stuck to the brickmold.
3. Apply the flashing tape to the door sides first, then the top (shingle style). For the sides, tape can be applied in a single piece or multiple pieces (easier) not less than 20" in length and overlapping about 2" starting from the bottom (shingle style). The top piece of tape must be a single piece extending above and past the outside edges of the side tapes.
4. Install bottom "Corner Seal Pads".