4. Components and Stairs

4.1 BUILDING WINDOW AND DOOR COMPONENTS
4.2 BUILDING STAIRS

Tools needed by volunteer:

Hammer
Nail apron
Tape measure
Square
Utility knife
Pencil

Materials needed:

2x6 plate lumber
2x4 plate lumber
16d nails
8d nails
3/8"x1½" lag bolts with washers
6" TimberLok® screws
3" Weathermate™ Construction tape

Tools and equipment needed:

Generator
Extension cords
Circular saw w/worm drive
Chop saw
Paslode nailer
Framing square
Framing square w/ stair gauge
Sawhorses
6' level
Chalk line
String line
Felt tip markers

Personal Protection Equipment:

Safety glasses (required)

Reference Materials:

House Plan Supporting Documents
- Component Cut List
- Component Assembly Drawings
- Plate Layout Drawing

NOTE: All exterior and interior walls are framed 24" o.c.

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

4.1. BUILDING WINDOW AND DOOR COMPONENTS

4.1.1. Cutting Component Pieces

1. Before marking and cutting any components, sort and crown 2x4 and 2x6 stud lumber into 3 piles (straight, slightly crowned and RETURN/TO CUT). If the stud has a "slight" crown, mark the wide surface with an arrow toward the "crown up" edge. If the stud is "straight" (no crown) mark the wider surface with an arrow toward the end of the stud. If the stud has a "severe" crown, bow or other unacceptable defect put it in the RETURN/TO CUT pile (if possible place this pile near street or driveway to separate it from the two "good" piles of studs and for easier pickup by the supplier). Check for studs that are twisted. Do not use these for door components or window components.

   NOTE: Be very selective ("Would you use this for your house?") during the initial sorting of the studs as we can always go back to the RETURN/TO CUT pile if needed.

2. Use only straight studs for kitchen walls, tub walls, and the ends of sliding closet doors first, then for all other walls as available. Use straight or only slightly crowned studs for component King and Jack pairs.

3. Locate the separate bundle of lumber expressly intended for component construction. It should consist of 2x10's, 2x6's, 2x4's, and one 8' 1x6. Label the bundle with "Components" to avoid use for general construction.

4. Determine window and door sizes and dimensions from the House Plan Supporting Documents.

5. Referring to the Component Cut List, cut pre-defined pieces of 2x10 headers, 2x6 headers, 2x4 headers, 2x6 window sill pieces, and 2x4 and 2x6 Jack studs. The list specifies the lengths of material to use, how many to cut and to what length. As each piece is cut, label it with the length and check it off the cutting diagram (the diagrams are in a three-ring binder in the site support box).

   NOTE: The Component Cut lists are designed to minimize material waste and cost, so should be followed exactly.

4.1.2. Assembling Exterior Wall Components

1. Referring to the Component Assembly Drawings, begin by assembling the window and exterior door components. (It is best to work on a flat surface such as the deck or the porch. However, place a piece or pieces of OSB or decking under the work on the porch to protect the concrete from protruding nails.)

2. Align two matching-length 2x10 pieces to create an exterior header (windows greater than 6' may require three header pieces).

a. Ensure that both ends and at least one side are flush. Trim if required.

b. Nail at an angle with three rows of 3¼" Paslode nails - two about 2" from the edge and one in the middle - no more than 12" apart. Stagger the nails on opposite sides. Bend over any protruding nails.

3. Select two 2x6 studs for use as King studs and check for crown. Nail each stud to the header assembly with the crown DOWN (this will place the King stud the desired crown UP during wall assembly). Nail three 3¼" Paslode nails into each header piece (for a total of six nails per King stud) taking special care that the King stud is flush with both the top and sides of the header.

4. Place the matching 2x6 header piece between the king studs and tack to the underside of the 2x10 header pair. Carefully square each end of the 2x6 to the adjoining king stud and nail through the king stud into the end of the 2x6 (three 3¼" Paslode nails). Then finish nailing the 2x6 to the underside of the 2x10 header. (This sequence is crucial to ensuring that the Jack studs supporting the header provide an adequate bearing surface.)

5. Select two precut 82" 2x6 pieces from Section 4.1.1.5 above for use as Jack studs and check for crown. (The cut list specifies a Jack stud length slightly longer than needed to accommodate varying 2x10 header widths.) Place each piece next to a King stud (crowns and bows opposite king stud if applicable), tight to the header, mark, and trim to length.

   NOTE: Before assembly, make sure the crown (and bow) of the Jack stud are opposite that of the King stud (this helps to create a straight component). Flush the narrow edges of the two studs along the length, clamp, and nail.

   a. For doors, place the Jack stud tight to the header and nail at an angle through the Jack stud into the King stud using pairs of 3¼" Paslode nails, no more than 12" apart. Bend over any protruding nails.

   b. For windows, FIRST CREATE AN "H" ASSEMBLY of the two Jack studs and the matching 2x6 sill piece. Clamp and nail the "H" to the King studs with 3¼" Paslode nails as above (see Figure 4-1). DO NOT nail the Jack studs to the King studs before creating the "H".

6. On exterior door components, cut and nail a 38½" piece of 1"x6" pine board (located in the component package) to the underside of the header. This will provide an additional nailing surface and also make the top part of the door frame easier to air seal.

7. Clearly mark all components with the correct size of the component on the face of the header.

8. Stack components separately by size. Be sure the labeled surface of the header is face up to facilitate later identification of the component's size.

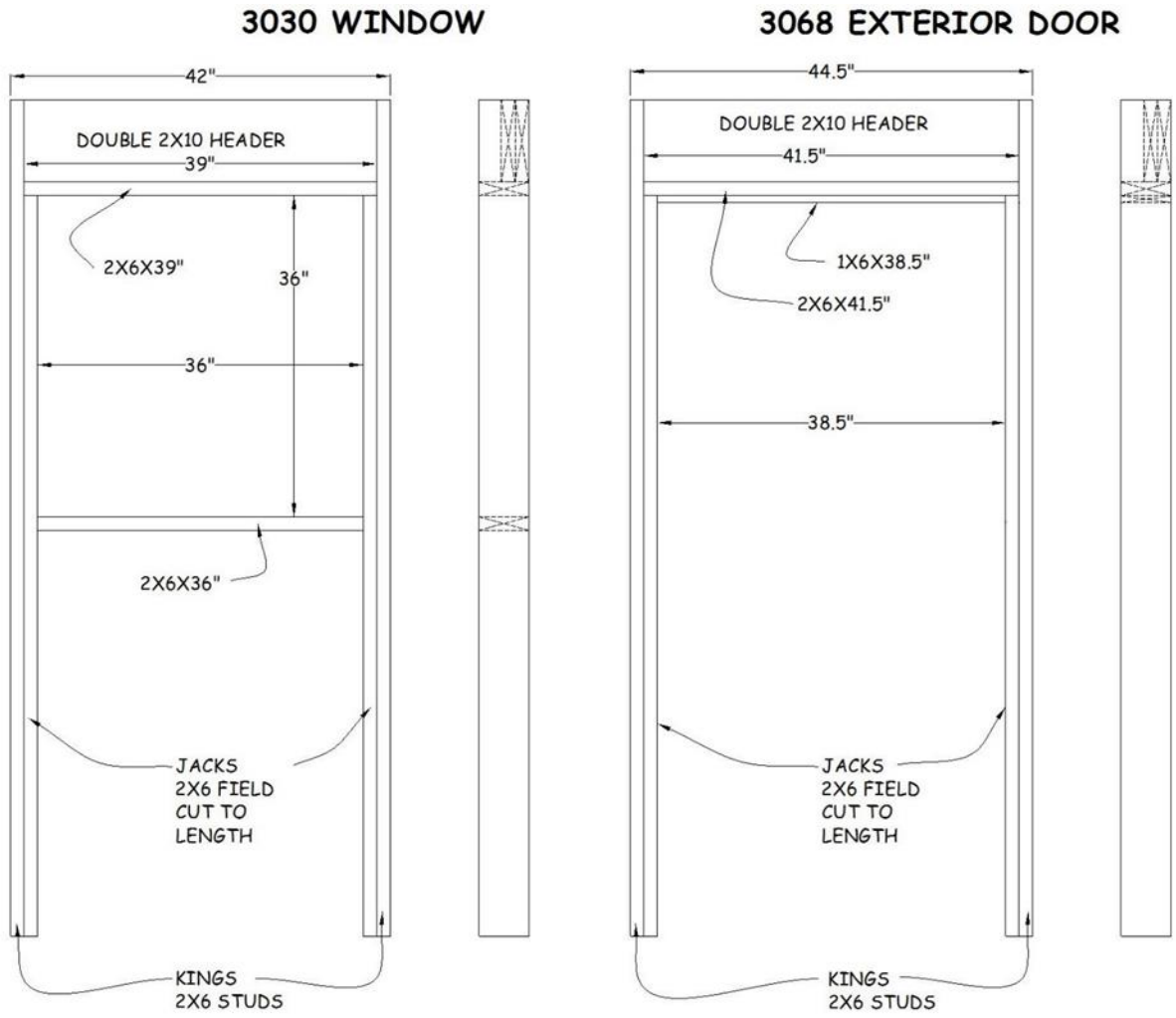

Figure 4-1. Component Assembly Drawing.

4.1.3. Assembling Interior Wall Components

1. Refer to the Component Assembly Drawings for interior components. From the 2x4 pieces precut in Section 4.1.1.5, select matching-length header pieces for each interior door. Nail together with 3¼" Paslode nails to create a "T" header.

   NOTE: Some homes may include a 2x6 wall and sliding closet door designed to accommodate piping from the basement to the roof (so-called plumbing wall). The T-header for these walls consists of a vertical 2x4 and a horizontal 2x6 per the component cut list.

2. Assemble the door components for SWINGING doors:

   a. Select two 81" 2x4 pieces from the precut component package for use as Jack studs in each main floor swinging door. Select two 82" pieces for use as Jack studs in each basement swinging door.

   b. Nail each Jack stud to a standard 2x4 stud. Flush one end and the narrow edges of the two pieces along the length, clamp, and nail using 3¼" Paslode nails, no more than 12" apart.

   c. For main floor swinging doors only, place the T-header upside-down on top of the Jack studs, tight against the King studs. Nail through the King studs into the ends of both header pieces with two 3¼" Paslode nails each. Do not nail basement door headers to their King/Jack studs.

   d. Write the door size on the header and set aside. Indicate basement doors by also writing "Basement" on the header. Bundle basement door component pieces together

3. Assemble the door components for SLIDING doors:

   a. For NON-FLUSH main floor sliding doors, select two 82" 2x4 Jack studs for each door, pair with two 2x4 studs, combine; construct and attach a T-header as in Step 4.1.3.2.c above. For NON-FLUSH basement sliding doors, select two 83" Jack studs for each door, pair each with a 2x4 stud and nail together as in Step 4.1.3.2.b above, but do not nail them to their headers

   b. For FLUSH main floor sliding doors, select only ONE 82" Jack stud and one King stud for each door and combine as above. Construct the appropriate T-header but do not nail the header to the Jack/King pair at this time. Set the header and King/Jack pair aside for wall building (at which time assembly is usually easier). For FLUSH basement sliding doors, select one 83" Jack stud and one King stud for each door and nail together as in Step 4.1.3.2.b above. Do not nail them to their headers.

   c. Label each header and corresponding King/Jack pair with the door size and set aside with other components. Indicate basement doors by also writing "Basement" on the header. Bundle basement door component pieces together.

4.2. BUILDING STAIRS

4.2.1. Calculations

1. Refer to House Plan for layout dimensions. Measure from the top of the deck to the basement floor on the end of opening where the stairs will sit on basement

floor. Use this dimension for stair calculations using the Stair Stringer Riser Calculations Worksheet (see Figure 4-2.)

EXAMPLE: Overall dimension from deck to basement floor is 102". Subtract ⅞" for DRIcore; this = 101⅛". If there is hard flooring at the top of the steps, add ¼"; this = 101⅜" working dimensions.

Table 4-1. Determining Riser Height Fractions.

Calculated Riser Height		Rounded to Fraction
0	0.031	0
0.032	0.094	1/16
0.095	0.156	1/8
0.157	0.219	3/16
0.220	0.281	1/4
0.282	0.344	5/16
0.345	0.406	3/8
0.407	0.469	7/16
0.470	0.531	1/2
0.532	0.594	9/16
0.595	0.656	5/8
0.657	0.719	11/16
0.720	0.781	3/4
0.782	0.844	13/16
0.845	0.906	7/8
0.907	0.969	15/16
0.970	1.000	1

2. Refer to the House Plan to find the number of runs and risers to be used. (13 risers and 9¾" deep cut treads are normal). Established run/rise relationships must be followed. No rise can exceed 8". No rise can vary more than 3/16". Treads must be at least 9" wide.

EXAMPLE: Using the above assumptions: the calculated riser height = 101⅜"/13 = 7.8". To convert the decimal portion to a usable fraction, refer to Table 4-1 above. 0.8 is between 0.782 and 0.844 in the table, indicating the nearest fraction is 13/16. Therefore, use 7-13/16" for the riser height.

Worksheet - Stair Stringer Riser Calculations

Calculate Step Rise

		Total Height - measured as basement floor to top of deck
+		Hard flooring at top? If yes **Add** 1/4" (0.25")
		Intermediate Result
-		DRIcore at bottom? If yes **Subtract** 7/8" (0.875")
=		**Calculated Total Height**
/		Total number of risers (from plan)
=		**RISE per step (must be minimum of 7" and no more than 8")**

Adjust Bottom Step Rise

		RISE per step (as calculated above in the Calculate Step Rise section)
-	(1-1/8")	Tread thickness, **Subtract** 1-1/8" (1.125")
		Intermediate Result
+	7/8"	DRIcore at bottom? If yes **Add** 7/8" (0.875")
+	1/4"	Hard flooring at bottom? If yes **Add** 1/4" (0.250")
=		**Bottom Step Rise**

Adjust Top Step Rise (i.e. Determine Stringer Mount Location)

		RISE per step (as calculated above in the Calculate Step Rise section)
-	(3/4")	Deck thickness, **Subtract** 3/4" (0.75")
		Intermediate Result
+	1-1/8"	Tread thickness, **Add** 1-1/8" (1.125")
		Intermediate Result
-		Hard flooring at top? If yes **Subtract** 1/4" (0.25")
=		Top Step Rise (measure down this distance from the **underside** of the deck and make a mark - Mount top edge of stringer at this mark)

NOTE: **The TOP step of each stringer must have 3/4" (0.75") removed from the run resulting in a 9" run versus the normal 9.75" because no riser board is needed for this step**

Figure 4-2. Stair Stringer Riser Calculations.

4.2.2. Layout and Cutting Stringers

1. Select one 2x12 stringer and place it on saw horses with the crown toward you. The stringer is strengthened by this orientation because the tread/riser sections can now be cut from the crown edge of the 2x12.

2. Attach stair gauges to the framing square and locate the precise dimensions calculated in Section 4.2.1 for run and rise. If the rise is 7¾", set the gauge to this dimension on the short side of the square; set the gauge to 9¾" on the long side of the square (see Figure 4-3).

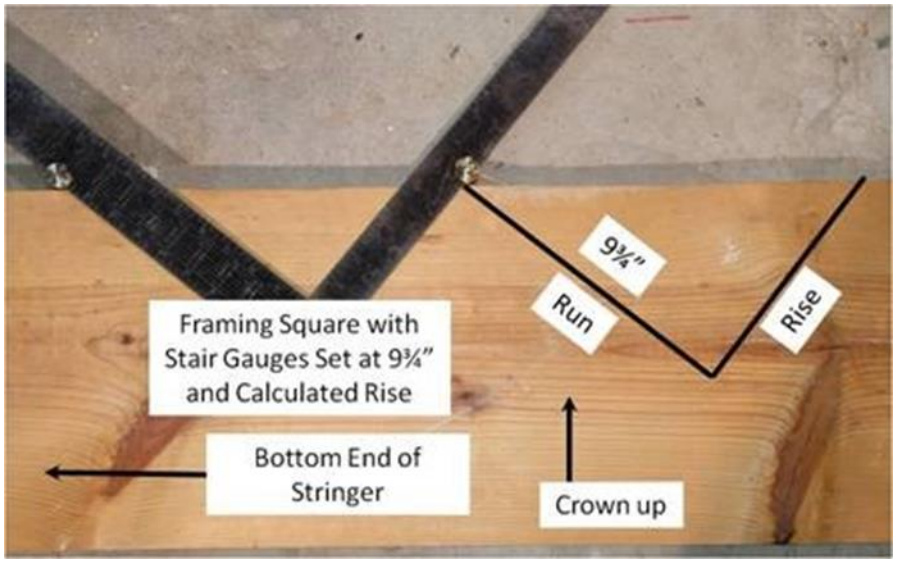

Figure 4-3. Stair Stringer Layout.

3. Mark the rise and run along the stringer until the proper number of risers needed are marked.

4. Reduce the height of the last riser at the bottom of the stringer by 1⅛" (the thickness of the tread), unless the basement floor is to be finished. If the basement floor is to be finished, reduce the height of the riser by only ¼". This will accommodate the 1⅛" thickness of the tread and the 7/8" thickness of the DRIcore (see Figure 4-4).

5. Use a worm drive circular saw to cut out the stringer, cutting so that half of the pencil line remains.

REQUIREMENT: Building inspectors will reject a stair unit if dimensions between risers vary by more than 3/16".

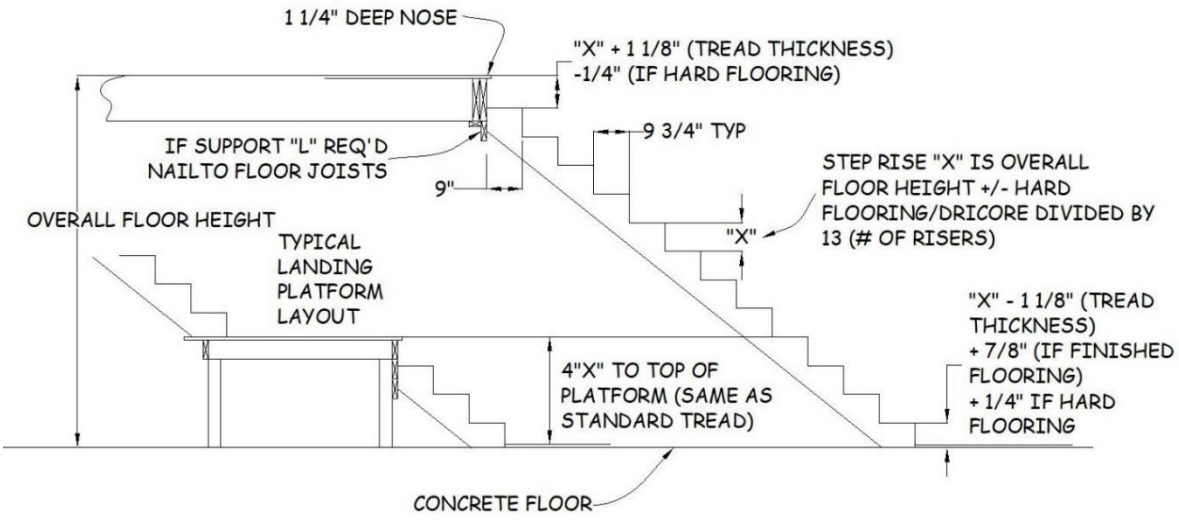

Figure 4-4. Stair Stringer Installation.

6. Cut ¾" off the back edge of the top riser so the stringer can be fastened to the floor joist (there is no ¾" thick riser at the top step since the floor joist serves as the finished riser).

7. Place the finished stringer in the stairwell hole to check for accuracy of installation. When set in place treads must be level and risers must be plumb. Verify that the bottom riser is equal to the height of the risers minus the thickness of the tread (1⅛" for an unfinished basement floor) plus the thickness of the DRIcore (⅞") if the basement floor will be finished. Verify that the top tread is located below the surface of the deck by the height of the riser plus the thickness of the tread (1⅛") minus ¼" if hard flooring will be installed.

8. Use the one correctly cut stringer as a template to mark the other two 2x12's. Cut out the remaining stringers with care.

9. On each stringer, drill 3/16" pilot holes and use three 5/16" x 1½" lag bolts with washers to attach an L-bracket flush to the top of the tread and flush with the end of the stringer. Be sure to use correctly oriented brackets (left and right) on the appropriate outside stringers (either bracket can be used on the middle stringer).

10. Create a "sandwich" at the bottom of each of the outside stringers. For each of the stringers.

    a. Cut a 2x4 slightly shorter than the bottom of the stringer.

    b. Rip 3½"-wide pieces of OSB cut to a total length approximately equal to that of the 2x4.

    c. Create the "sandwich" of 2x4/OSB/stringer by nailing the 2x4/OSB pair to the outside, bottom of the stringer with 16d or 3¼" Paslode nails. (This sandwich

provides a 2" gap between the stringer and the wall to allow for installation of sheetrock and a skirtboard later in the construction process.)

NOTE: Before attaching the 2x4/OSB sandwich to the outside stringers, the finished stringer to the wall, or the 2x4 support to the center stringer (see Step 11), check each cut stringer for crown. Cutting the riser/tread notches may have relieved built-in stresses, resulting in distortion. If significant movement has occurred, contact the Construction Supervisor

11. Cut a third 2x4, also slightly shorter than the stringers, and nail it to one side of the center stringer, flush with the bottom. This will provide additional stiffness during use of temporary stair treads.

12. Use the last calculation in Figure 4-2 (Top Step Rise) and measure that distance down from the underside of the deck. Make a line on the stairwell framing at this point. This line marks the location of the tops of the three stringers (Figure 4-4).

13. Before installing the stringers, attach Weathermate™ Construction tape to the bottom of the stringer where it will rest on the concrete.

14. Align the top of the outside stringers to the mark from Step 12 and clamp each stringer in place to a convenient stud. Drill 3/16" pilot holes using the bracket as a template, and then secure the angle bracket at the top to the rim board/lam beam using three 5/16" x 1½" lag bolts with washers.

15. Secure the two outside stringers to the stairway walls with one 6" TimberLok® screw through the stringer into each stud between stairs 4 and 9. This makes it easier to remove a stud when creating the angled stairway wall.

16. Install the center stringer with the top aligned with the mark made in Step 12, centered between the two outside stringers, attaching the top bracket with 5/16" x 1½" lag bolts with washers.

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17. Install the temporary stair treads using one 2x4 and one 2x6 on each step. Attach each piece of lumber to the stringers using a SINGLE 8d nail at each end of the lumber. Treads must not extend beyond the width of the two outside stringers as this will conflict with installation of sheet rock and the skirt board. These temporary treads will be removed later when finished treads are installed.

4.2.3. Landing Design and Dimensions

1. A landing, if required, is a "joist" box made of 2x6's covered with ¾" floor decking with floor joists installed on 16" centers (see Figure 4-4).

2. Think of the landing as a step with the top surface acting as a finished stair tread.

3. Refer to the House Plan for landing location. The elevation above the basement floor is determined by the number of steps to the landing times the riser height. If the basement has DRIcore, add ⅞" to the height of the platform. Remember, the bottom riser on the platform and the bottom riser on the basement floor are both reduced by the thickness of a tread (1⅛"). Furthermore, the distance from the main floor to the first tread is increased by the thickness of a tread.

4. Nail the landing box to wall studs. Any vertical supports that contact the concrete floor must be green.