

Chapter 13

Drawing an Architectural Floor Plan

In this chapter, you will learn the following to World Class standards:

1. Starting a Floor Plan Using an Architectural Sketch
2. Creating a Drawing Using the Architectural Template
3. Creating the Perimeter Wall with a Polyline and Exploding It
4. Creating the Interior Walls with Tools on the Modify Toolbar
5. Roughing in a Bathroom, Vestibule and Stairs
6. Using a Door Block on a Floor Plan
7. Using a Window Block on a Floor Plan
8. Drawing a Fireplace
9. Drawing a Kitchen
10. Drawing a Pantry and Laundry Room
11. Finishing the Bathroom
12. Completing the Basement Stairs
13. Labeling the Floor Plan

Starting a Floor Plan Using an Architectural Sketch

Any drawing is an accumulation of ideas put into written form for the customer or the end user, utilizing as many technologies as known presently. Questions come to the designer in many forms, like what is the number of rooms in the house? How many people will utilize the dwelling or what is the workflow that will exist in the structure? The always tricky one: who is the customer? The contractor, who may be building a series of houses along a new street, feels that they are the customer, but as all owners soon discover the end user will determine the reputation and the demand for the final product. What does the designer or architect bring to the equation? They bring experience, a center point to collect information from all parties involved, a style using art and creativity, and safety from an understanding of ergonomics and convenience. A good designer will collect all the input, sort through the magnitude of requests, prioritize the output based upon design criteria and create a storyboard or sketch which the CAD operator will place in the computer.

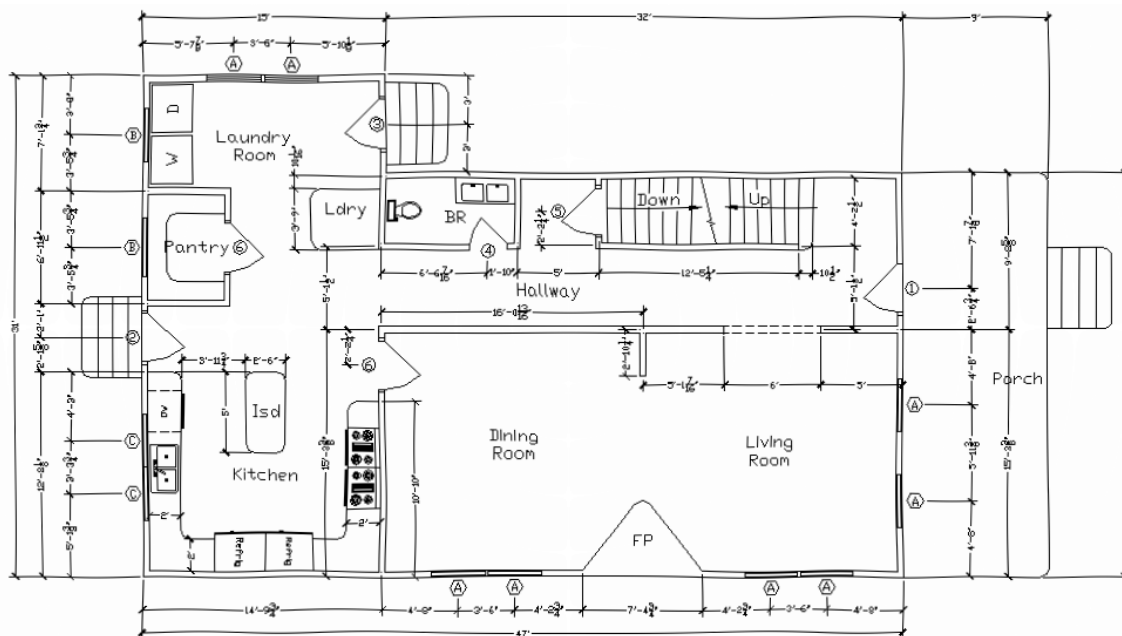
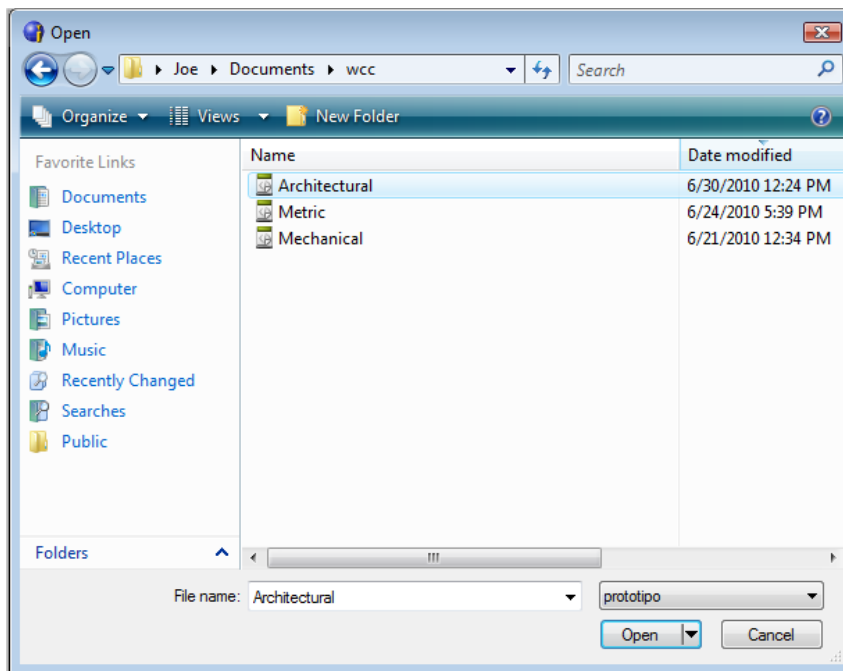


Figure 13.1 – Receiving a Sketch from the Architect

A sketch of the first floor can be and is often the first rough draft that demonstrates what can be possibly done with the living space. This floor is the center of work and leisure in most dwellings. The drawing shown in Figure 13.1 is a design concept of an existing city lot of 40' width by 100' long. Not every home will be the 3000 to 5000 square feet, enormously expansive residence that is available to a small percentage of the urban area. Many residential and commercial businesses are small or medium plan sets that employ each spot of the floor space as efficiently as possible, while showing flexibility to withstand the test of time. Many designers receive their initial sketch on paper with rough dimensions, but this detail, although rough, has massive amount of precise measurements for completing the progeCAD drawing. In appendix E, you will find a larger copy of the floor plan, which will be easier to read.

Creating a Drawing Using the Architectural Template

In the Architectural Floor Plan problem, you will begin the drawing by selecting the template you created in a previous assignment. After selecting the New tool from the Standard toolbar, choose to start with a template and then select the Architectural template you have already customized (Figure 13.2).



If you did not create the Architectural template in the chapter 8b, then you will want to stop now and make the template using the Mechanical template as the guide. There are a list of modifications to the Units, Dimension Style, Line scale, and other specific variables that will enable you to work on any residential drawing without the bothersome routine of creating explicit Layers and other particulars for each session.

Figure 13.2 – Starting with the Architectural Template

Many professionals ask, “why is the Rectangle problem so important in developing drawing strategies? It seems simple and misses a lot of advanced CAD tools.” After asking them some of the questions listed below, almost all technical experts go right back to work on the Rectangle drawing and labor through the basics of 2D drawing, which presently is the most common style of CAD work in industry.

1. What are your drawing times for floor plans?
2. Can your architects or architectural designers draw and interact in CAD while the customer is watching, or does the process take so long the client needs to return in a few days or even weeks?
3. Does your company use standard settings for each type of drawing?
4. Does your company employ templates to increase speed and accuracy?

Time is what keeps the professional from completing the design process and accuracy is a problem when object lines and dimensions are shown incorrectly. The advantage of the computer aided design system over the pencil drawing is that design concepts and drawing standards are built into the software if the individual knows how to use them. Almost unanimously, CAD users from small, medium and large organizations feel they need to

improve in their primary form of communication to the machinist or construction worker, the 2D drawing. They feel they know their CAD commands, but they were never taught how to develop the process and procedures for deploying the style of drawing their company uses.

In the Rectangle problem, you begin to learn tactics along with tools where you use eight lines and three circles to draw 58 entities residing on Layers 0 and Center. From those original building blocks, 81 total entities are made in the computer file explaining each step in constructing the object. Almost all drawings need to begin with the same approach, so in the floor plan, the perimeter of the proposed house is made first.

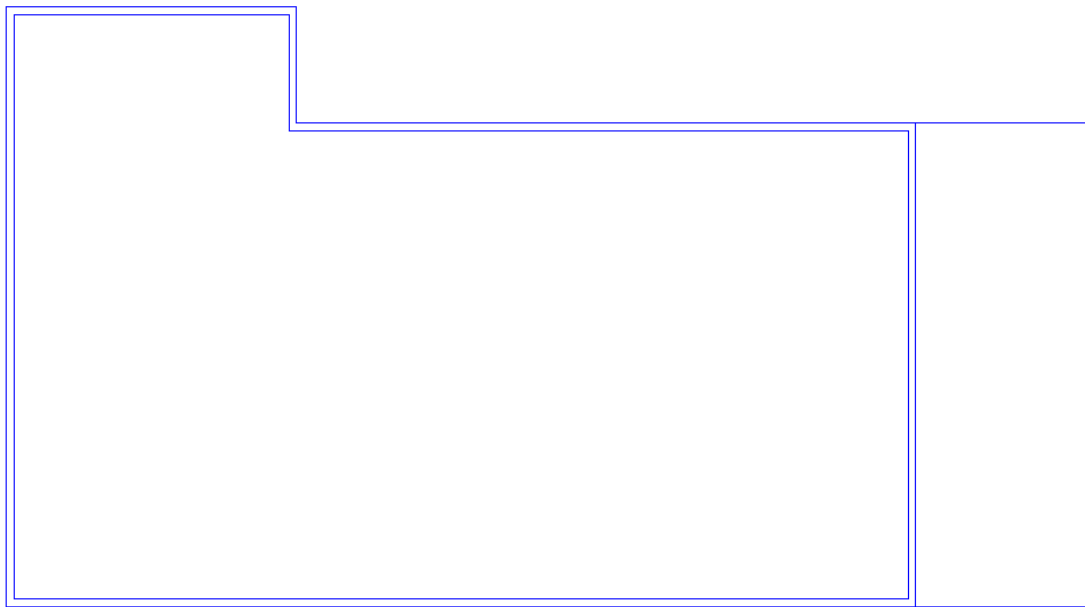
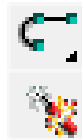


Figure 13.3 – Exterior Walls and Porch

Creating the Perimeter Wall with a Polyline and Explode It

First, change the active layer in the Layer Control list box to the Floorplan layer. Select the Polyline tool on the Draw toolbar. Starting at the lower left hand cornering of the graphical display and pick your starting point. The with Ortho (F8) set to On, draw a polyline 47' to the right, 25' up, 32' to the left, 6' up, 15' to the left and 31' down to complete the command. For the architectural units, the format for inputting values in feet-inches is simple.



The architectural unit is the most flexible of all Unit formats in the progeCAD software and you can type the measurement of feet and inches at the command line. Many operators place dashes and inch marks like those at the progeCAD status bar on their input when drawing lines, but this is only a waste of time. The system default is still in inches, so the inch (") is never needed. The only time you need a dash is when you type a fraction after a number representing an inch (See Table 13.1 – Yellow Highlight).

Architectural Measurements			
Feet	Inches	Degree or Fraction	progeCAD Format
20	0	0	20'
10	6	0	10'6
5	3	1/2	5'3-1/2
4	2	0.5	4'2.5
2	0	3/4	2'3/4
1	0	0.875	1'0.875

Table 13.1 – Architectural Unit Format

Offset the polyline 4.5 inches to the inside creating the inside of the exterior wall. Explode both polylines using the Explode tool on the Modify toolbar, and the polyline will now become individual lines. You can use the Multiline tool to accomplish the same feat, but you will cover that technique in a later chapter.

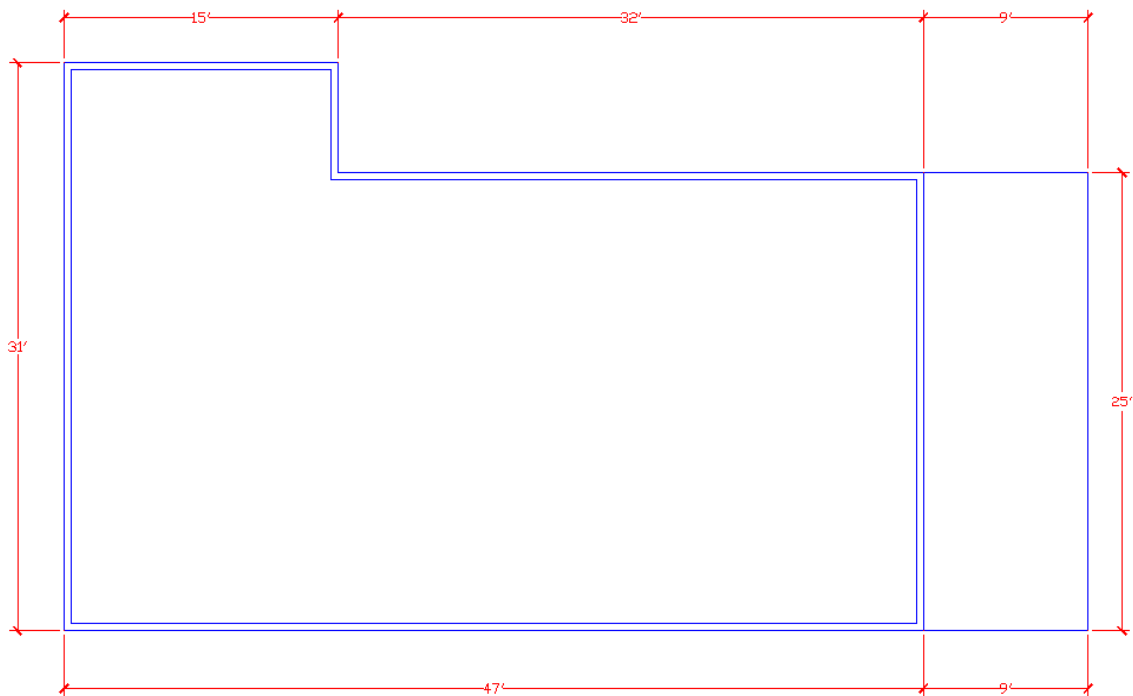


Figure 13.4 – Placing Dimensions on the Floor Plan

Draw the 9' by 25' porch using the Line tool on the Draw toolbar starting at the lower right corner of the house. Then change over to the Dimension Layer and place the dimensions on the drawing as shown in Figure 13.4, so that you can check your work on a complex design as you create the layout. In this lesson, you will have to modify much of the formatting of individual dimensions to get them to fit properly. Use the grips to modify the placement and alignment of dimensions and labels wherever necessary.

Creating the Interior Walls with Tools on the Modify Toolbar

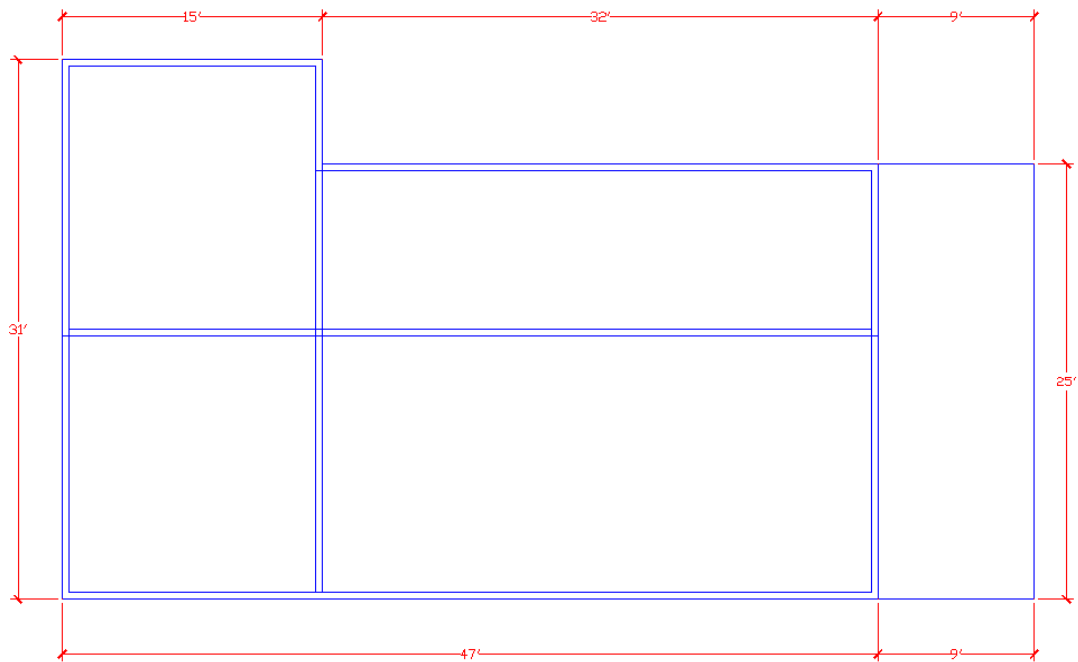


Figure 13.5 – Extending an Interior Wall and Copying a Wall

As in the Rectangular problem, the majority of the remaining lines and arcs will come from the original set. Using the Copy tool on the Modify toolbar, replicate the bottom two lines up 15'1.125 and using the Extend tool, lengthen the lines to the interior of the bottom wall. (See Figure 13.5) You will probably use Trim and Fillet tools (radius set at 0) to form the corner of the dining room wall as shown in your sketch.

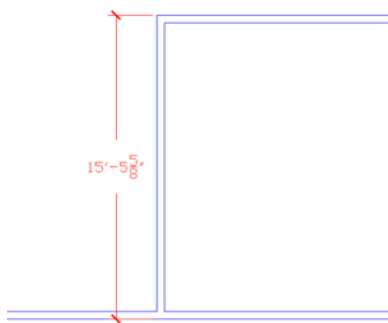


Figure 13.6 – Adding the Dimension

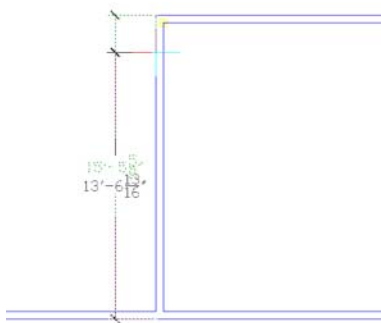


Figure 13.7 – Moving the Vertex 2.25 Down

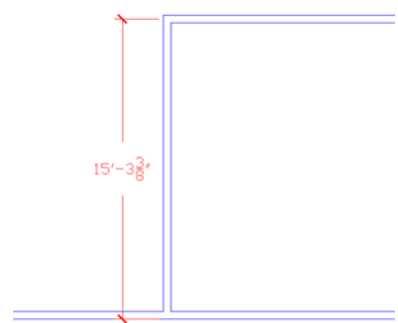


Figure 13.8 – The Finished Placement

Now dimension the wall as shown in Figure 13.6 from the outside of the exterior wall using the Nearest Esnap setting. Then as you see in Figure 13.7, grab the Grip, move the top extension line straight down, and type 2.25, which is half of width of the wall. The final dimension is 15'-3 3/8" and measures from the outside wall to the center of the interior wall.

Using the Properties Tool to Modify a Dimension Variable

Unlike other CAD programs, progeCAD does not allow you to toggle extension lines on and off. For this specific dimension, we want to remove one of the extension lines without exploding the dimension, in case we need to modify it later. Instead, select the dimension and then grab the handle on the bottom right. Move the handle so that it is parallel with the vertical line of the dimension; this in effect will enable you to keep the dimension but minimize the confusion of stacked lines.

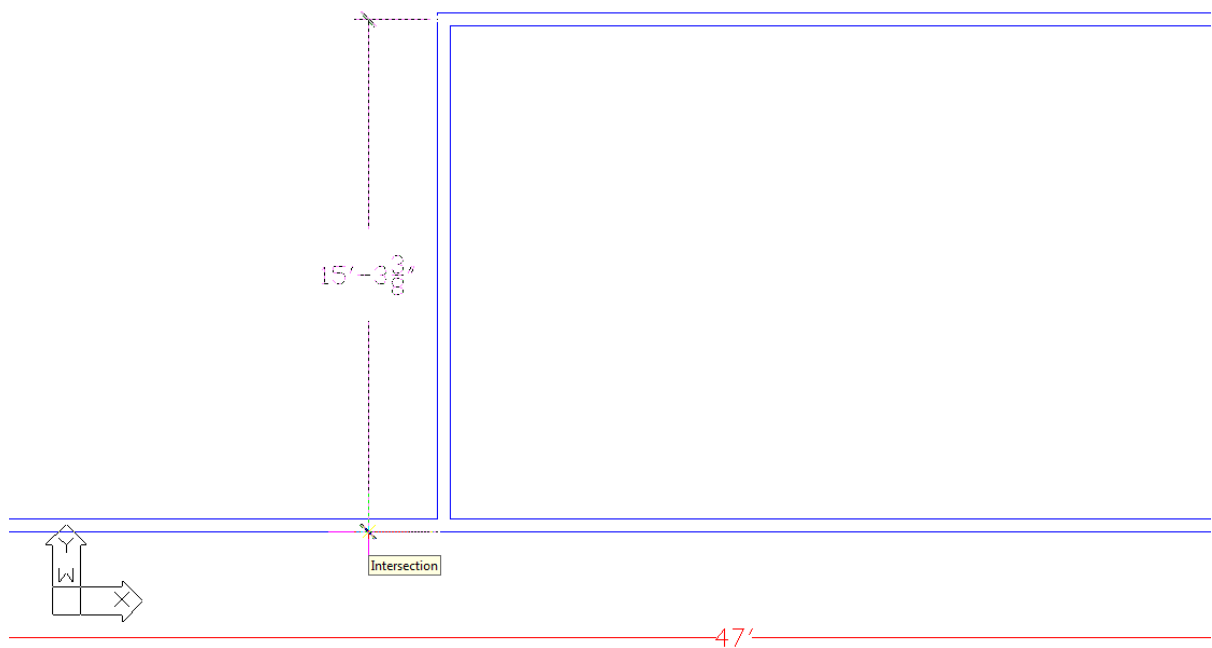


Figure 13.9 – Minimizing a Dimension Extension Line

Roughing in a Bathroom, Vestibule and Stairs

Once you place one vertical and one horizontal interior wall in the drawing, everything becomes very simple both mathematically and graphically. Copy the left dining room wall to the right a distance of 16'13/16. Clean up the wall intersections using the Extend, Trim and Fillet tools. The process of copying walls will quickly create the main rooms in the interior of the floor plan. Dimensioning for the interior walls goes from the center of one wall to the center of another wall. You can insert the measurements on the drawing at the endpoints of the lines and then move the dimension extension lines over 2.25 to the midpoint of the wall. Your drawing should look like that shown in Figure 13.10.

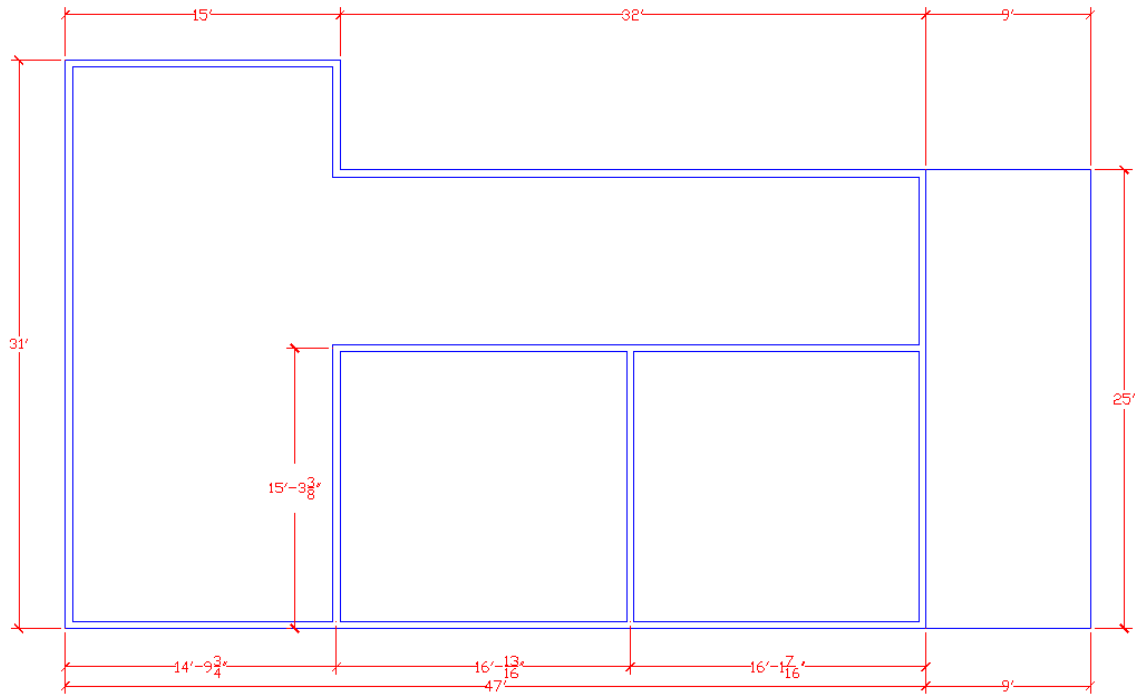


Figure 13.10 – Detailing the Dining And Living Rooms

Copy the wall at the top of the dining room 5'1-1/2 up to form the hallway. Extend the exterior wall out to the hallway, then trim, and fillet the corners as shown in Figure 13.11. Now copy the left side of the bathroom wall 8'4-7/16 to the right to make the opposite wall of the bathroom as shown in Figure 13.12.

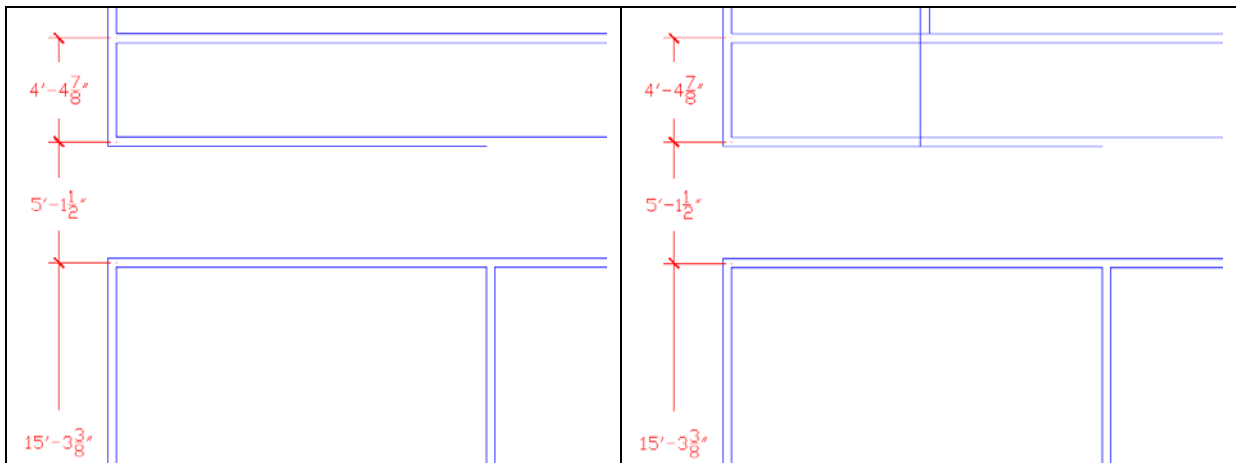


Figure 13.11 – Creating the Hallway

Figure 13.12 – Creating the Bathroom

When working with architectural drawings, you should not worry about dimensions that do not round off to the nearest foot or inch, like 5'-1". Neither should you be anxious with the hallway being precisely 4' wide to maximize a standard building material. Floors are built from one edge of the floor joist to the other end and finished rooms will vary in fractions from one construction site to another, even for the same design.

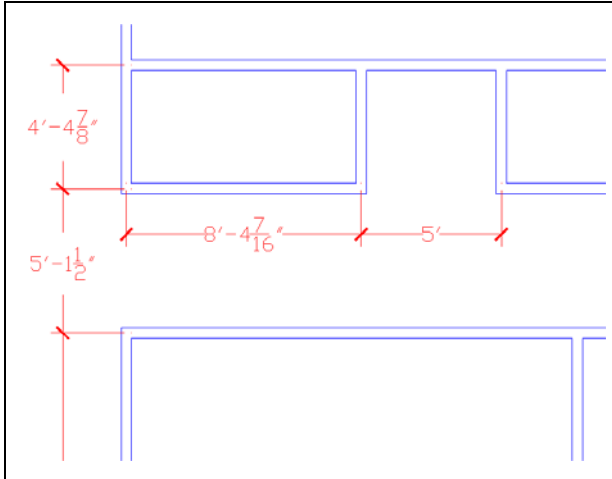


Figure 13.13 – Creating the Vestibule to the Basement Stairs

After walling in the first floor bathroom, you can copy the right bathroom wall 5' to the right to create the vestibule leading to the basement stairs as shown in Figure 13.13. Sometimes in cases like the vestibule, you can try a different drawing method by using the dimension as a reference point. Select the Linear Dimension tool, pick the endpoint of the right bathroom wall and for the second point, push the mouse to the right and type 5'. For the third selection, pick a point on the 8'4-7/16 dimension to align the 5' measurement. Move the dimension 2.25 to center the extension lines in the walls.

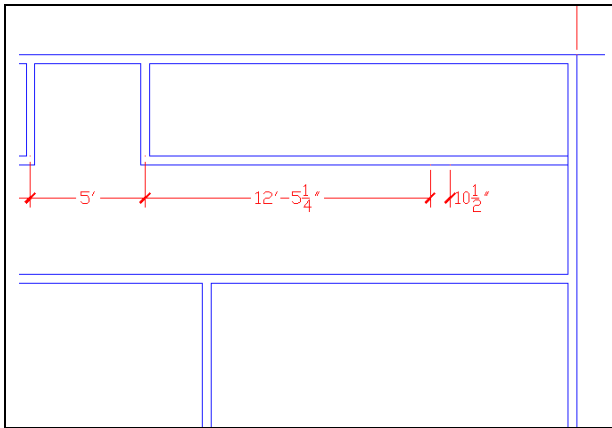


Figure 13.14 – Dimensioning the Stairs

You can mirror the bathroom wall instead of copying the lines, selecting the Mirror tool and the right bathroom wall. Pick the midpoint of the dimension and then just above it for the second point to create the mirror line. Finish the command and the lines will be perfectly placed. In Figure 13.14, you can see the 12'5-1/4 and 10-1/2 dimensions off the 5' dimension. You can modify any set of lines using the dimension endpoints, nodes or midpoints.

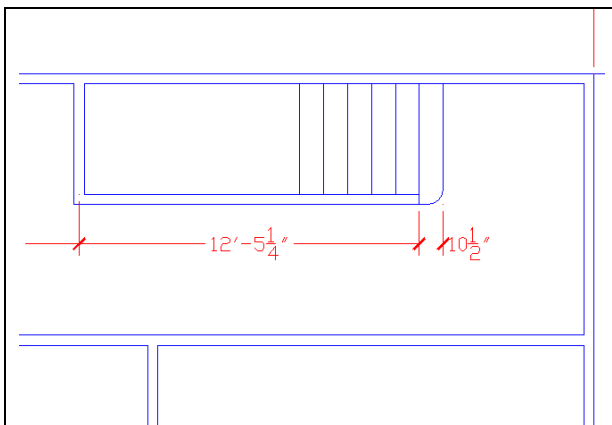


Figure 13.15 – Drawing the Stairs

Now that all the interior rooms are done, you can draw the stairway wall to the end of the 12'5-1/4 dimension. The stairs are 10.5 inches apart with a 7" radius arc using the Fillet tool on the corner as shown in Figure 13.15. The steps go upstairs on the right side of the detail, so you need to stop after six steps. You will show a break in the downstairs steps to the basement in a short while.

Using a Door Block on a Floor Plan

To insert the 36-inch wide exterior door into the outside wall, select the Insert tool on the Draw toolbar. In the Insert window on the graphical display as shown in figure 13.16, select the block named **door_ext_36_right**.

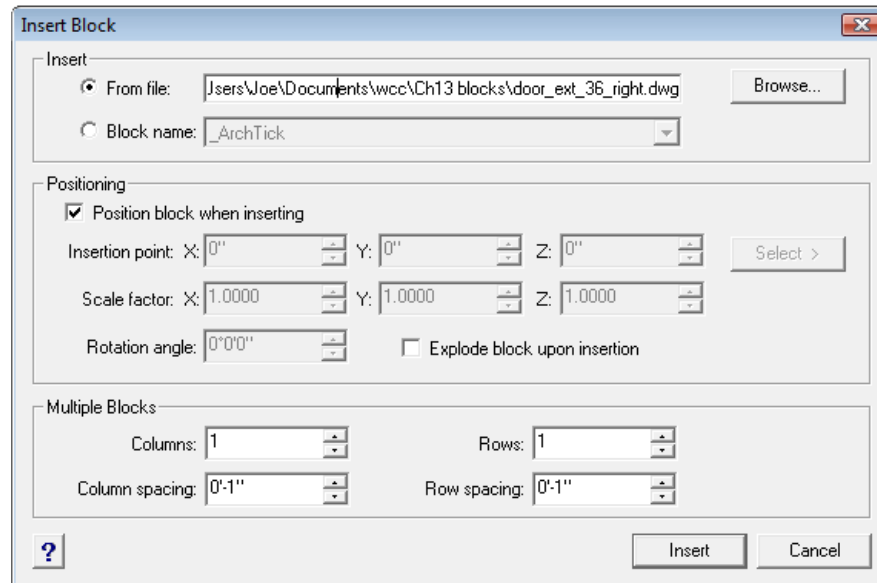
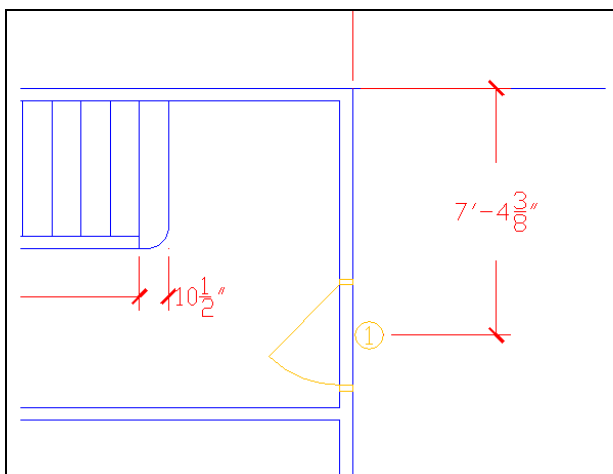
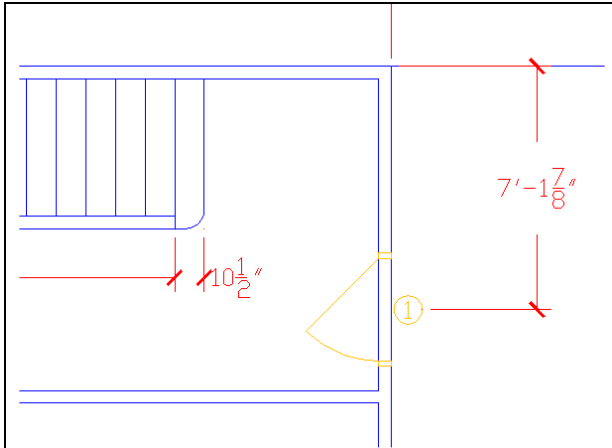


Figure 13.16 – Selecting the 36-Inch Door in the Insert Window



Select the OK button and insert the door in the drawing, placing the insertion point on the right wall anywhere as shown in Figure 13.17. The door and window blocks in the library have attributes connected to them, so after inserting the door and scaling it using a factor of 1 for the x and y axis, there will be a prompt on the Command line asking you what “What is the door number?” According to the sketch, the front entry is “1.” Type “1” and Enter.

Figure 13.17 – Inserting the Door Block



To move both the dimension and the door into a proper location of 7'1-7/8, use the same technique as before. Place a 7'1-7/8 dimension coming from the outside corner of the house. Then you can move the door to the other end of the dimension using the left quadrant of the number symbol (Figure 13.18).

Figure 13.18 – Stretching the Door into Position

The distance you need to move the door may vary depending on the initial placement. Some CAD operators will place the door exactly on an end or mid point of a reference, and then move the door into position from there. Add the 2'6-3/4 dimension as shown in Figure 13.19.

You can use the Break tool on the Modify toolbar to trim the lines on the exterior wall as shown in Figure 13.20. Select the line of the wall you wish to trim not using the pick box, but rather using a selection window; then pick the points outside of the door to show which part of the wall to remove.

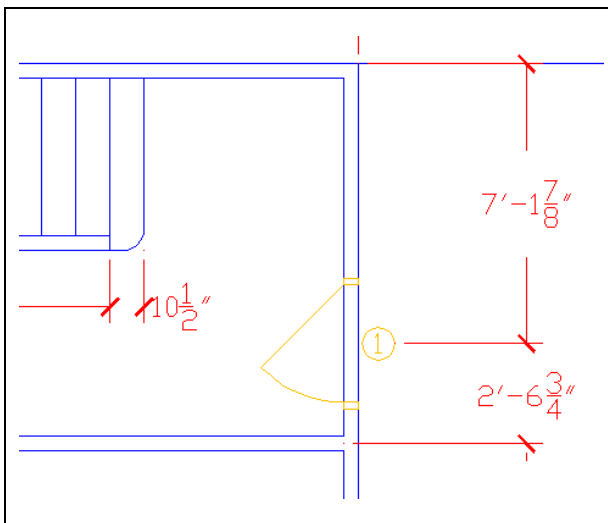


Figure 13.19 – Adding a Dimension

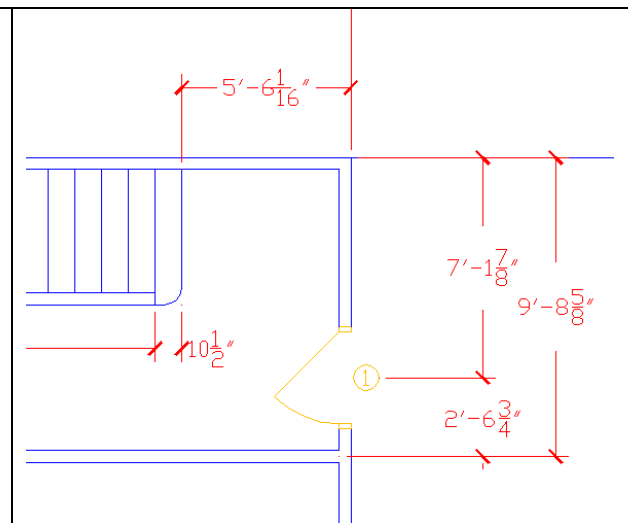
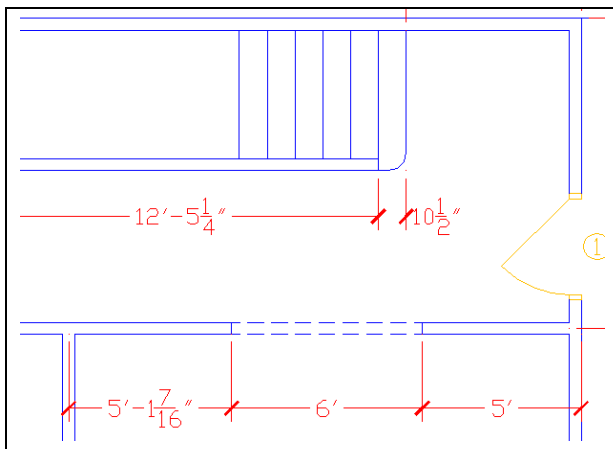


Figure 13.20 – Trimming the Wall

Making an Opening in the Living Room Wall



With the door and entry well on their way to completion, you can add the 6-foot opening from the hall to the living room. Offset the outside line 5' to the left and the newly drawn line 6' to the left again. Use the tools on the Modify toolbar to trim the longer lines to length. Many workers will trim away the lines in the 6-foot opening and use the Line tool along while on the Hidden layer to draw the two hidden lines shown in the Figure 13.21. Add the three dimensions to check your work and pan into the living room.

Figure 13.21 – Making an Entrance

Using a Window Block on a Floor Plan

To insert the 36-inch wide window into the outside wall, select the Insert tool on the Draw toolbar. In the Insert window on the graphical display as shown in Figure 13.22, select the block named **window_36_vert**.

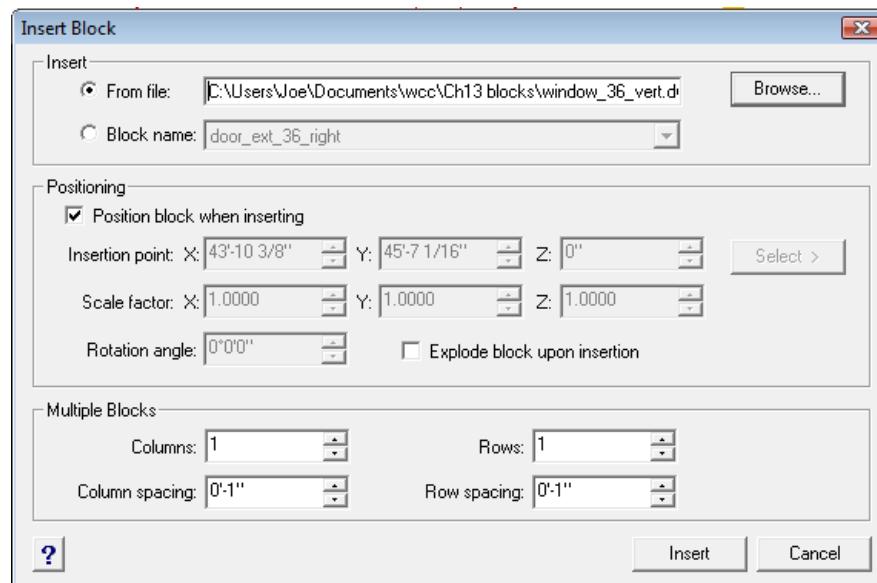


Figure 13.22 – Selecting the 36-Inch Door in the Insert Window

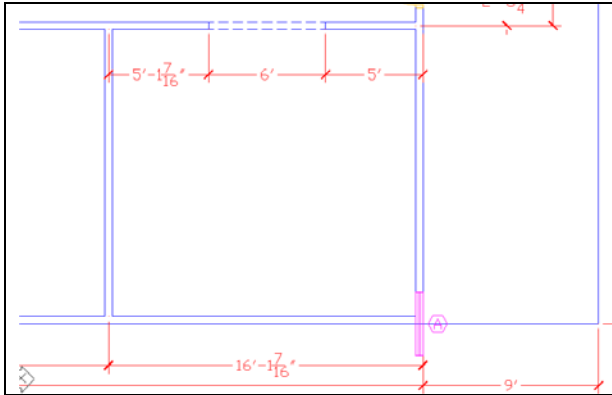


Figure 13.23 – Inserting a Window Block

Select the OK button and insert the window in the drawing, placing the insertion point on the right wall anywhere as shown in Figure 13.23. The window blocks in the library have attributes connected to them, so after inserting the window, there will be a prompt on the Command line asking you what “What window letter?” According to the sketch, the front entry window is “A”. Type “A” and Enter.

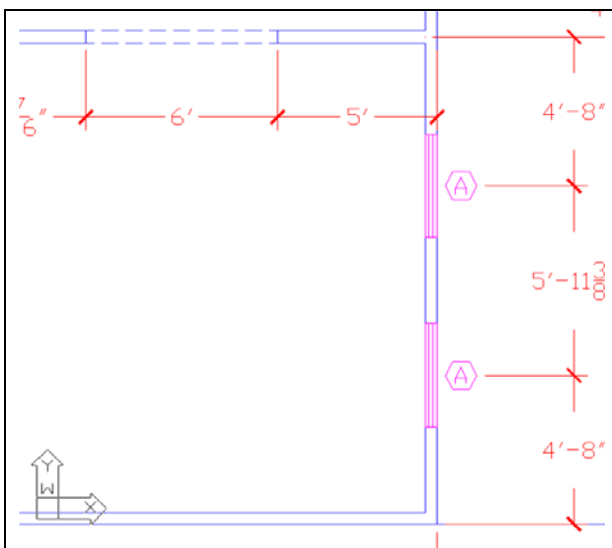


Figure 13.24 – Front Windows

To move both the dimension and the window into a proper location of 4'-8", move the window up the wall 4'-8". Copy the first window up 5'-11-3/8 to create the second front window. Place dimensions from the exterior wall to window-to-window to the midpoint of the interior wall as shown in Figure 13.24. Place a dimension (15'-3-3/8) from the exterior wall to the midpoint of the interior wall.

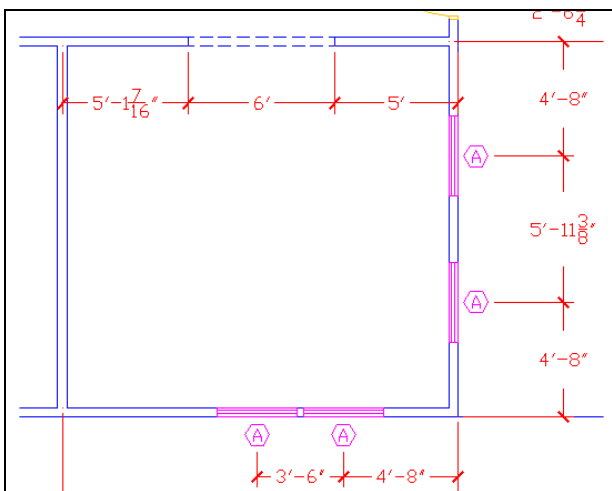


Figure 13.25 – Adding Two Windows

Repeat the process using the **window_36_horiz** block on the bottom exterior wall. Place the dimension as shown in Figure 13.25. Next, you will create the double-sided fireplace and move to detail the dining room. Once you start your precise detail of the rough layout, follow the same pattern when working on the print.

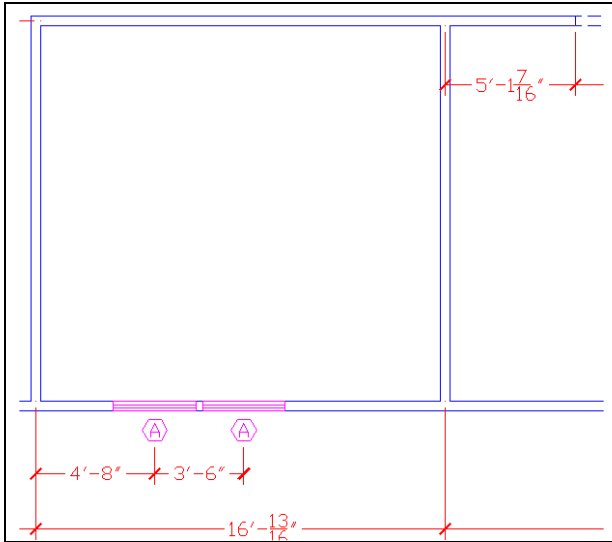


Figure 13.26 – Copying Two Windows

Copy the two horizontal windows, along with the 3'-6 dimension over to the dining room exterior wall. Use the midpoint Esnap of the top horizontal line of the A hexagon as the basepoint, and move the group of entities to the middle of the wall. Then you can move both entities again, using the same basepoint, 4'-8" to the right. Place a dimension from the left window to the middle of the wall (Figure 13.26).

Drawing a Fireplace

To make the fireplace that has the hearth projecting 45 degrees into both the living and dining room, you need to offset the wall 3'-6-1/8 to both sides (See Figure 13.27). Then reset the Offset command by pressing the Enter twice and place the offset distance to 2'-8 and offset the inside top wall down. Rotate the lines as shown in Figure 13.28, forty-five degrees inward and fillet the two crossing lines with a seven-inch radius.

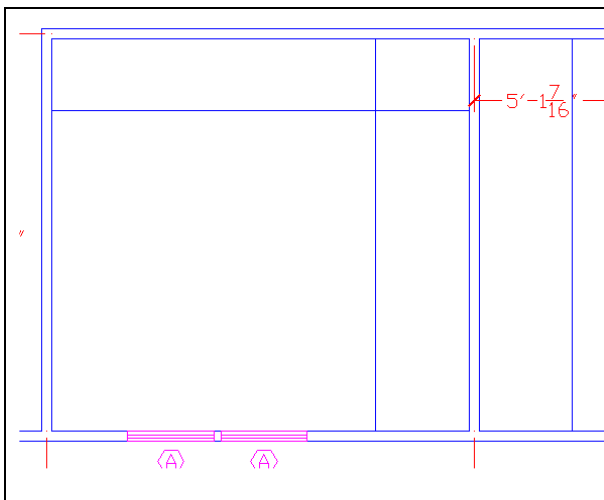


Figure 13.27 – Offset Lines

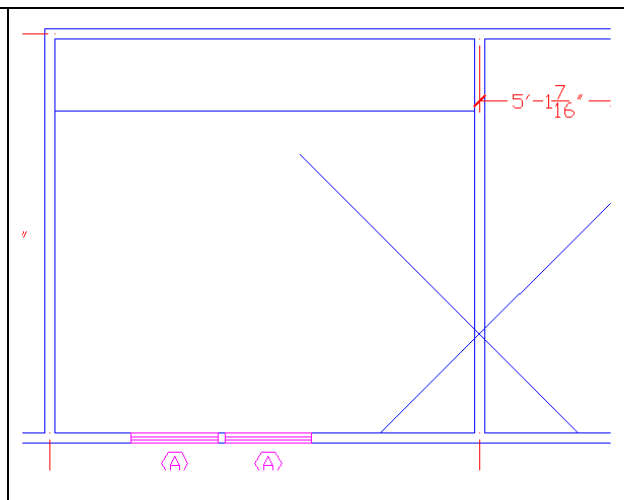


Figure 13.28 – Rotating Lines

Now trim the lines as shown in Figure 13.29. You then need to place the dimensions on the fireplace. When you obtain the exact type of this special fireplace that will be built, you will return to the drawing and update the view. You will add the chimney detail at that time, also. Use the Line tool while in the Dimension layer to add the dimension lines as shown.

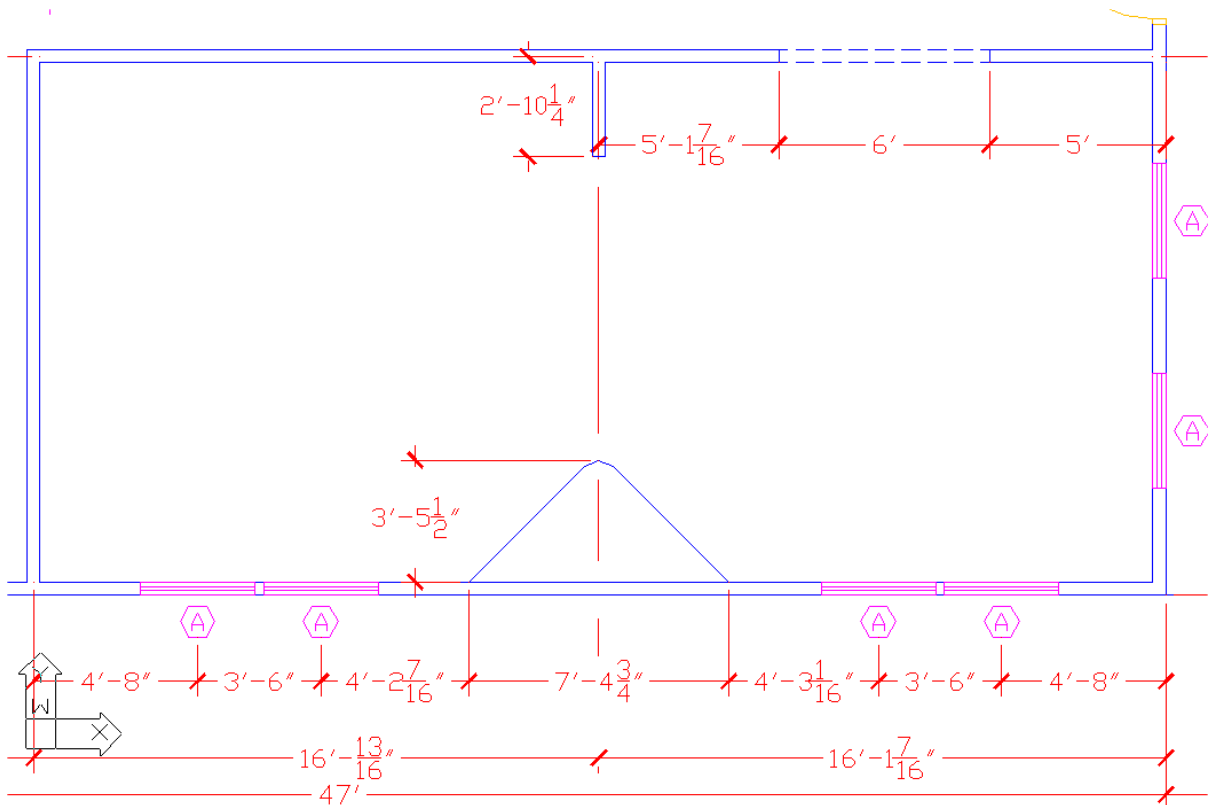
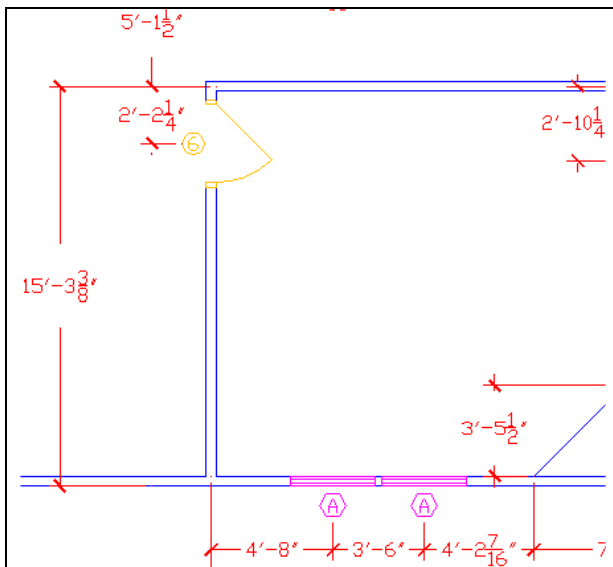


Figure 13.29 – Completing the Fireplace and the Entry to the Dining Room



To insert the 36-inch wide interior door into the wall separating the kitchen and the dining room, select the Insert tool on the Draw toolbar. In the Insert window, select the block named **door_ext_36_left** from the list of blocks. Select the OK button and insert the door in the drawing, placing the insertion point on the left wall as shown in Figure 13.30. The door again has an attribute, so after inserting the door, there will be a prompt on the Command line asking you what “What is the door number?” According to the sketch, the front entry is “6”. Type “6” and Enter. Place a dimension on the drawing as shown

Figure 13.30 – Placing a Door in a Wall

Drawing a Kitchen

When drawing each room in a floor plan, you will discover the kitchen contains countless details that you do not illustrate in the other parts of the house. Since there is a counter that wraps around three sides of the kitchen, the first step you will take is to offset the inside of each wall 24 inches (2 feet) as shown in Figure 13.31. Also, copy the outside bottom wall 10'10" up, and then copy that same line again 12'8-1/8". Fillet the rounded edges with a 7" radius. Trim and dimension the counters as shown in Figure 13.32. A good rule of thumb is to highlight each dimension on a copy of the sketch to account for all the measurements in the drawing. If the red dimension extension line covers the blue floor plan line then minimize it using the handles. You should be getting pretty handy using handles to edit entities.

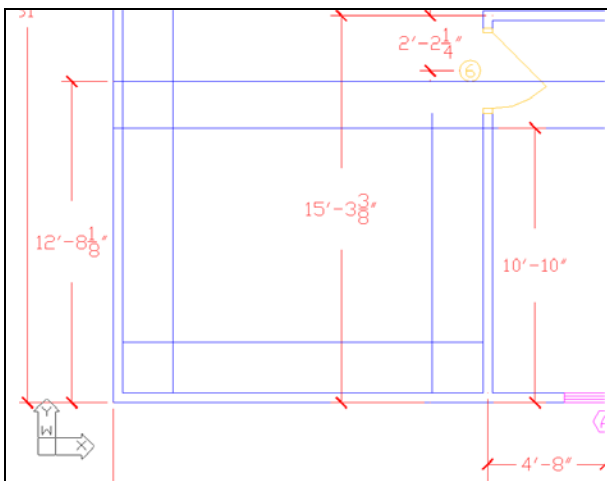


Figure 13.31 – Offset for the Counter

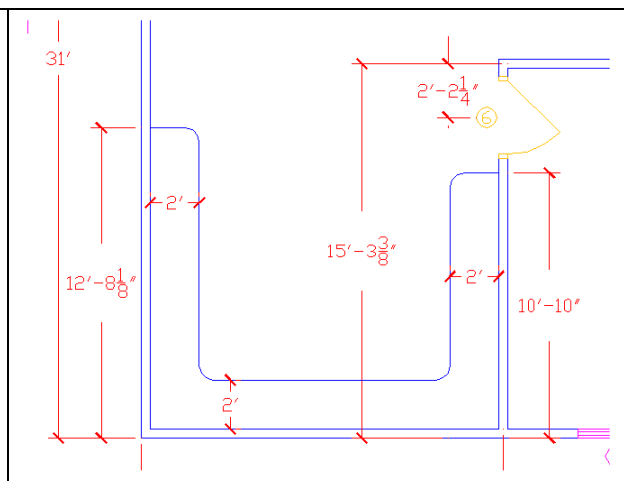


Figure 13.32 – Fillet and Trim

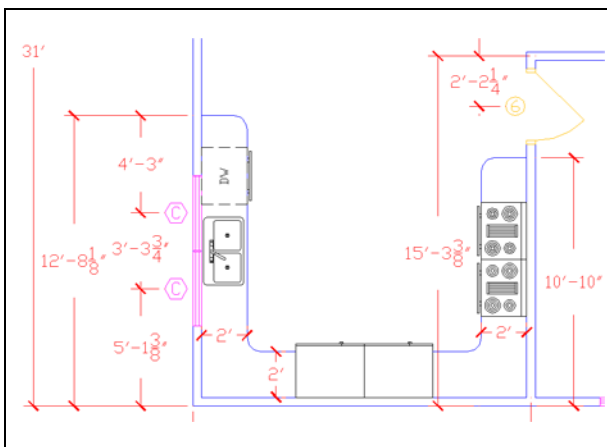


Figure 13.33 – Inserting the Appliances

You now need to use the Insert tool on the Draw toolbar to insert the **kitchen_sink**, **dishwasher**, **window_36_vert_left**, **range-oven - 30 in top** and **refrigerator-2 door - 36 in top** blocks into the kitchen, using the Appliance layer. Start out with the two windows, labeled “C,” as shown in Figure 13.33. Next, you will insert the kitchen sink and center the apparatus between the two windows. The two range-ovens are directly across from the sink. Locate the two refrigerators at the midpoint of the counter.

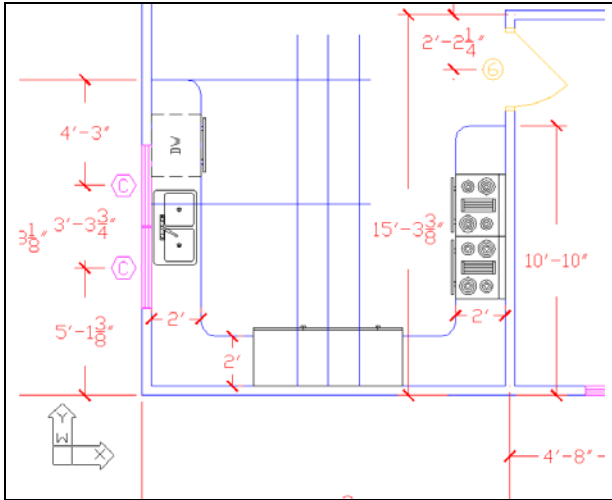


Figure 13.34 – Making an Island

Position the dishwasher just to the right of the sink and now you are ready to place an island in the kitchen. Many food preparation areas are too small for a middle of room work area, but this kitchen is large enough. Making the table to match the counter and to be movable is an advantage. Draw a line up from the center of the two refrigerators and offset the line 15 inches each way. Draw a line off the upper left of the counter and offset the line down 60 inches. Go ahead and erase the center construction line.

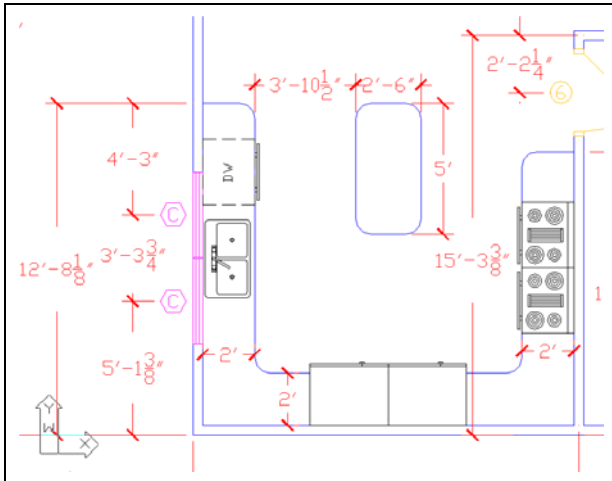


Figure 13.35 – Fillet and Dimension

Fillet the island with the seven-inch radius corners that is the standard in the house design (Figure 13.35). Although you will lose work area at the corners, the removal of corners from even a finished kitchen is a benefit when you consider safety in your design. When a wall is not present at eye level such as in this layout, inhabitants of a house will eventually find every sharp corner in your design. The movement in the design allows for easy movement from refrigerator to sink, to preparation table to cooking surface. Dimension the island as shown.

Drawing a Pantry and Laundry Room

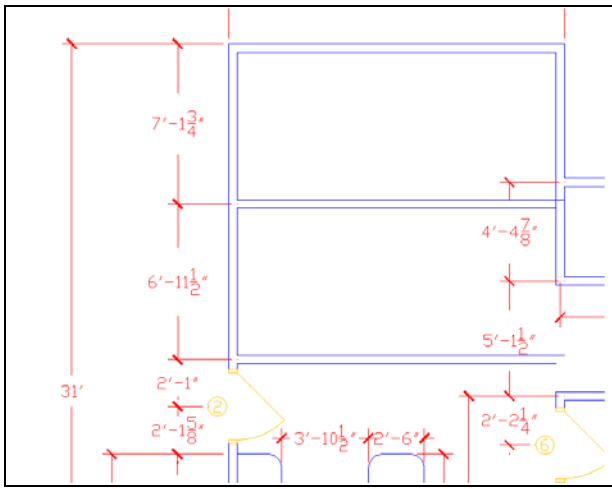


Figure 13.36 – Inserting the Back Door

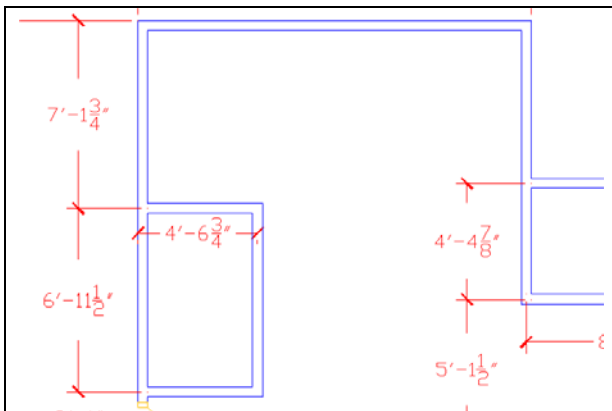


Figure 13.37 – Making a Pantry

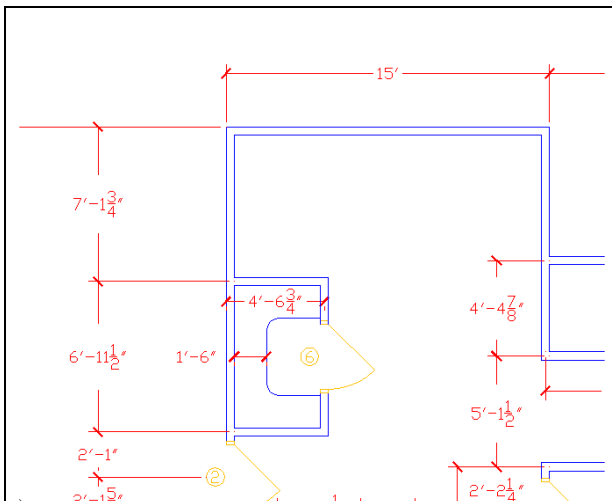


Figure 13.38 – Offset Shelves in Pantry

Again, use the Insert tool on the Draw toolbar to add a back door, which you will indicate with the number “2” when the command prompt queries you. Copy the two lines from the top down 6’11-1/2 to make a wall for the pantry. Copy that wall down 6’11-1/2 to make the other wall. You can select the lines by the grips on the right side to shorten them as shown in Figure 13.36. Making a pantry and laundry close to the kitchen is plus for a workspace, since the rear rooms of the house is now similar, less for entertaining and more for household tasks.

Now to insert the 36-inch wide interior door into the pantry wall, select the Insert tool on the Draw toolbar. In the Insert window, select the block named **door_ext_36_left** from the list of blocks. Select the OK button and insert the door in the drawing, placing the insertion point on the wall and at the Command line asking you what “What is the door number?” According to the sketch, the pantry door is “6.” Type “6” and Enter.

Offset the pantry shelves 18” from three walls. Fillet the shelves with the seven-inch radius corners that are the standard in the house design (Figure 13.38). If you place a pantry in a house, add a storage system to your design and many people will admire your plan. Leave the pantry walls empty and the approximately 4’ by 6’ area will likely become a cluttered closet. Organization of small regions is an important as large ones. Dimension the walls and shelves to check your accuracy.

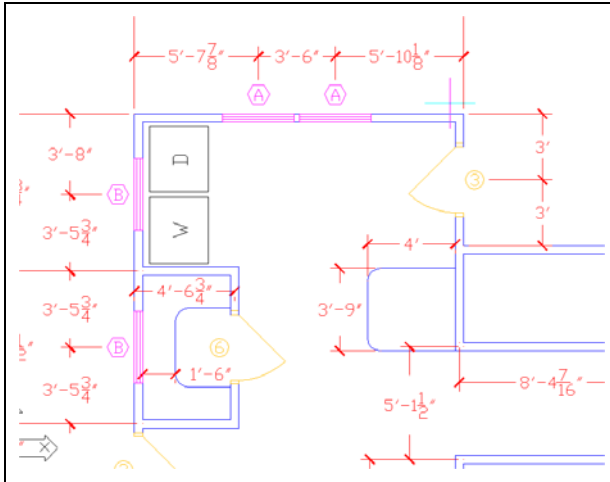


Figure 13.39 – Add Details

Insert the “B” labeled **window_36_vert_left** block for the small windows, which will add natural light into the laundry and pantry. Add the “A” tagged **window_36_horiz_top** block as shown in Figure 13.39. The side door marked “3” is the **door_ext_36_right** block, which you need to insert 3 feet from the outside wall. Add the block **washer** and **dryer** in the nook behind the pantry. Lastly draw a line off the hallway wall 48 inches to the left, go up 45 inches and back 48 inches. Place two seven-inch radius corners on the laundry table.

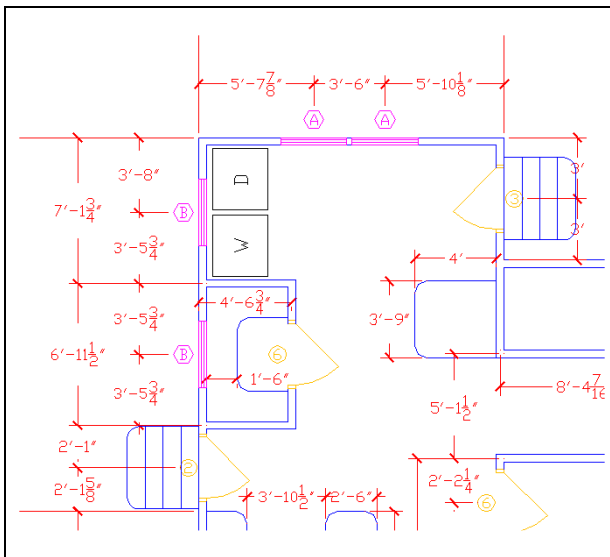


Figure 13.40 – Adding Stairs

Insert two four-step stairs at the midpoint of the back and side doors. You can also add a third set that will come off the front porch, which you need to center on the door. You can replace the blocks with a better detail of the stairs when the customer determines whether they want to do with the yard or add a deck. Handrails are an important feature and do not forget them. Usually, you will show exact particulars of the dwelling on separate sheets where you can display multiple views of the construction. When you add the additional details, you will note the view letter and sheet number next to the feature in the floor plan.

Finishing the Bathroom

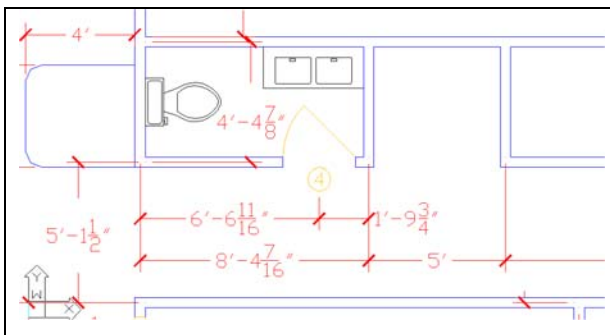
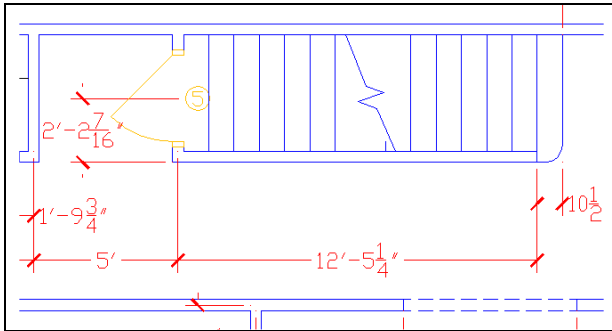


Figure 13.41 – Completing the Bathroom

Insert the **Toilet – top** block in the middle of the left wall of the bathroom. Add the **bathroom sink** block in the corner as shown in Figure 13.41. The bathroom door, marked “4” is the **door_30_right** block, which you need to insert 6’6-11/16 off the left wall. Move the hallway dimension that may interfere with the new bathroom measurements.

Completing the Basement Stairs



The basement door, marked “5,” is the **door_ext_36_right** block, which you need to insert 2’2-7/16 feet off the hallway wall. Start the first step 10.5 inches from the inside of the basement door and offset each step 10.5 inches seven times. Draw a freehand line as shown in Figure 13.42 that indicates a cut line separating the up and down stairs.

Figure 13.42 – Completing the Bathroom

Labeling the Drawing

When labeling the floor plan with text, you may want to learn one more of the text tools available. The first one you learn is obviously the **Mtext** tool that allows you to add notes similar to a simple word processing application. The second tool is **Dtext**, which you will use for single line text, like labels on floor plans. For these labels use the add the **Single Line Text** tool to the Text toolbar.



```
Command : _DTEXT
Text: Style/Align/Fit/Center/Middle/Right/Justify/<Start point>:
Height of text <0'-6">: 6
Rotation angle of text <0°0'0">:
Text: Down
```

Figure 13.43 – DTEXT Command Line prompts

Choose the Single Line Text tool on the Text toolbar and draw a line that will define the placement of the text. Follow the command line prompts, keeping the Text Height at 6”. Type Down for the label and hit enter to place the text (Figure 13.43). Use the Break tool to trim the stair lines to make room for the labels as shown in Figure 13.44.

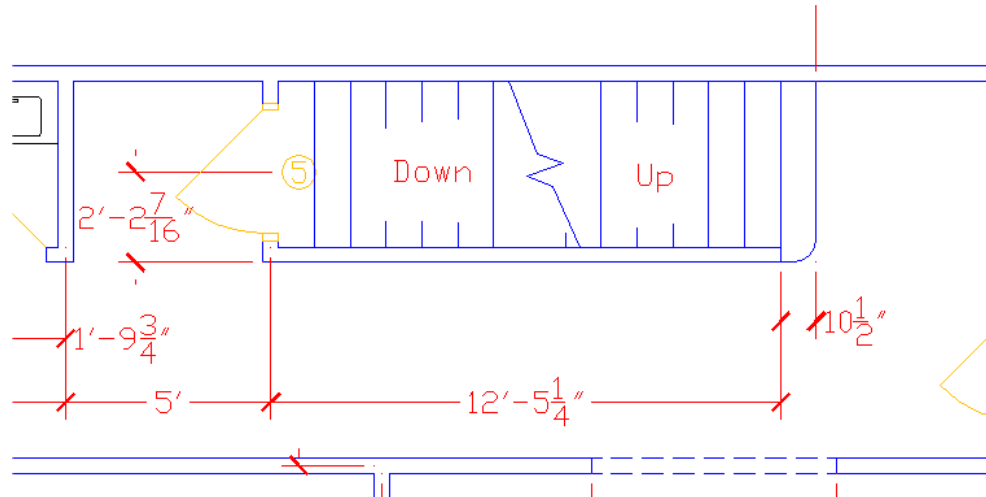


Figure 13.44 – The Two Labels on the Stairs

Label all the rooms, hallway, porch, fireplace and other features as you see in the floor plan sketch. Finally the drawing is finished; save the file as “First Floor Plan.” Make time in the two hours to check the drawing, since missing dimensions and details do not reflect well on you professionally.

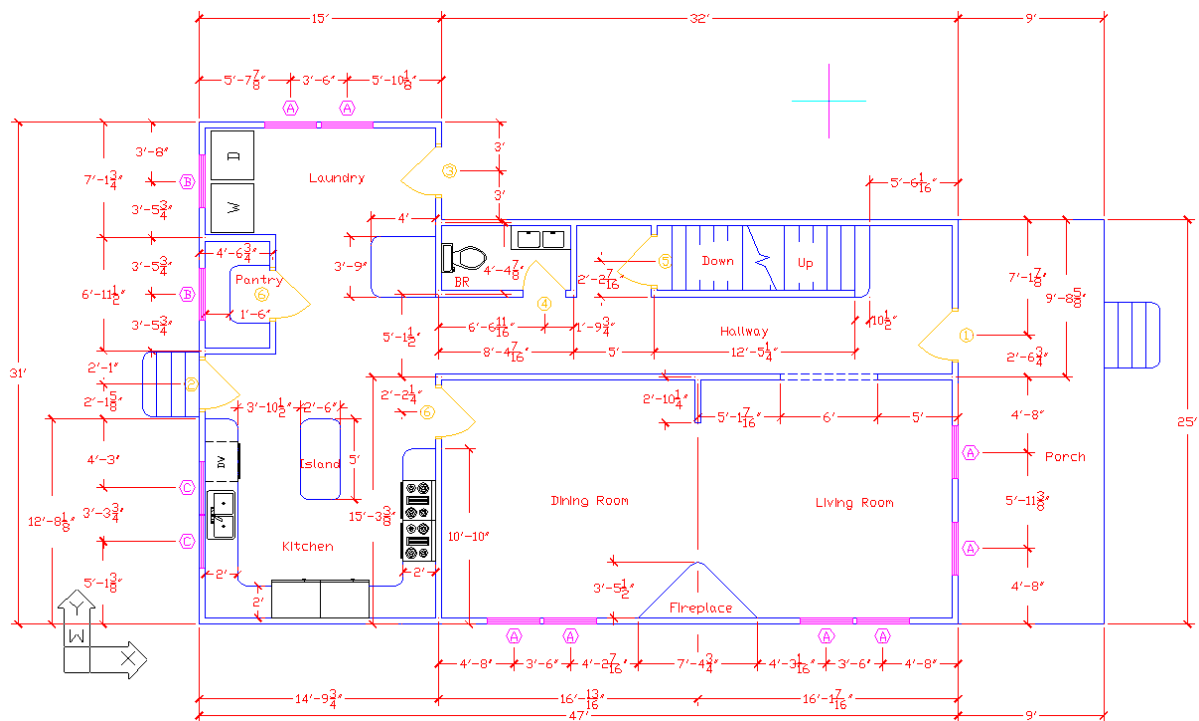


Figure 13.45 – Labeling and Finishing the Floor Plan

*** World Class CAD Challenge 100-24 * - Create a new file using the Chapter 13 Architectural template provided with this text and draw the First Floor Plan in 120 minutes. Continue this drill four times, each time completing the drawing under 120 minutes to maintain your World Class ranking.**