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Commercial Design Using Autodesk® Revit® 2027

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Lesson 3

FLOOR PLAN (First Floor):

In this lesson, you will draw the first floor plan of an office building. The office building will be further developed in subsequent chapters. It is recommended that you spend adequate time on this lesson, as later lessons build on this one.

Exercise 3-1:
Project Overview

A project's **space program** is developed in the pre-design phase. Working with the client (or user group), the architect gathers as much information as possible about the project before starting to design.

The information gathered includes:

- Rooms: What rooms are required?
- Size: How big do the rooms need to be? (e.g., toilets for a convention center are much bigger than those for a dentist's office.)
- Adjacencies: This room needs to be next to that room. (e.g., the public toilets need to be accessible from the public lobby.)

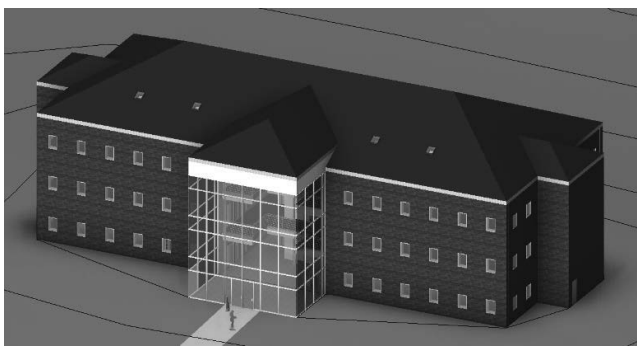
With the project's space program in hand, the architect can begin the design process. Although modifications may (and will) need to be made to the program statement, it is used as a goal to meet the client's needs.

You will not have a program statement per se for this project. However, the same information will be provided via step-by-step instructions in this book.

Project Overview

You will model a three-story office building located in a rural setting. For the sake of simplicity, the property is virtually flat.

The main entry and parking are from the south side of the building. You enter the building through a three-story atrium. Levels 2 and 3 have guardrails that look down into the atrium lobby on Level 1. The atrium is enclosed on three sides by full-height curtain walls (glass walls). See the image on the front cover.



This building is not meant to meet any particular building code. It is strictly a tool for learning to use Revit. Having said that, the book includes several general comments on how codes may affect a particular part of the design throughout.

The floor plans are mostly open office areas with a few smaller rooms for toilets, private offices, work and break rooms, etc. These areas have several "punched" window openings on the exterior walls (punched as opposed to ribbon windows).

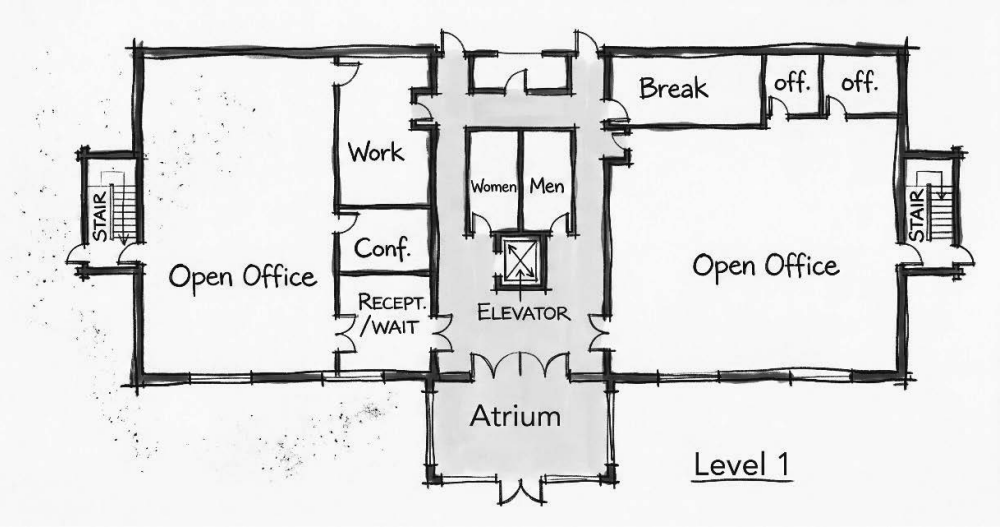


FIGURE 3-1.1 Level 1 floor plan preliminary concept sketch

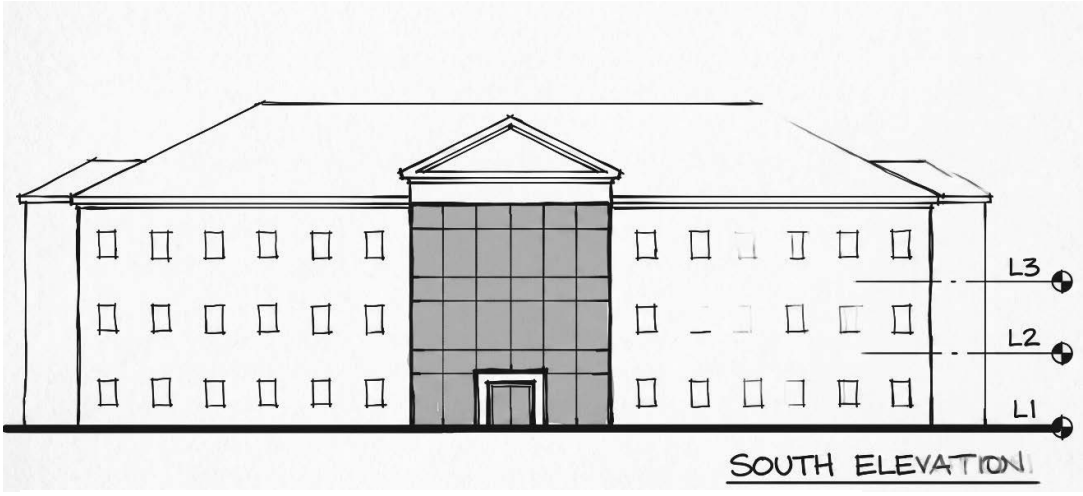
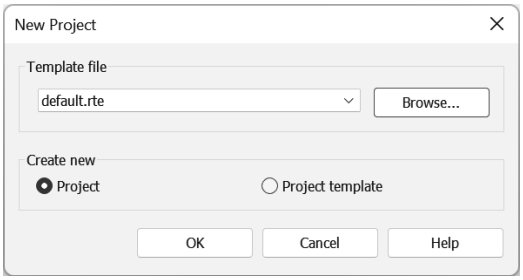


FIGURE 3-1.2 South elevation preliminary concept sketch

Exercise 3-2:
Exterior Walls

You will begin the first floor plan by drawing the exterior walls. Like many projects, you might not be certain what the exterior walls will be early on. So, we will start out using the generic wall styles. Then you will change them to a custom wall style (that you will create) once you have decided on the wall construction.

Adjust Wall Settings



1. Start a new project
   - Click **New**
   - Click the **Browse** button
   - Select **Default.rte**, click **Open**
   - Click **OK**
   - *Warning:* Be sure to select the correct template as this is the basis for the remainder of the book.

The previous chapter started with a more complete template. This chapter starts from the default template, giving you the opportunity to learn how to create things such as the room finish schedule, so you can better understand how Revit works.

2. Select the **Wall** tool from the *Ribbon* and then make the following changes to the wall options (Figure 3-2.1):
   - Wall style: *Basic Wall:* **Generic – 12″**
   - *Height:* **Unconnected**
   - *Height:* **36′ 0″**
   - *Location Line:* **Finish Face: Exterior**
   - *Chain:* **Checked**

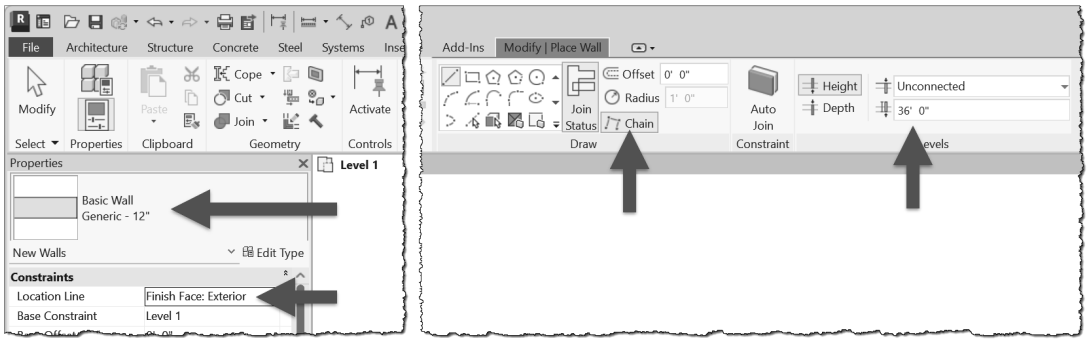


FIGURE 3-2.1 Ribbon, Properties Palette, and Type Selector: Wall tool active

Draw the Exterior Walls

3. Draw the walls shown in Figure 3-2.2. Make sure your dimensions are correct. Use the *Measure* tool to verify your dimensions. Do not add the dimensions.

NOTE: *If you draw clockwise, your walls will have the exterior side facing the correct direction. You can also use the spacebar to toggle which side the exterior face is on. Position your building in the center of the exterior elevation tags.*

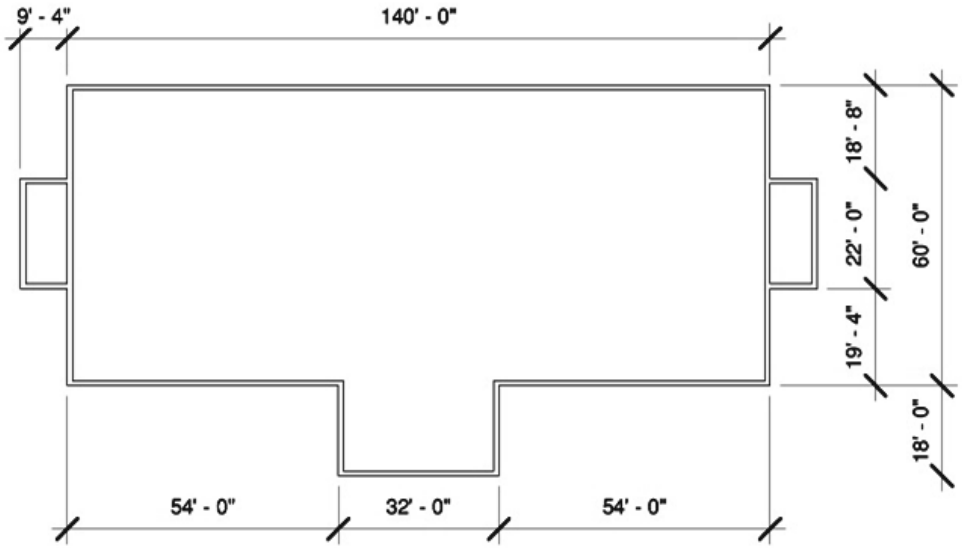


FIGURE 3-2.2 Exterior walls

Create a Custom Wall Style

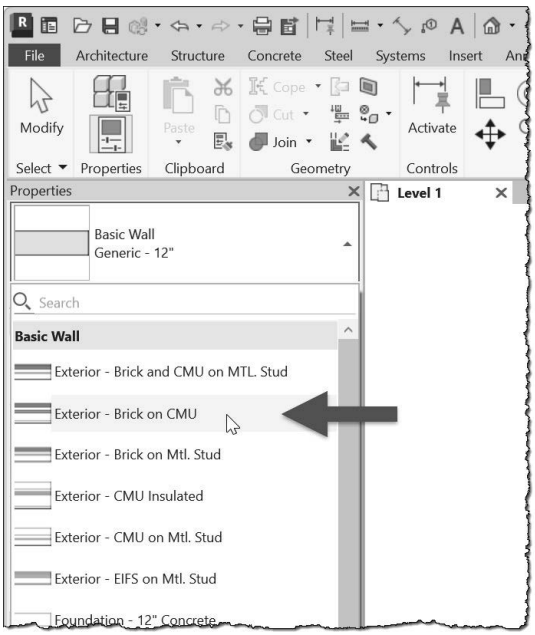
Revit provides several predefined wall styles, from metal studs with gypsum board to concrete block and brick cavity walls. However, you will occasionally need a wall style that Revit has not provided in the template. You will study this feature next.

First, you will quickly review a more complex wall type in Revit to see how it is set up.

4. With the *Wall* tool selected, pick the wall type *Basic Wall:* **Exterior – Brick on CMU** from the *Type Selector* drop-down list. (See image at right.)

5. Click the **Edit Type** button on the Properties Palette (Fig. 3-2.3).

6. You should be in the *Type Properties* dialog box. Click the **Edit** button next to the *Structure* parameter (Figure 3-2.4).



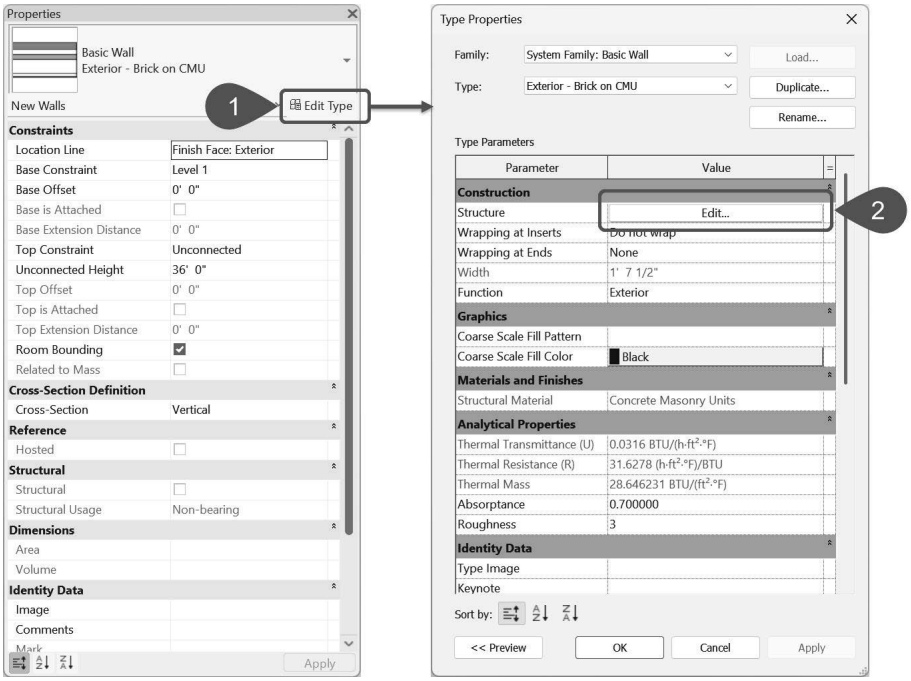


FIGURE 3-2.3 Properties Palette

FIGURE 3-2.4 Type Properties

7. Finally, you are in the *Edit Assembly* dialog box. This is where you can modify existing wall types or create new ones. Click **<<Preview** to display a preview of the selected wall type (Figure 3-2.5).

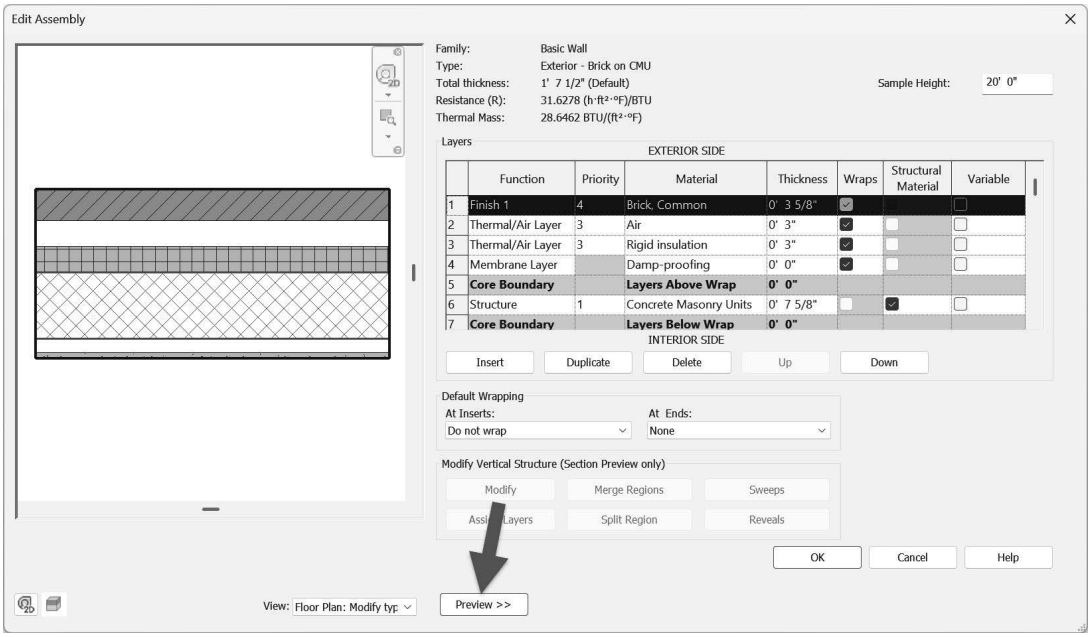


FIGURE 3-2.5 Edit Assembly

Here, the *Edit Assembly* dialog box lets you change the composition of an existing wall or create a new one.

Things to notice in the *Edit Assembly* dialog box (Figure 3-2.5):

- The **exterior side** is labeled at the top and the **interior side** at the bottom.
- You will see two horizontal rows (i.e., the Core Boundary) that identify the core material.

> What is the Core Boundary?
> It is typically the structural part of the wall. If a wall only has one layer, it must be within the core boundary.
>
> The core material can be used to place walls and dimension walls. For example, the *Wall* tool will let you draw a wall with the interior or exterior core face as the reference line. On an interior wall, you would typically dimension to the face of CMU rather than to the finished face of gypsum board. This is to work out the masonry coursing and provide the contractor with the information needed for the part of the wall they will build first.

- Each row is called a layer. By clicking a layer and using the Up or Down buttons, you can reposition materials (i.e., layers) within the wall assembly.

8. Click **Cancel** in each open dialog box to close them (don't close the *Properties Palette*).

9. Set the wall style back to *Basic Wall:* **Generic – 12″** in the *Type Selector*.

10. Click the **Edit Type** button again on the *Properties Palette*.

11. Click **Duplicate**.

12. Enter **Brick & CMU cavity wall** for the new wall type name, and then click **OK** (Figure 3-2.6).

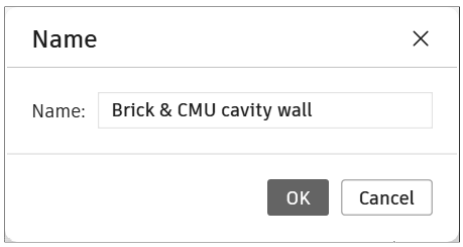


FIGURE 3-2.6 New wall type name

13. Click the **Edit** button next to the *Structure* parameter.

14. Using the **Insert** button and the **Up** and **Down** buttons, add the *layers* to your new wall style, as shown in the table below (Figure 3-2.7).

Function	Priority	Material	Thickness
Finish 1	4	Brick, Common	4″
Thermal/Air Layer	3	Air	2″
Thermal/Air Layer	3	Rigid insulation	2″
Membrane Layer		Damp-proofing	0″
Core Boundary		*Layers above wrap*	*0″*
Structure	1	Concrete Masonry Units	8″
Core Boundary		*Layers below wrap*	*0″*
Substrate	2	Metal Furring	2 1/2″
Finish 2	5	Gypsum Wall Board	5/8″

FIGURE 3-2.7 New wall layers

Masonry is sometimes drawn nominally in floor plans. This helps to figure out coursing for both drawing and dimensioning. Note that 8″ concrete block is actually 7⅝″.

Also, notice that the CMU, Rigid Insulation, Air Space and Brick add up to 16″ in thickness. This portion of the wall would sit on a 16″ concrete block (CMU) foundation wall directly below.

15. Your dialog should look like **Figure 3-2.8**. Click **OK** to close all dialog boxes.

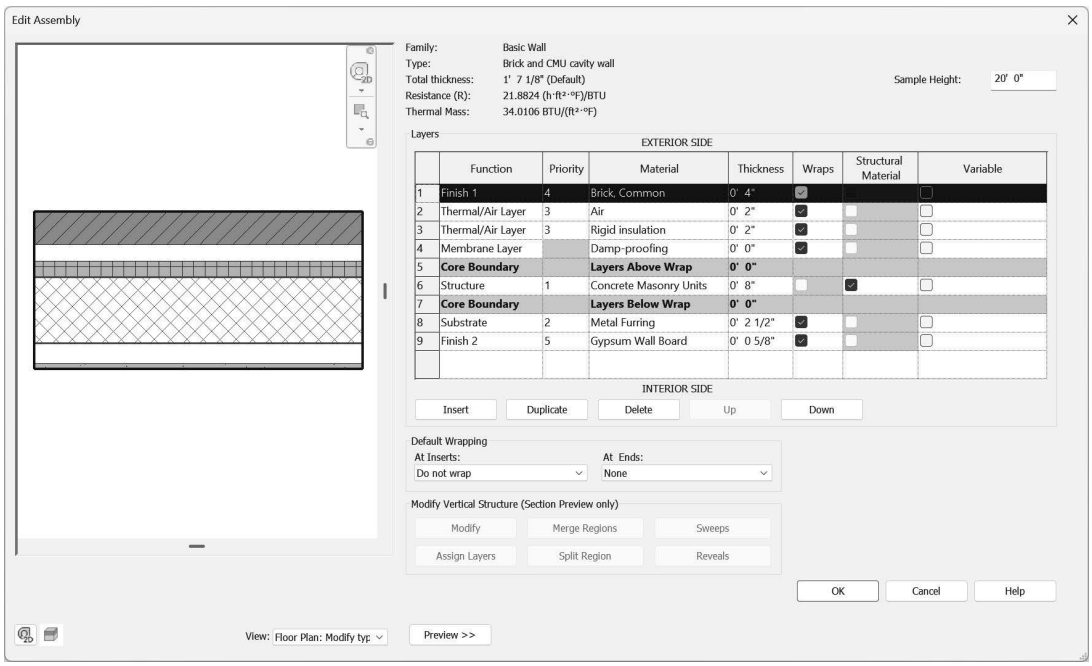


FIGURE 3-2.8 Edit Assembly for new wall type

The next step is to change the wall type for the previously drawn walls.

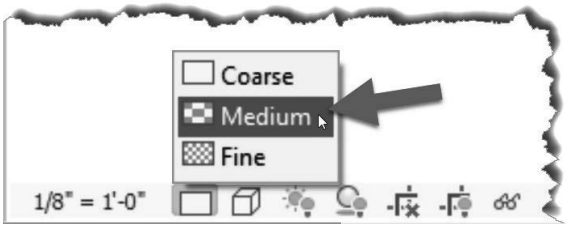
16. Select the **Modify** button on the *Ribbon*; this cancels the active command and allows you to select elements in your drawing.

17. **Zoom out** so you can see the entire plan. Dragging your mouse from one corner to the other, make a window over the plan to select all the walls. Be careful not to select the exterior elevation tags – move them away from your building first if needed.

18. With the walls selected, pick *Basic Wall:* **Brick & CMU cavity wall** from the *Type Selector* drop-down list.

TIP: *If, after selecting all the walls, the Type Selector is not active and shows no wall types, you probably have the exterior elevation tags selected. If needed, click and drag the elevation tags away from the building to make the walls easier to select, but do not delete them. You can also click on the Filter button (located on the Ribbon when objects are selected) and uncheck the types of elements to exclude from the current selection.*

You should notice the wall thickness change, but the wall cavity lines and fill patterns are not showing yet. This is controlled by the *Detail Level* option for each view.



Detail Level; Set to Medium

19. Click on the **Detail Level** icon in the lower-left corner of the *Drawing Window*, on the *View Control Bar*.

20. Select **Medium**.

You should now see the brick and CMU thicknesses, along with their fill patterns. If you did not draw the walls clockwise, some of your walls may show the brick on the inside of the building.

21. Select **Modify** (or press **Esc**); select a wall. You will see a symbol that lets you flip the wall orientation by clicking it (Figure 3-2.9).

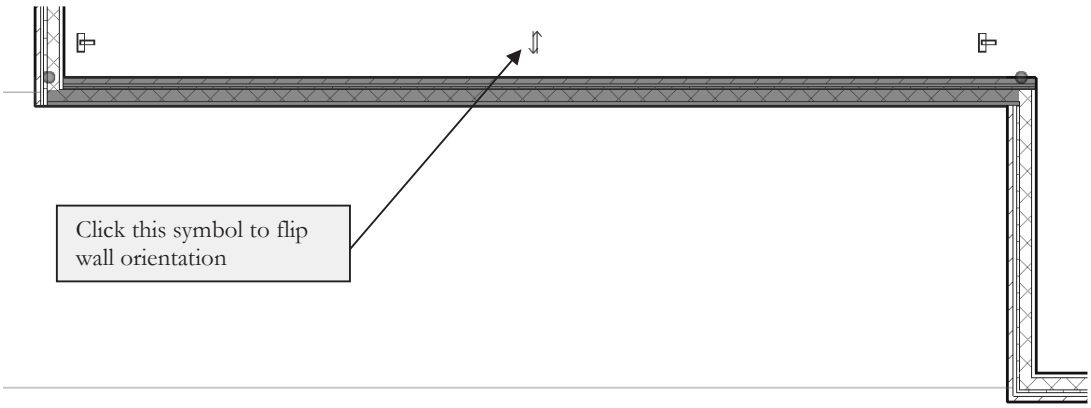


FIGURE 3-2.9 Selected Wall; notice some walls have the brick on the interior

22. Whether you need to adjust walls or not, click on the flip symbol to experiment with its operation.

    TIP: *The Flip symbol is always on the exterior side (or what Revit thinks is the exterior side) of the wall.*

23. If some walls do need to be adjusted so the brick is to the exterior, do it now. You will probably need to select the wall(s) and use the temporary dimensions or move tool to reposition them to match the required dimensions.

    TIP: *If you set the "location line" in the Properties Palette to "Wall Centerline," the wall will not move or alter the overall dimensions when flipped. You will want to set the "location line" back to Finish Face: Exterior when done.*

TIP: *You can use the MOVE tool* Move *on the Ribbon (when a wall is selected) to accurately move walls.*

Follow these steps to move an object:

- *Select the wall*
- *Click the Move tool*
- *Pick any point on the wall*
- *Start your cursor in the desired direction (don't click)*
- *Start typing the distance you want to move the wall and press Enter.*

Finally, you will convert the three walls in the atrium into curtain walls (full glass). This will let a lot of light into the atrium and better identify the building's main entry.

24. Drag a selection window (from left to right) to select the three walls around the atrium, or hold the Ctrl key on the keyboard and select them.

25. With the walls selected, pick *Curtain Wall:* **Curtain Wall 1** from the *Type Selector* drop-down. FYI: the walls will not touch at the corners until mullions are added in a later step.

Your atrium is now surrounded by curtain walls (Figure 3-2.10). In a later lesson, we will add horizontal and vertical mullions to the curtain wall.

You can see your progress nicely with a 3D view. Click the **3D View** button on the *QAT*. Notice that Revit shows the curtain wall as transparent because it recognizes it as glass. The other walls are shaded on the exterior side due to the brick pattern.

26. Save your project as **ex3-2.rvt**.

Revit automatically sets the fill pattern intensity (i.e., material representation within each layer of the wall) and line weights.

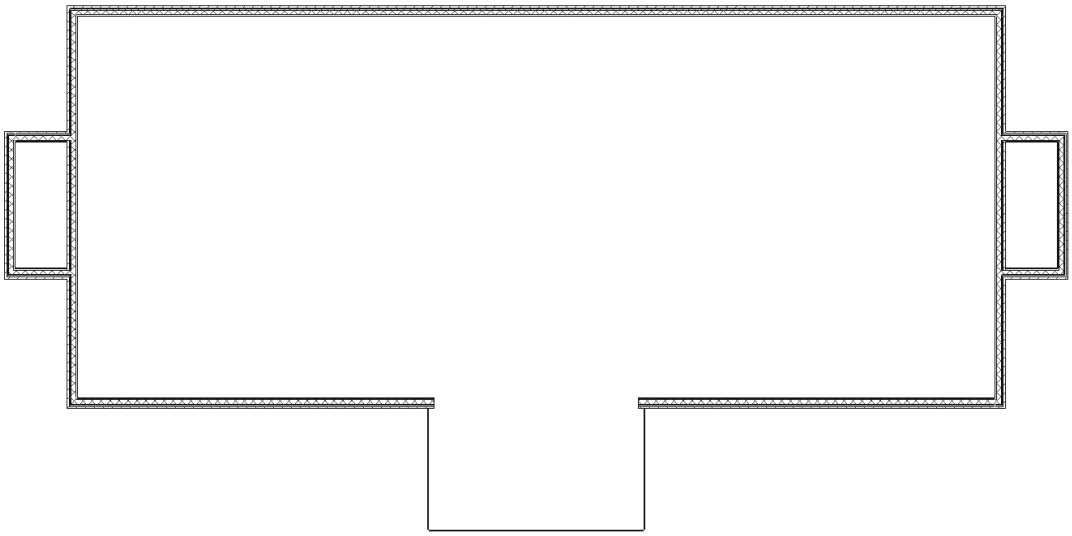


FIGURE 3-2.10 Completed exercise (Level 1 plan view)

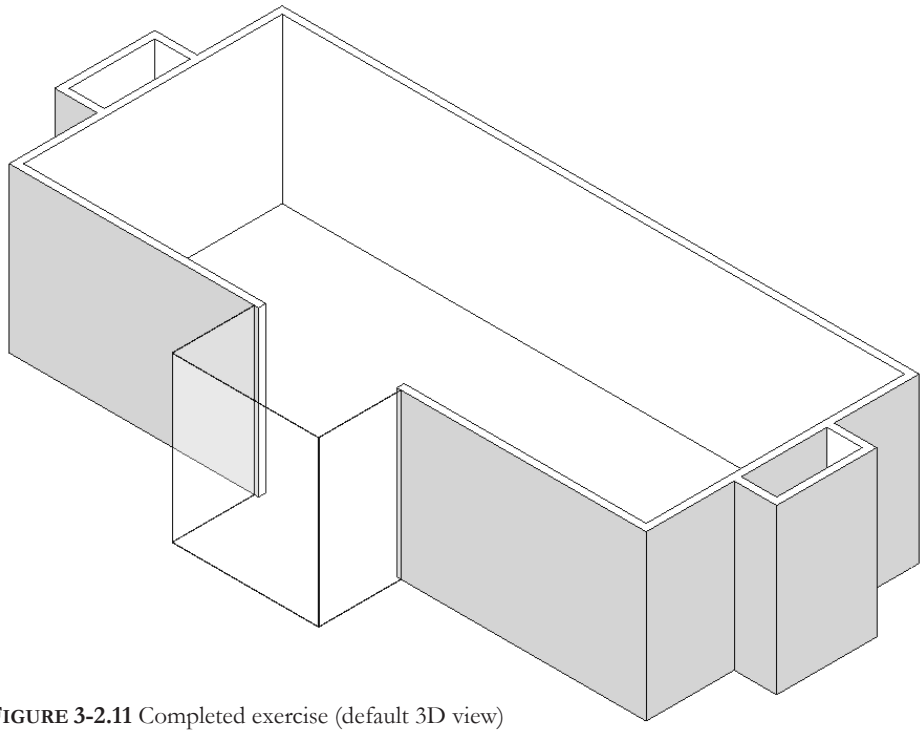


FIGURE 3-2.11 Completed exercise (default 3D view)

Exercise 3-3:
Interior Walls

In this lesson, you will draw the interior walls for the first floor.

Adjust Wall Settings

1. In the Level 1 floor plan, select **Architecture → Build → Wall** from the *Ribbon*.

2. Make the following changes to the wall options on the *Ribbon*, *Properties,* and *Type Selector* (Figure 3-2.1):
   - Wall style: *Basic Wall:* **Interior – 4 7/8″ partition (1-hr)**
   - *Height:* **Level 2**
   - *Location Line:* **Wall Centerline**

Draw the Interior Walls

3. Draw a "vertical" wall approximately as shown in Figure 3-3.1. You will adjust its exact position in step #4.

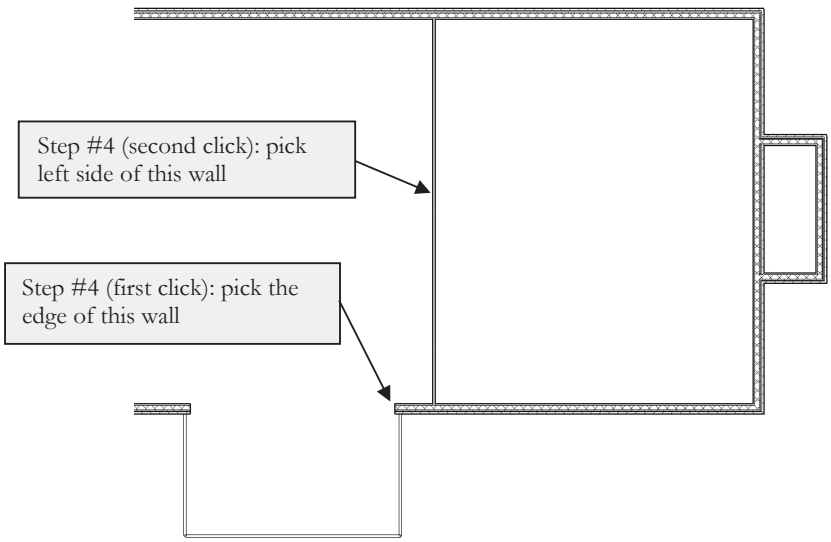


FIGURE 3-3.1 First interior wall

4. Select **Modify → Modify → Align** tool to align it with the edge of the exterior wall in the atrium (Figure 3-3.1). When you are done, the wall should look like Figure 3-3.2.

5. Create the same wall for the West side of the atrium, repeating the above steps.

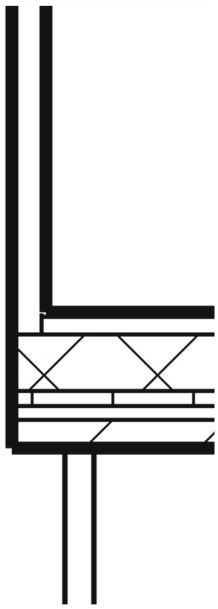


FIGURE 3-3.2
First interior wall

Modify an Existing Wall Type

Next, you will add some additional interior walls. You will be drawing 8″ CMU walls. Revit does have an 8″ Masonry wall type available in the default template file that you started your project from. However, the thickness for this wall type is 7⅝″, which is the actual block size. Floor plans are sometimes drawn nominally (i.e., 8″), not actual (7⅝″). This is done so you can determine the masonry coursing, minimizing cutting (and associated extra material and labor costs). Therefore, rather than creating a new wall type, you can simply modify the existing wall type. Some firms prefer to use actual masonry dimensions. However, these changes should still be made to this project so you learn more about how walls work and so all the tasks in this book work as expected or intended.

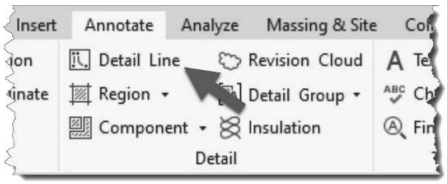
6. In the Wall command, select the wall type *Basic Wall:* **Generic – 8″ Masonry**.

7. Select the **Edit Type** button on the *Properties Palette* to view the wall's *Type Parameters*, and then click **Edit** next to the *Structure* parameter.

8. Change the masonry thickness from 7⅝″ to **8″** in the *Edit Assembly* dialog box, and then select **OK** to close each dialog.

Occasionally, Revit will not list dimensions relative to the walls you want to draw new walls from, while in the "create wall" mode. One way to deal with this is to draw temporary *Detail Lines* to use as a reference. After using the temporary line as a reference, you can delete it.

9. Select **Annotate → Detail → Detail Line** from the *Ribbon*; the line type does not really matter, but select a continuous one called "Thin Lines" via *Line Style* on the *Ribbon*.



10. Draw the "vertical" line, **35'-0"** long, as shown in Figure 3-3.3; be sure to snap to the *Midpoint* of the atrium wall as your first point.

Next, you will draw an elevator shaft, centered on the atrium and 35′-0″ back. The temporary line will help position it in the center; then we will delete the line.

The inside dimensions of the elevator are **7′-4″ x 6′-10″**. Since you know the inside dimensions, you will want to adjust the location line to match the known information.

11. Activate the *Wall* tool with **Generic – 8″ Masonry** selected in the Type Selector.

12. Set the *Location Line* to **Finish Face: Interior**.

13. Draw the **7′-4″ x 6′-10″** elevator shaft. Make sure the location line is to the inside so your shaft is the correct dimension. Draw the shaft anywhere in the *Drawing Window*; you will adjust the exact position next.

    FYI: *Use the Measure tool to double-check the dimensions.*

14. Select the 4 walls that represent the elevator shaft, and then pick the **Move** tool.

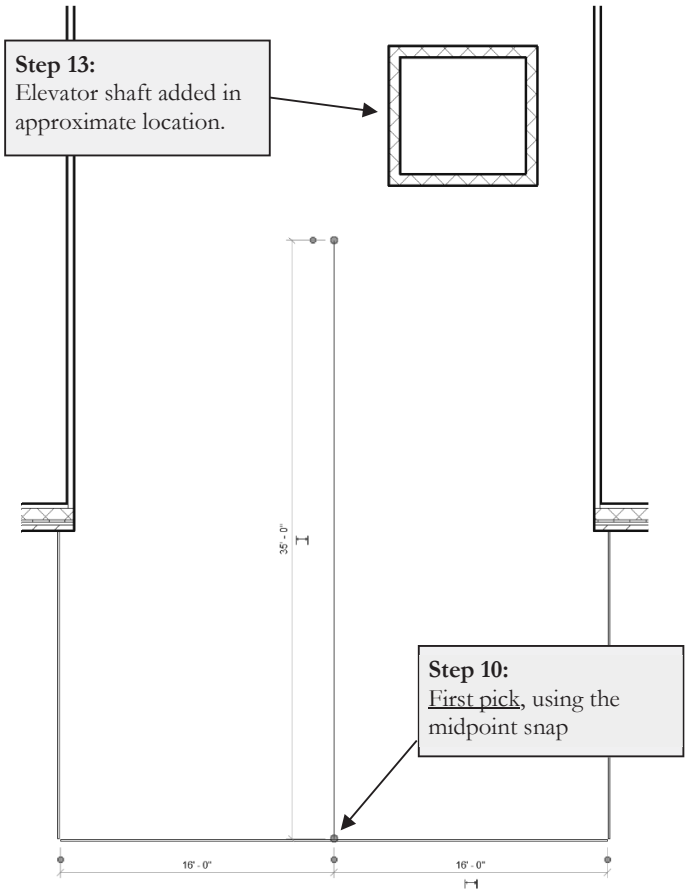


FIGURE 3-3.3 Temp. Detail Line

TIP: *Concrete blocks come in various widths, and most are 16″ long and 8″ high. When drawing plans, there is a simple rule to keep in mind to make sure you are designing walls to masonry coursing. This also applies to wall lengths and openings within CMU walls.*

Dimension rules for masonry coursing in floor plans:

- *e′-0″ or e′8″* — *where e is any even number (e.g., 6′-0″ or 24′-8″)*
- *o′-4″* — *where o is any odd number (e.g., 5′-4″)*

15. Snap to the *Midpoint* of the shaft as your first point, and then snap to the *Endpoint* of your temporary detail line (Figure 3-3.4). You should zoom in to verify your snaps. Do not draw the dimensions; they are for reference only.

The elevator shaft is now perfectly centered in the atrium and exactly 35′-0″ back from the South curtain wall.

16. At this point, you can **delete** the temporary line. Select the line and then right-click and select delete, or press the Delete key on the keyboard.

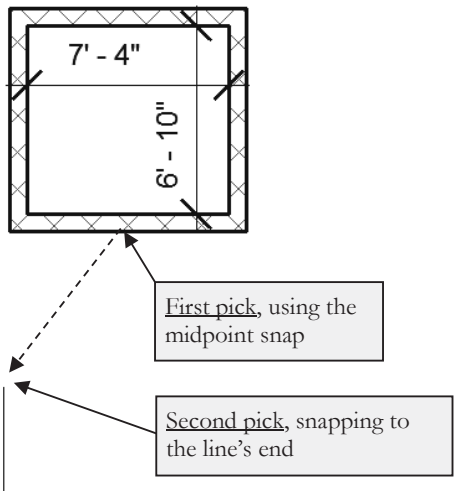


FIGURE 3-3.4 Move elevator shaft into place

FYI: *When a wall is selected, you can see that wall's properties via the* Properties Palette *(Type "*PP*" to open the Palette if it is not visible). Click one of the elevator shaft walls and verify that it is 36′-0″ tall.*

Modify an Existing Wall

Next, we want to change the portion of the wall between the building and the East and West stair shafts. To do this, you will need to split the current wall, trim the corners, and then draw an 8″ masonry wall.

17. **Zoom** in on the West stair shaft and select the **Split Element** tool (*Modify* tab on the *Ribbon*).

18. Pick somewhere in the middle of the wall (Figure 3-3.5).

19. Select **Modify → Modify → Trim** to trim the corners so the exterior wall only occurs at exterior conditions (Figure 3-3.6).

TIP: *Select the portion of wall you wish to retain.*

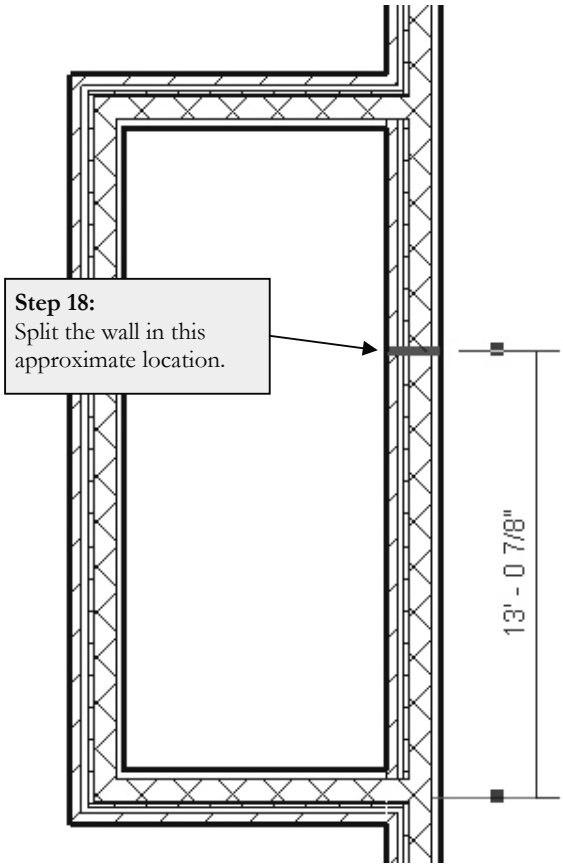


FIGURE 3-3.5 Split tool

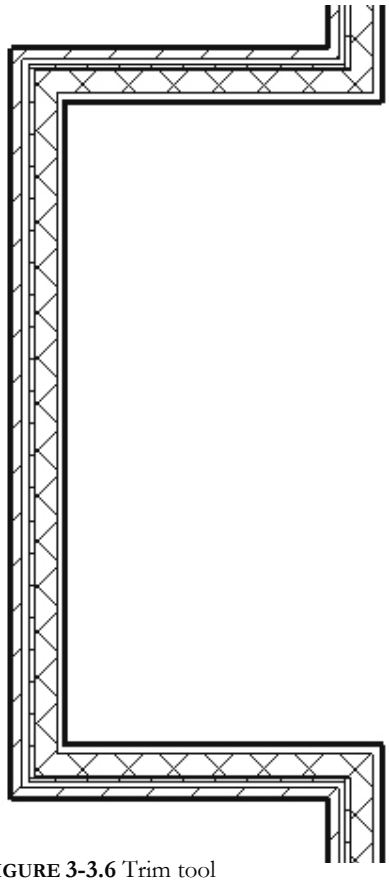


FIGURE 3-3.6 Trim tool

Additional Custom Wall Types

We decided that the stair shafts are mostly utilitarian and do not require gypsum board on the walls. In the next steps, you will create a new exterior wall type similar to the one previously created, without gypsum board or metal studs. Also, you will create a custom wall type to close the open side of the stair shaft we created in the previous steps. This wall type will have gypsum board and metal studs on one side.

20. Using the wall type *Basic Wall: Brick & CMU cavity wall* as a starting point, create a new wall type named **Brick & CMU cavity wall (no GWB)**. Remove the gypsum board and metal studs, and save the new wall type. *(Reminder: Edit Type and Duplicate.)*

21. Change the **three exterior walls** around the west stair shaft to the new wall type created in the previous step (select them and pick from the Type Selector).

22. Using the wall type *Basic Wall: Brick & CMU cavity wall* as a starting point, create a new wall type named **8″ Masonry with GWB 1S**. Remove the brick, air space, rigid insulation and membrane layer and save the new wall type (Figure 3-3.7).

FYI: *It will be useful to come up with a standard naming system for your custom wall types. If the names get too long they are hard to read. The example above has:*
- *GWB = Gypsum Wall Board (and would imply studs)*
- *1S = finish only occurs on one side of the wall.*

Function [Priority]	Material	Thickness
n/a	*n/a*	*n/a*
Core Boundary	*Layers above wrap*	*0″*
Structure [1]	Concrete Masonry Units	8″
Core Boundary	*Layers below wrap*	*0″*
Substrate [2]	Metal Furring	2½″
Finish 2 [5]	Gypsum Wall Board	⅝″

FIGURE 3-3.7 New wall layers

23. Draw a wall so the gypsum finish continues on the office side, using the *Align* tool if necessary (Fig 3-3.8).

Tip: Use the Measure tool to make sure the stair shaft is the correct size; don't draw the dimensions.

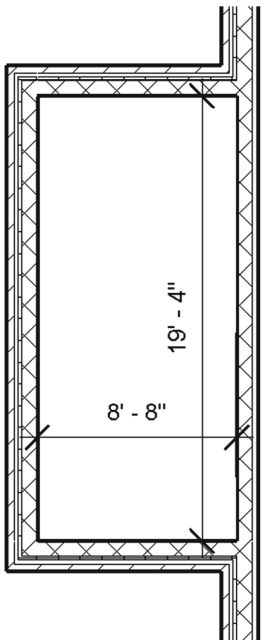


FIGURE 3-3.8 Revised west stair

Next, you will use the *Mirror* tool to update the east stair. Before doing so, you will draw a Reference Plane to use as the Axis of Reflection (more on this later when using the Mirror tool).

24. Select **Architecture → Work Plane → Ref Plane** from the *Ribbon*.

25. Draw a *Reference Plane* snapped to the vertical, centered on the South atrium wall (See Figure 3-3.9).

26. Erase the four walls of the East stair shaft; this will include the main east wall of the office building (Figure 3-3.9).

TIP: *Select the walls and press Delete on the keyboard.*

27. Select the six walls at the West stair (Figure 3-3.9).

TIP: *Make sure the count is correct on the Status Bar.*

28. Select the **Mirror - Pick Axis** tool (on the *Ribbon*) and then select the *Reference Plane* (Figure 3-3.9).

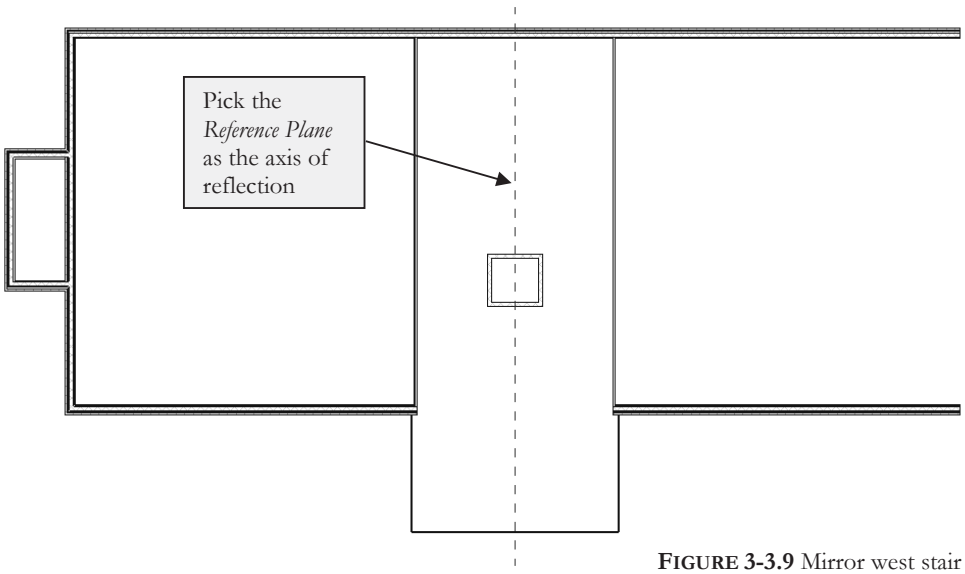


FIGURE 3-3.9 Mirror west stair

29. Use the **Measure** tool to verify the overall length of the building is 140′-0″ (not including the stair shafts). Adjust as necessary (see Fig. 3-2.2).

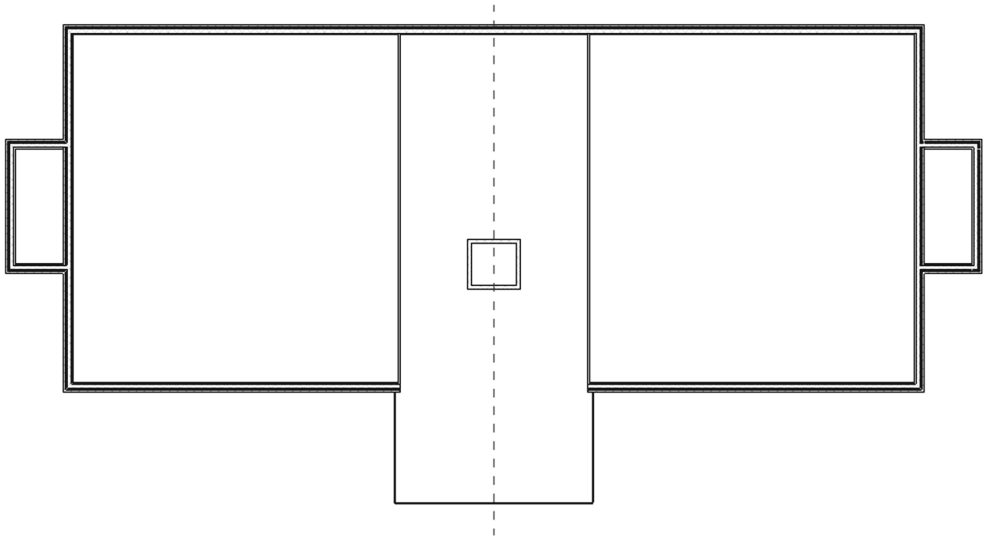


FIGURE 3-3.10 Mirrored west stair

Finally, you will draw a few more interior walls to complete the first floor plan. **Do <u>not</u> delete the *Reference Plane*** (note: the reference line may not show up in every image in this text).

30. Using the *Wall* tool, set the wall type to *Basic Wall:* **Interior – 4 7/8″ partition (1-hr)**.

31. Draw the additional walls shown in Figure 3-3.11. Make sure to position the walls per the dimensions shown. Use the *Measure* tool to verify accuracy. Also, modify the *Location Line* as required.

DRAWING TIPS: *Copy the existing atrium wall 6′-4 7/8″ over (6′-0″ plus one wall thickness), draw a wall from the midpoint of the elevator shaft with centerline reference (Location Line), and use the Trim and Mirror tools. Do not draw the dimensions.* ***SAVE YOUR PROJECT as ex3-3.rvt.***

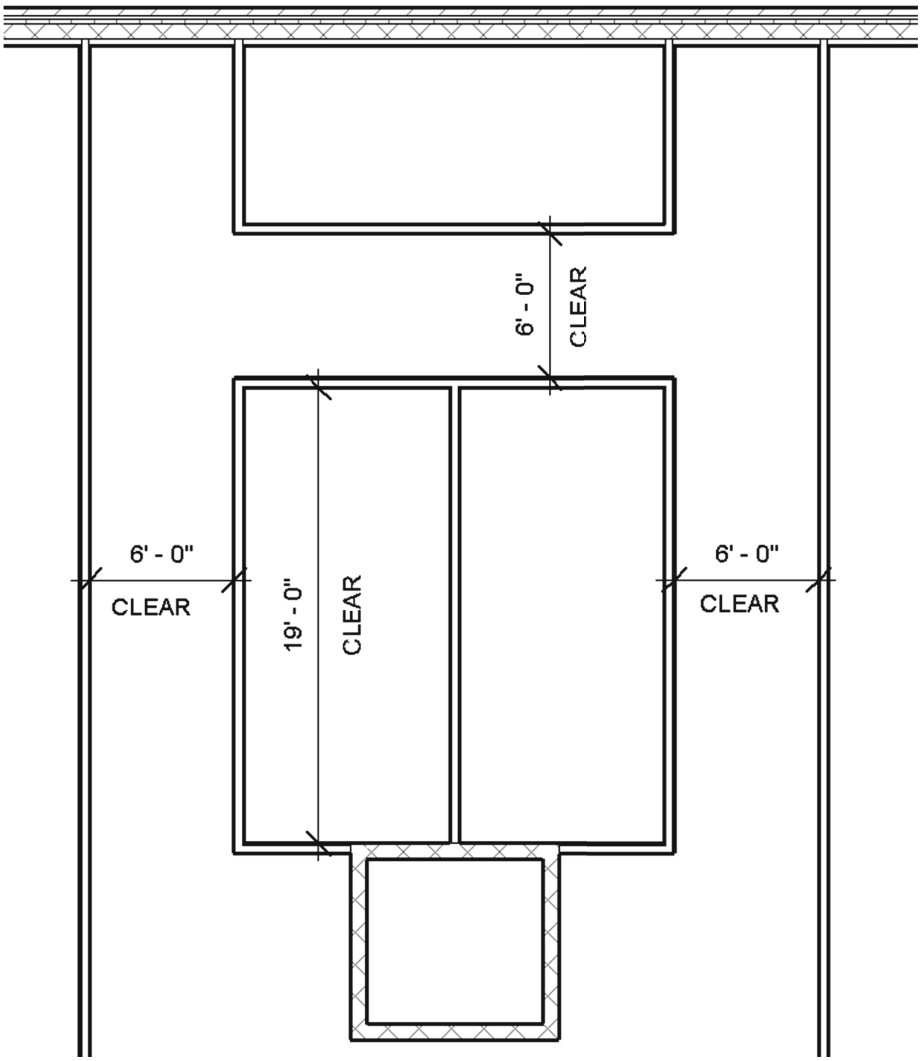


FIGURE 3-3.11 Remaining interior walls

Exercise 3-4:
Elevator

This lesson shows you how to install an elevator in your elevator shaft.

Insert Elevator

Revit provides many *Families*, which are predefined elements ready to insert into your project. However, many elements are not readily available, such as elevators. You will get an elevator family online in this exercise. The online library is where you will acquire an elevator family for use in your project.

1. Open project ex3-3.rvt and ***Save As* ex3-4.rvt**.

You will have to download the elevator from the web. *Of course, you will need to be connected to the Internet.*

2. Click on the **Insert** tab on the *Ribbon*.

3. Select **Load from Library→ Load Autodesk Family** from the *Ribbon*.

4. Search for **Elevator-Electric**, select it, and then click **Load** to import the family into your project (an internet connection is required for this step).

5. In the *Project Browser*, click the **Families** filter to narrow down the list (Figure 3-4.1).

6. Expand the **Vertical Circulation** list, and then **Elevator-Electric**.

As you can see, four elevator types were loaded into your project. Like wall types, you can add one of these types as-is, or modify or create a new one. Next, you will add information in the *Type Properties* dialog to better document the elevator being specified.

7. Right-click on the elevator type **2000 lbs**, and then select **Type Properties** from the pop-up menu.

You will now see a listing of the type properties for the selected elevator type.

FIGURE 3-4.1 Elevator family: Project Browser

8. Click the **Preview** button (if necessary) to see the graphical review of the elevator type. Set the *View* to 3D View: View 1.

9. Add the following information (Figure 3-4.2):

   - *Model:* **MadeUp 8864**
   - *Manufacturer:* **ThyssenKrupp Elevator**
   - *URL:* **www.thyssenelevator.com**

This data just entered represents the **I** in **BIM** (Building Information Modeling).

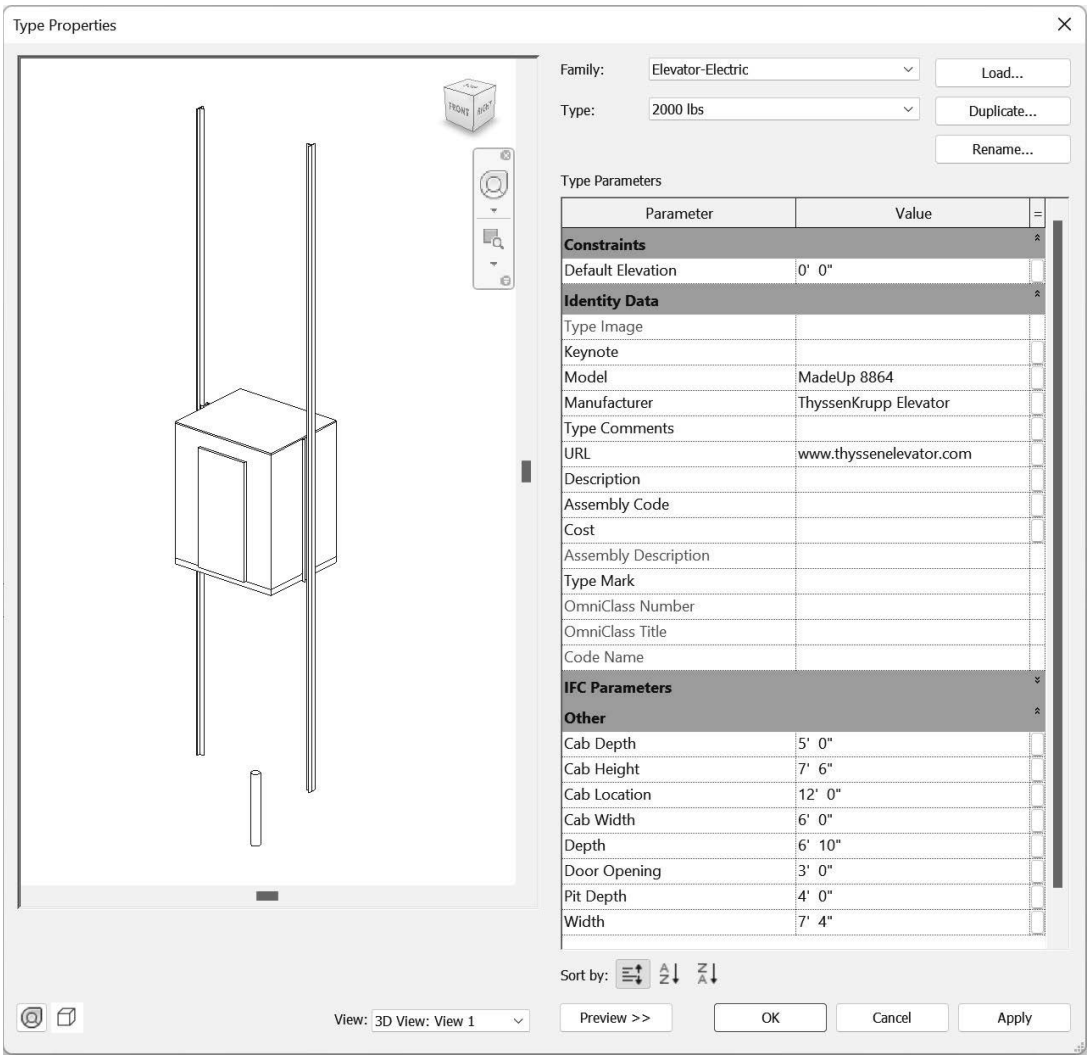


FIGURE 3-4.2 Elevator properties

10. Click **OK** to close the open dialog box.

11. Drag the **2000 lbs** elevator type from the *Project Browser* into the first floor plan.

    FYI: *You can also use the Component tool from the Architecture tab to place the elevator.*

The elevator type will be attached to your cursor, ready for insertion.

12. Move your cursor within the elevator shaft and adjust it until the elevator "snaps" in place, then click (Figure 3-4.4).

13. Press **Esc** twice to tell Revit you are finished placing elevators.

Now you need to add an elevator door in the shaft walls at each level; it is similar to a regular door in a wall.

14. Load the **Elevator Door – Center** family using the Load Autodesk Family command again.

15. Drag the **36″ x 84″** elevator door type from the project browser into the first floor plan (Figure 3-4.3).

16. Place the elevator door at the center of the wall, aligned with the elevator door on the cab (Figure 3-4.4).

    TIP: *If the door is inserted on the wrong side of the wall, select the door and click the Control Arrows to flip it within the wall.*

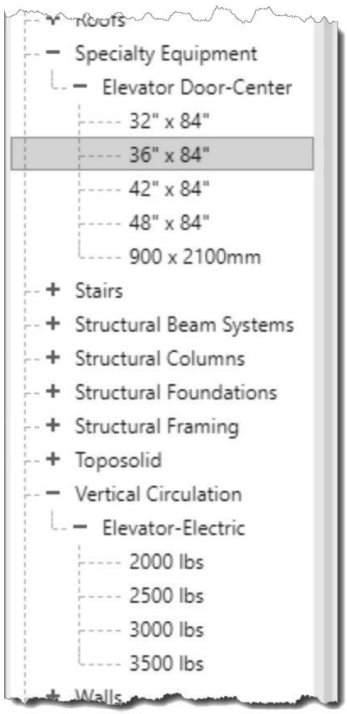


FIGURE 3-4.3 Elevator doors in Project Browser

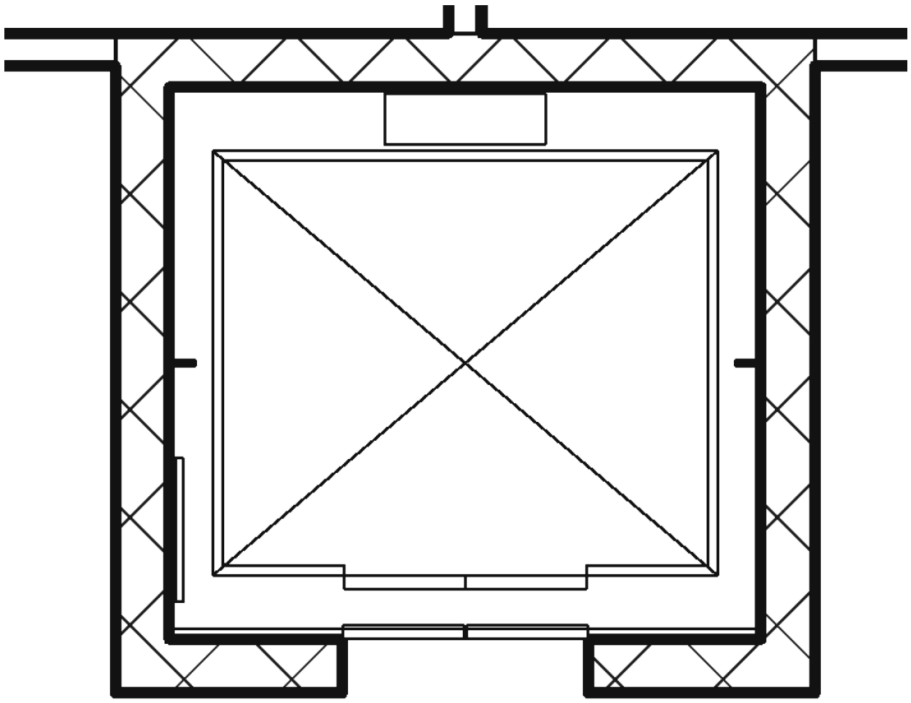


FIGURE 3-4.4 Elevator door added to plan

Notice when the elevator is selected, the flip icon (control arrow) is displayed. Similar to the doors and walls, you can click this icon to flip the orientation of the elevator within the shaft.

17. Save your project as **ex3-4.rvt**.

Exercise 3-5:
Doors and Windows

This lesson will take a closer look at inserting doors and windows.

Insert Doors

Revit has done an excellent job providing several different door families. This makes sense, seeing as doors are an important part of an architectural project. Some of the provided families include single, double, pocket, sectional (garage), and vertical rolling, to name a few. In addition to the families provided by Autodesk, many more are available on other websites (some free, some not).

The default template you started with only provides the **Sgl Flush** (Single Flush) family in the *Doors* category. If you want to insert other styles, you will need to load them from the library. This step is necessary because when you load a family, Revit actually copies the data into your project file. If every possible family were loaded into your project at the beginning, not only would it be hard to find what you want in a large list of doors, but also the project file would be several megabytes in size before you even drew the first wall.

You will begin this section by loading a few additional families into your project.

1. Open project ex3-4.rvt and **Save-As ex3-5.rvt**.

2. From the Insert tab, select the **Load Autodesk Family** button on the *Ribbon* (Figure 3-5.1).

3. Browse through the various categories for a moment.

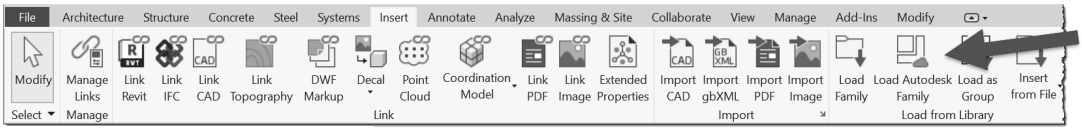


FIGURE 3-5.1 Load Family

Each file represents a *Family*; next you will load four door *Families* into your project.

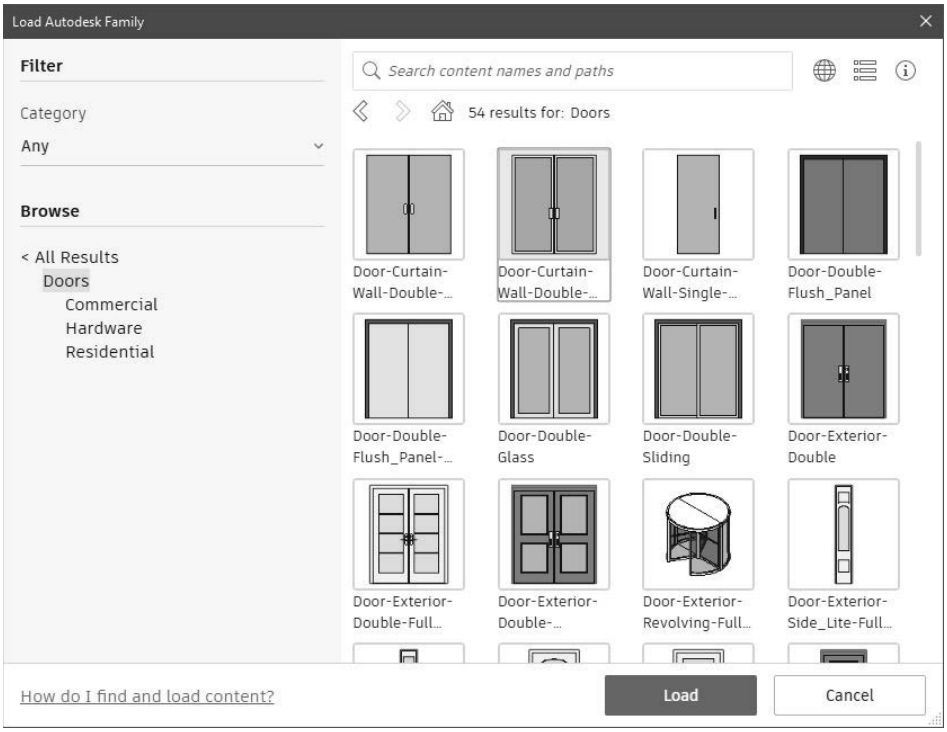


FIGURE 3-5.2 Door families on hard drive

4. Open the **Doors** category and then select **Door-Curtain-Wall-Double-Storefront**, and then click **Load** (Figure 3-5.2).

5. Using **Insert → Load Family**, load the following SDC provided door families:
   a. **Double-Glass 1**
   b. **Sidelights 1**
   c. **Single-Glass 1**

6. In the *Project Browser*, expand *Families* and *Doors* to see the loaded door families (Figure 3-5.3).

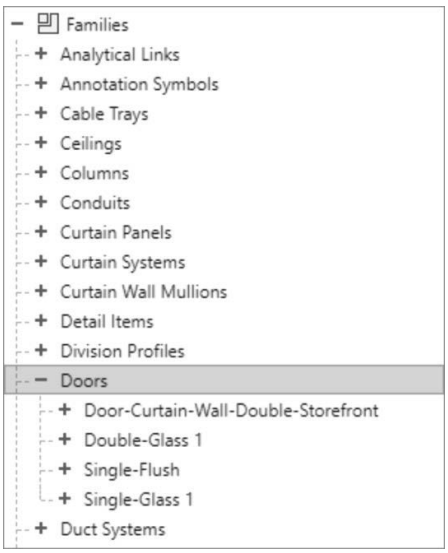


FIGURE 3-5.3 Loaded door families

If you expand a door family itself in the *Project Browser*, you see the predefined door sizes associated with that family. Right-clicking a door size lets you rename, delete, or duplicate it. To add a door size, duplicate the item, then modify its properties.

Next, you will insert the doors into the stair shafts.

7. Select the *Door* tool from the *Architecture* tab, and then pick **Sgl Flush: 36″ x 84″** from the *Type Selector* on the *Properties Palette*.

8. Insert two doors in the West stair shaft as shown in Figure 3-5.4. Remember you are inserting a door into a masonry wall, so your door position and size need to work with masonry coursing, thus the 8″ dimension (however, you would also need to include the door frame into the equation).

9. Repeat the previous step to insert doors into the East stair shaft.

10. Finish inserting doors for the first floor (Figure 3-5.5).
    Use the following guidelines:

    a. All doors should be 36″ wide and 7′-0″ tall.
    b. You will not insert doors into the curtain wall for now. You will do that in a later lesson when you design the curtain wall.
    c. Use the style and approximate location shown in Figure 3-5.5.
    d. Doors across from each other in the two atrium walls should align with each other.

    TIP: *While inserting the second set of doors, watch for the reference line to appear, indicating alignment.*

    e. Place doors approximately as shown, exact location not given.

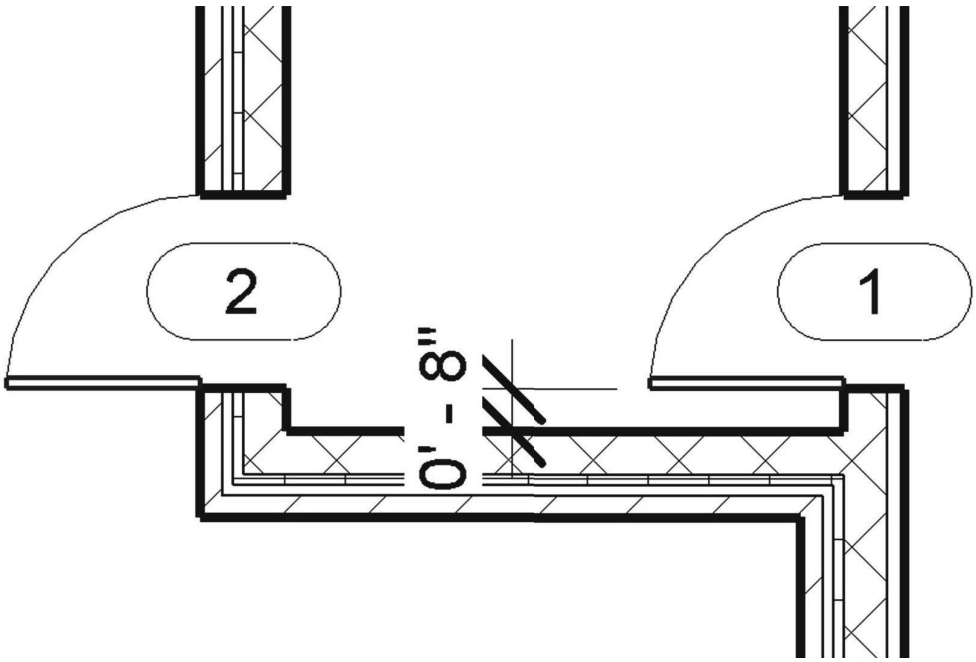


FIGURE 3-5.4 Doors in West stair shaft

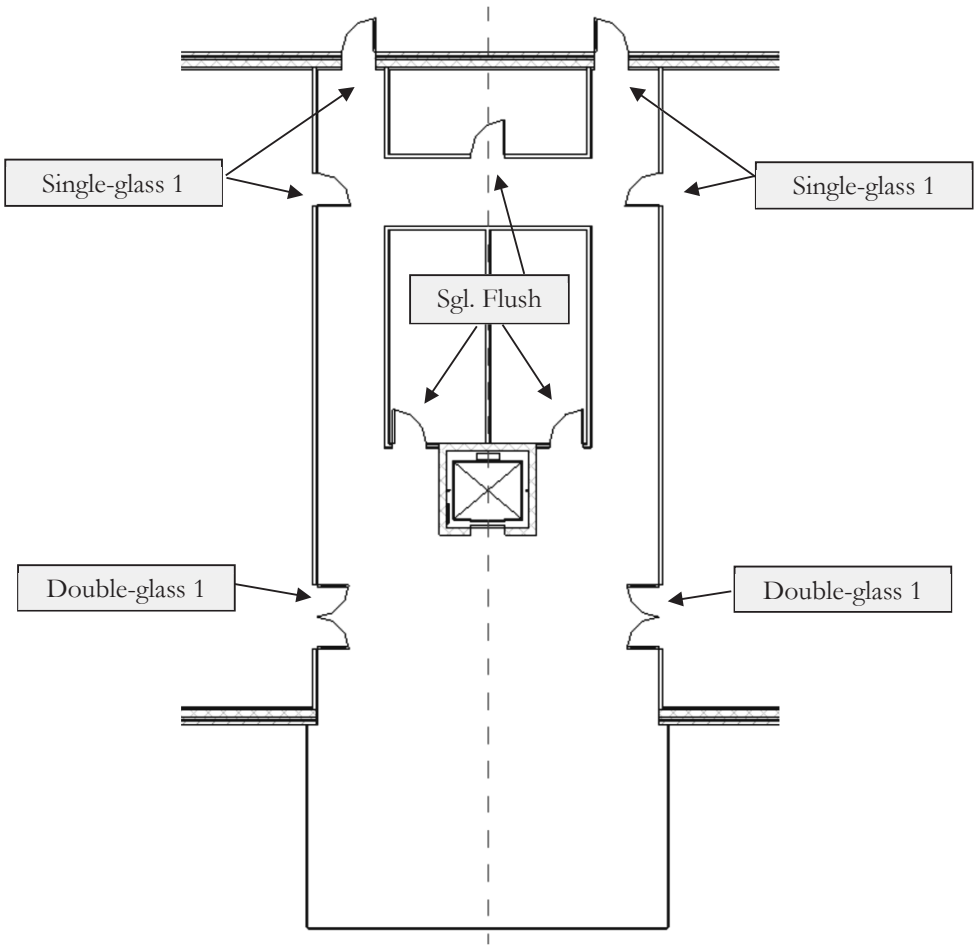


FIGURE 3-5.5 First floor with doors

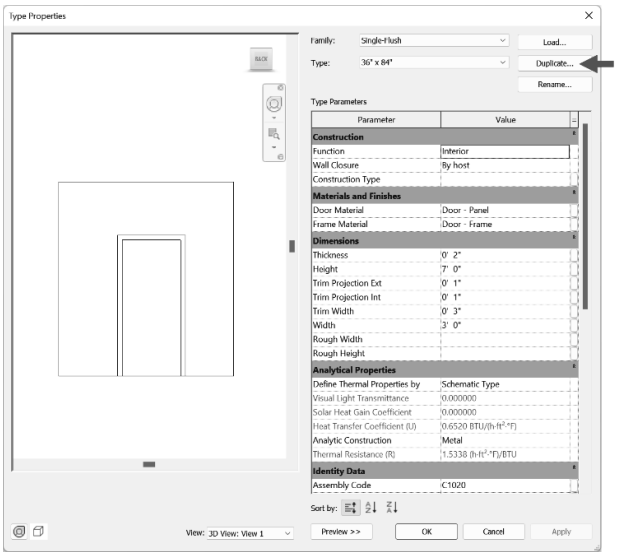


FIGURE 3-5.6 Door type properties

Door Type Properties:
If you select *Edit Type* while the Door tool is active (selected), you can modify various properties related to the door.

You can easily add another standard door size to the *Family* as required. Click "Duplicate," and type a name (Figure 3-5.6).

Standard door sizes (and *Families*) can be added to your template file, so you don't have to load them for every new project.

Insert Windows

Adding windows to your project is very similar to adding doors. The template file you started from already has three families preloaded: the Fixed, Double-Hung, and Casement. In the Type Selector drop-down, you will see the available sizes for insertion. At this point, you should also see the SIDELIGHT family that you loaded in the previous exercise. First, you will add a few interior borrowed lights using the sidelight family.

Interior Windows (Borrowed Lights)

11. With the *Window* tool selected, pick *Sidelights 1:* **18″ x 84″** from the *Type Selector*.

12. On the West side of the atrium, insert the four borrowed lights as shown in Figure 3-5.7; do not add the dimensions.

Make sure the borrowed light frames are flush with the atrium side of the wall. You can control that option by moving your cursor to the side of the wall you want the frame flush with before clicking to insert. After drawing the window, you can select the frame and use the flip icon (similar to doors and walls).

13. Repeat the previous steps to insert the borrowed lights on the East side of the atrium.

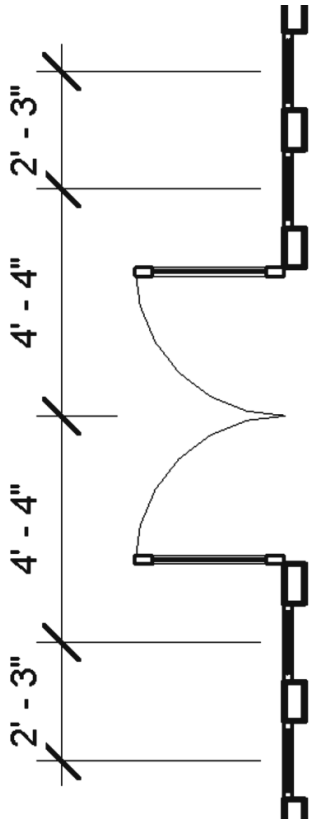


FIGURE 3-5.7 Sidelights added

Exterior Windows

14. Using the methods previously covered in this book, create a new window size in the *FIXED* family. Create *Fixed:* **32″ x 48″**. You are creating this new size to fit masonry coursing in the plan view. The largest window (preloaded) that fits coursing in the plan view is 24″.

15. Adjust the sill height for your new window size to fit within masonry coursing as well. Set the sill height for *Fixed:* **32″ x 48″** to be **3′-4″** (Figure 3-5.8).

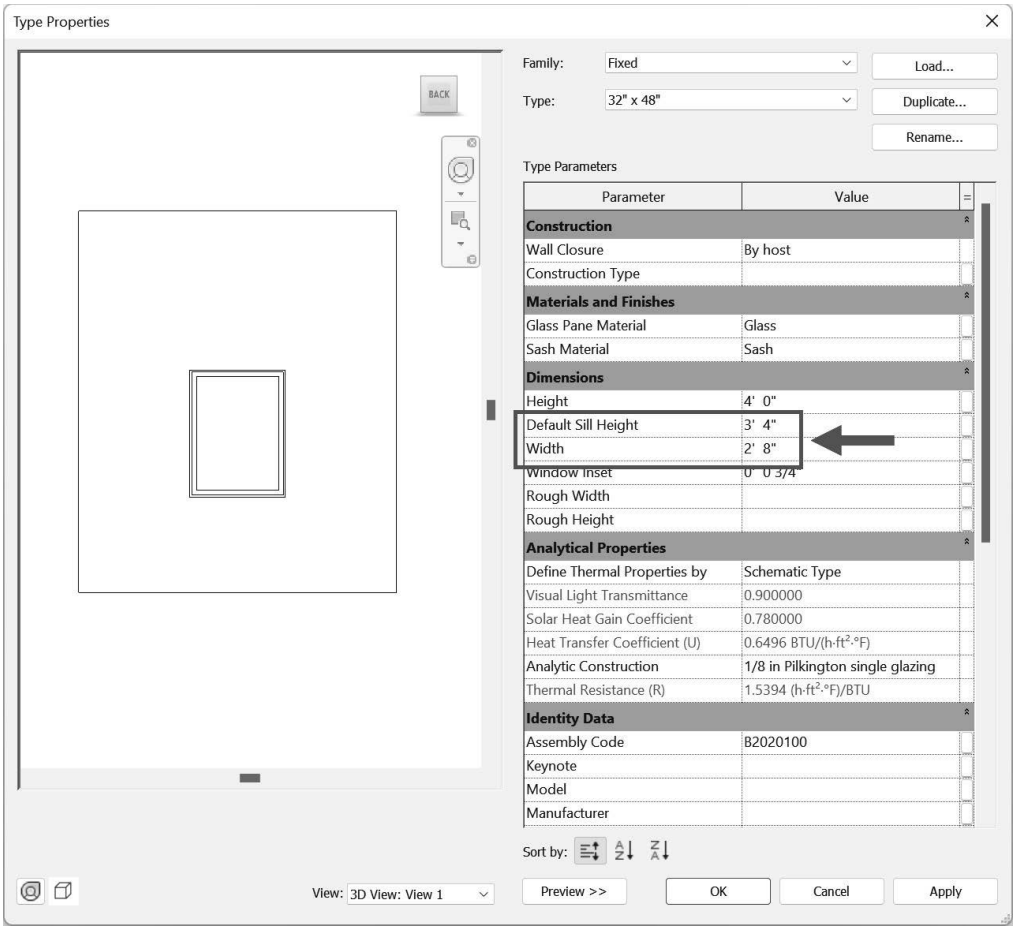


FIGURE 3-5.8 New window size with modified window sill height

16. Insert a single window as shown in **Figure 3-5.9**. The window should be inserted with masonry coursing in mind. Ensure *Tag on Placement* is active.

NOTE: *The dimensions displayed while inserting the window will not match the coursing dimensions because Revit is measuring from the center of the adjacent exterior wall. Thus, you will have to insert the window as close as possible and adjust its location, verifying with the* Measure *tool.*

Array Window

The *Array* tool allows you to quickly copy several objects that have the same distance between them. You will use the *Array* tool to copy the windows:

17. Click the *Modify* tool and then select your window.

18. With the window selected, pick the **Array** tool from the *Modify* tab.

19. On the *Ribbon*, type **6** for the *Number* field.

20. Click the left mouse button at the midpoint of the window and move your mouse to the East until the dimension displayed is **8′-6″**.

21. You should now see the windows arrayed in the wall. 8′-6″ is not coursing, so select the **Activate Controls & Dimensions** button on the *Ribbon* and then enter **8′-8″** in the displayed dimension to adjust the window openings. This allows you to more accurately adjust the dimensions.

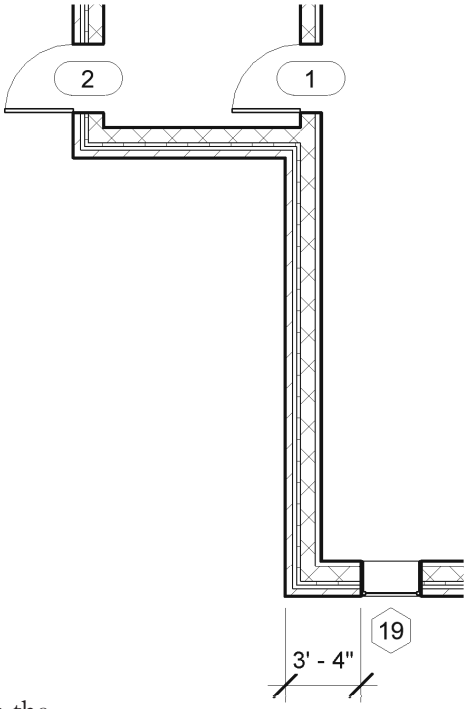


FIGURE 3-5.9 Exterior window

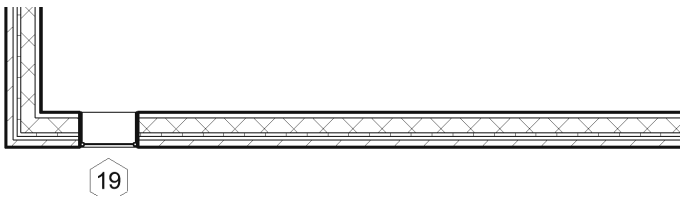


FIGURE 3-5.10 Window to be arrayed

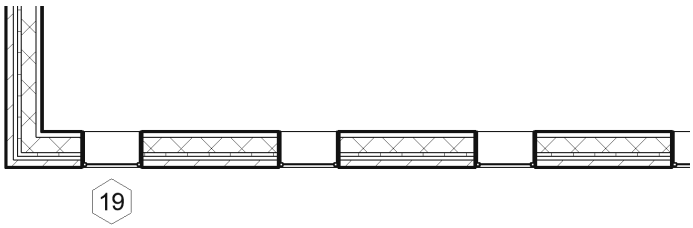


FIGURE 3-5.11 Window after array

22. Place the windows on the three remaining walls of the first floor (Figure 3-5.12). Consider the following:
    a. This would be a good use for the *Mirror* tool.
    b. You can use the *Reference Plane* to mirror the windows in the East-West direction.
    c. Create a horizontal reference line for a mirror reflection axis in the North-South direction.
    d. Use the *Measure* tool to verify accuracy.
    e. Use the Ctrl key to select multiple windows.

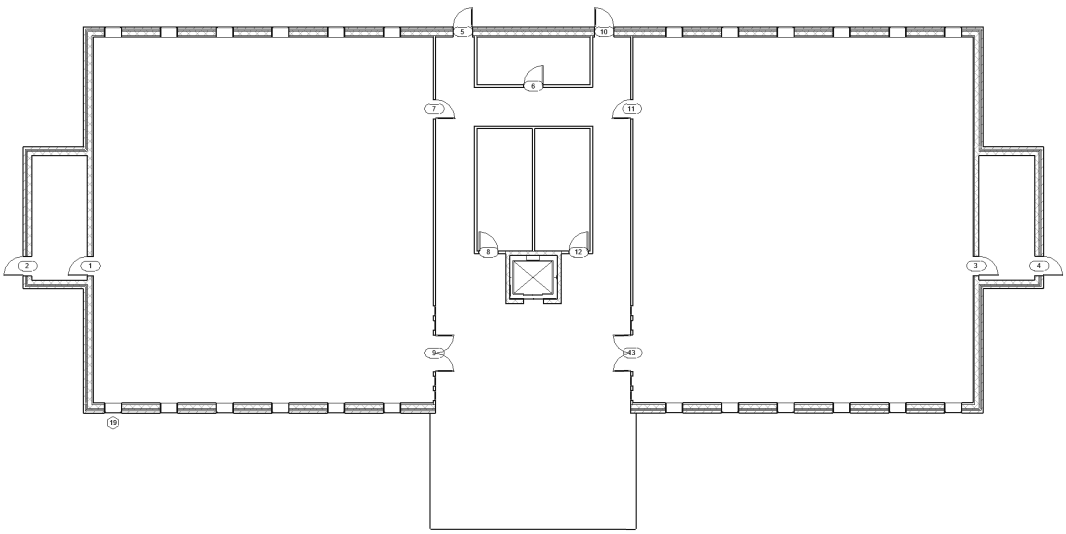


FIGURE 3-5.12 Completed window layout

Cleaning House:

As previously mentioned, you can view the various Families and types loaded in your project. The more Families and Types you have loaded the larger your project file is, whether or not you are using them in your project. Therefore, it is a good idea to remove any doors, windows, etc., that you know you will not need for the current project.

23. In the *Project Browser*, navigate to Families → Windows → Fixed. Right-click on **36″ x 48″** and select **Delete**.

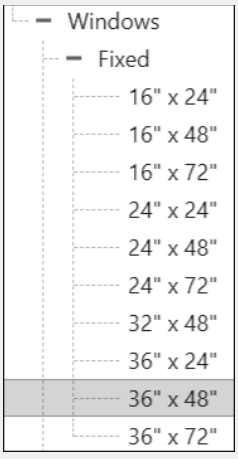


FIGURE 3-5.13 Project Browser

24. **Save** your project.

Self-Exam:

The following questions can be used as a way to check your knowledge of this lesson. The answers can be found at the bottom of this page.

1. The *Ribbon* allows you to set the height of a wall when first drawing it. (T/F)

2. It is not possible to draw a wall with the interior or exterior face of the core as the reference point. (T/F)

3. Elements cannot be moved accurately with the **Move** tool. (T/F)

4. The _____ tool, in the *Ribbon*, has to be selected in order to select an element in your project.

5. A wall has to be _____ to see its flip icons.

Review Questions:

The following questions may be assigned by your instructor as a way to assess your knowledge of this section. Your instructor has the answers to the review questions.

1. Revit comes with many predefined doors and windows. (T/F)

2. The length 3′-8″ is a masonry dimension. (T/F)

3. You can delete unused families and types in the *Project Browser*. (T/F)

4. It is not possible to load families and types from the internet. (T/F)

5. It is not possible to select which side of the wall a window should be on while you are inserting it. (T/F)

6. What tool will break a wall into two smaller pieces? _____

7. The _____ tool allows you to match the surface of two adjacent walls.

8. Occasionally you use the Split Element command to turn one wall into two walls. (T/F)

9. You can use the _____ tool to copy an element multiple times in one step.

10. The template file has a few doors, windows and walls preloaded in it. (T/F)

SELF-EXAM ANSWERS:
1 – T, **2** – F, **3** – F, **4** – Modify, **5** – Selected

Notes: