Autodesk® Revit® Architecture Workflow Fundamentals and New Features

Paul F. Aubin

AB3529-L   If you are new to Autodesk Revit Architecture software and want to get a quick hands-on overview of the recommended practices for using BIM in architecture and its associated workflows, then this is the class for you. We highlight several workflows, including conceptual design, documentation, visualization, and multidiscipline coordination. These workflows highlight the capabilities of Revit Architecture, and touch on some of the Autodesk® BIM 360™ cloud-based offerings as well. In this hands-on lab, you walk through exercises that highlight each of the major phases of design, with an emphasis on recommended workflow, while simultaneously incorporating features that are new to Revit Architecture 2014.

Learning Objectives

At the end of this class, you will be able to:

- Incorporate a massing study into a building design

- Explain how to lay out basic architectural objects, such as walls, openings, and floors

- List the newest features in Revit Architecture 2014, such as alternate dimensions and room calculation point

- Move a Revit Architecture model through the various phases of architectural design

About the Speaker

Paul F. Aubin is the author of many CAD and BIM book titles including the widely acclaimed: *The Aubin Academy Mastering Series*: *Revit Architecture and MEP* titles. Paul's newest title: *Renaissance Revit: Creating Classical Architecture with Modern Software* debuts here at AU. Paul is also the author of Revit video training for lynda.com www.lynda.com/paulaubin. He is an independent architectural consultant who travels internationally providing Revit® Architecture and AutoCAD® Architecture implementation, training, and support services. Paul's involvement in the architectural profession spans over 20 years, with experience that includes design, production, CAD management, mentoring, coaching and training. He is an active member of the Autodesk user community, and has been a top-rated speaker at Autodesk University for many years. Paul has also spoken at the Revit Technology Conference (RTC) in both the US and Australia and other regional events such as the Central States Revit Workshop and CAD Americas. His diverse experience in architectural firms, as a CAD manager, and as an educator gives his writing and his classroom instruction a fresh and credible focus. Paul is an associate member of the American Institute of Architects. He lives in Chicago with his wife and three children.
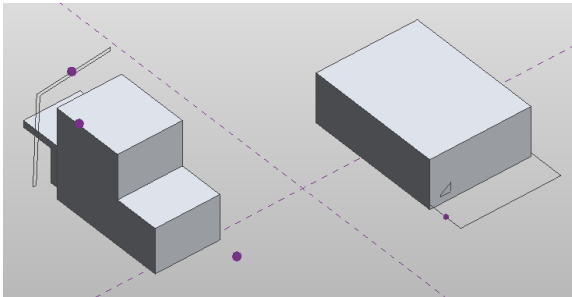
Contact Paul via the Contact link at www.paulaubin.com

Follow Paul on Twitter: @paulfaubin

Building a Mass Model

In this exercise you begin in a Massing model that is already begun. To it we will add additional forms to complete a basic building model form.
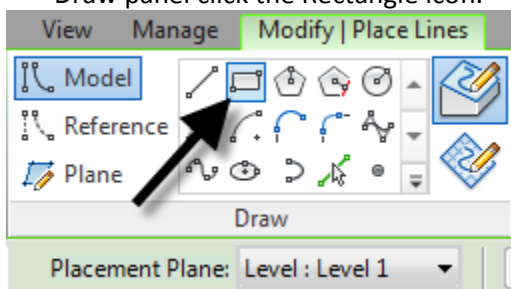

You do the following:

- Create solid mass forms
- Create voids and combine solids

Exercise 1 – Create a new Solid Form

1. Open the file named:
   01_Mass Model_Start_V2.rfa

   - Open the {3D} view.
   - On the ViewCube, click the Home icon

2. Zoom out a little and click on the Level to make it the active work plane.
3. On either the Create or Modify tab, on the Draw panel click the Rectangle icon.

4. Snap to each of the points located on the ground plane.
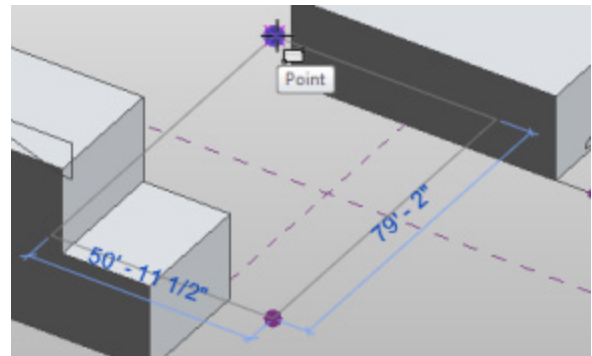
5. Click the Modify tool or press ESC to finish.
6. Move the mouse near the rectangle just created. It will highlight the entire shape (chain). Click to select the chain.
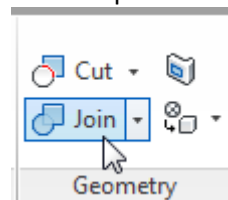7. On the ribbon, click the Create Form button.
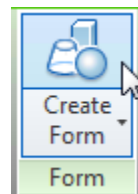
8. Click away from the form to deselect it.

Exercise 2 – Join Forms

Continue in the previous file.

1. On the Modify tab, on the Geometry panel, click the Join button.
2. Click the box just created.
3. Click the smaller box to the West.
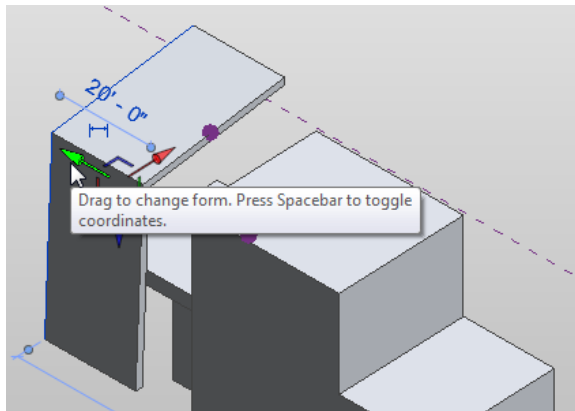
The two forms will join with a resolved edge between them.
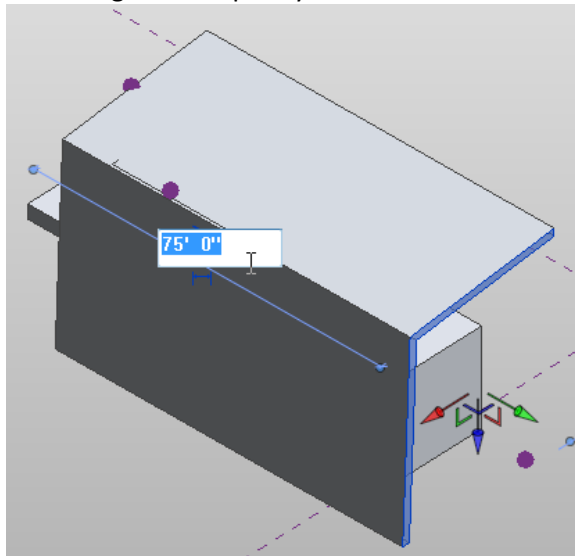
4. Repeat for the for to the East.

Exercise 3 – Create a Solid and Void

Continue in the previous file.

1. Zoom in on the shapes on the East side of the building.
2. Select the L shape on the left.
3. Click the Create Form button.

4. Highlight the green arrow on the form and drag it to the right across the top of the roof.
5. Change the temporary dimension value to **75**.

6. Click directly on the vertical surface on the East side of the new roof form. This will set this as the active work plane.

7. Draw a rectangle directly on this surface. Make it approximately 18 x 28.

8. Cancel the command, select this rectangle and then click the drop-down portion of the Create Form button and choose **Void Form**.
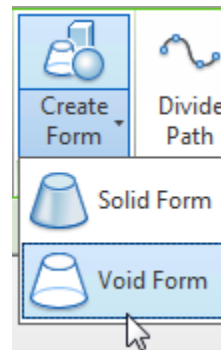
9. Click away from the element to deselect it and see the result.
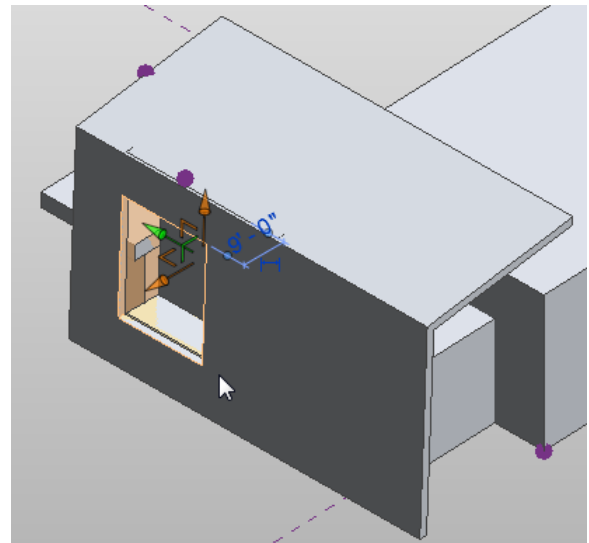
Exercise 4 – Create a "Lofted" Form

Continue in the previous file.

1. Zoom in on the shapes on the North-West side of the building.

- The lines on the ground will be the path.
- The wedge shape will sweep along the path.

2. Select the wedge shape and then using the CTRL key; click the path on the ground to select it as well.
3. Click the Create Form button.
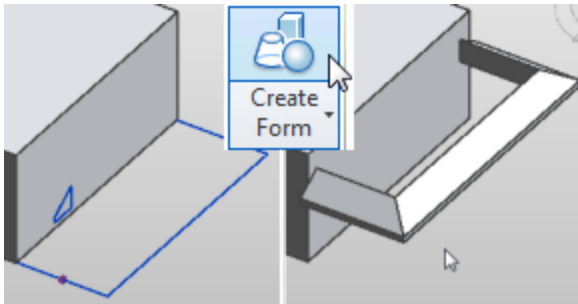
Exercise 5 – Save and Load Into Project

1. Close all files.
2. On the QAT, click the Open icon.

   - Browse to file named: *05_Schematic Project_Start.rvt*.
   - Select it and then click Open.

3. On the QAT, click open again.
   - Select the *05_Mass Model_V2.rfa* file and open it.

4. On the ribbon, click the Load Into Project button.
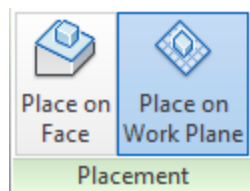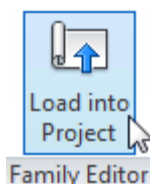
5. In the dialog that appears, simply click close.

This will enable the display of masses in the project.

6. On the Modify | Place Mass tab, ensure that Place on Work Plane is active and then click a point in the middle of the screen to place the model.

7. Click the Modify tool or press ESC to cancel.
8. On the QAT, click the Default 3D View icon.
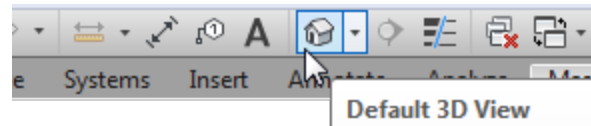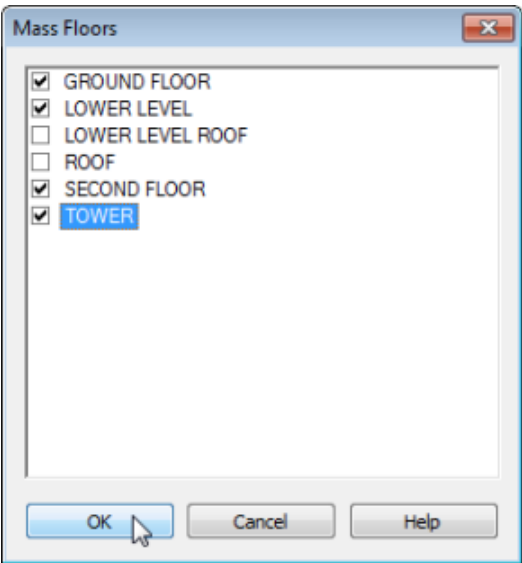

9. Save the file with a new name.

Exercise 6 – Creating Mass Floors

Continue in the previous file. If you closed the file, you can open *06_Schematic Project_V1.rvt* and make sure that on the Massing & Site tab, that Show Massing by View is toggled on. Make sure you are in a 3D view and zoom to fit.
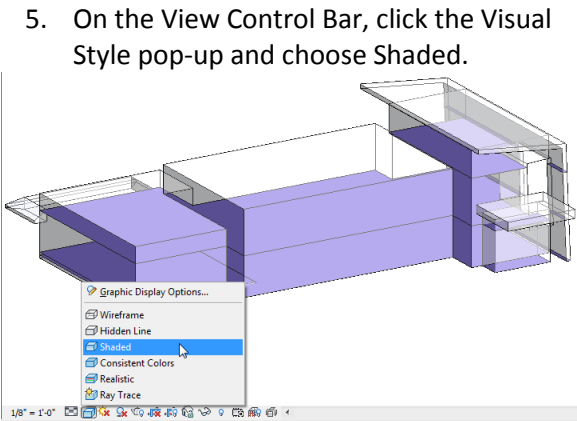
1. Select the massing model onscreen.
2. On the Modify | Mass tab, click the Mass Floors button.
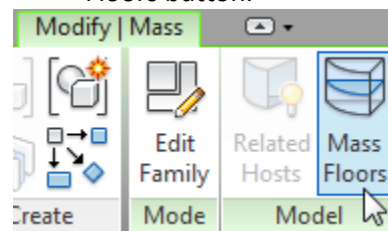
3. In the "Mass Floors" dialog, check GROUND FLOOR, LOWER LEVEL, SECOND FLOOR and TOWER.
4. Click OK.

It can be a little easier to see what we have done if we shade the model.

5. On the View Control Bar, click the Visual Style pop-up and choose Shaded.

Exercise 7 – Analyzing Mass Floor Area

Continue in the previous file. If you closed the file, you can open *07_Schematic Project_V2.rvt* and make sure that on the Massing & Site tab, that Show Massing by View is toggled on.

1. Select one of the Mass Floors (use the TAB key if necessary).
2. Take note of the area and other values on the Properties palette.
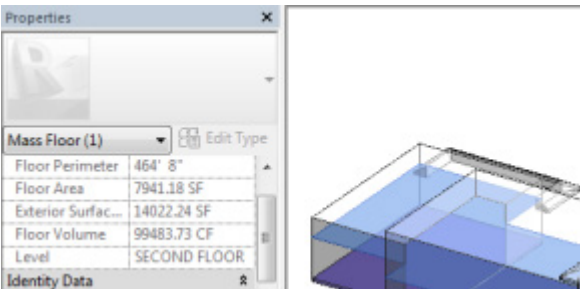
3. On the View tab, click the Schedules drop-down and choose Schedules/Quantities.
4. In the "New Schedule" dialog, from the Category list, choose Mass Floor.
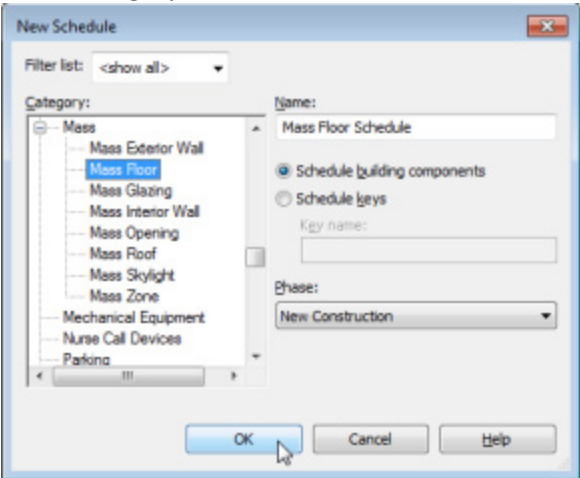
5. In the "Schedule Properties" dialog, on the Fields tab, choose Level, then Floor Area and then Floor Perimeter.
6. Click OK to display the schedule.

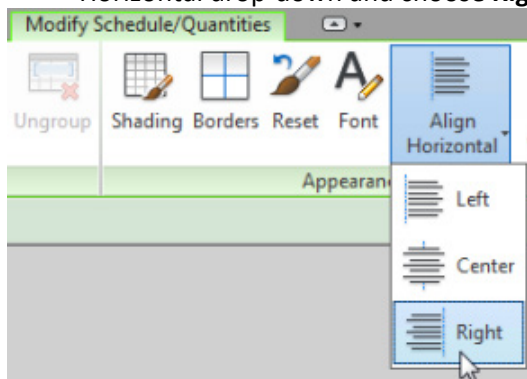| <Mass Floor Schedule>		
A	**B**	**C**
Level	Floor Area	Floor Perimeter
GROUND FLOOR	7941 SF	464' - 8"
SECOND FLOOR	7941 SF	464' - 8"
TOWER	929 SF	122' - 2"
LOWER LEVEL	2722 SF	211' - 1"

Exercise 8 – Adjusting Schedule Formatting

Continue in the previous file.

Let's adjust some formatting and add a total at the bottom.

1. Click in the header above the Floor Area column (labeled "B").

2. On the Modify | Schedule/Quantities tab, on the Appearance panel, click the Align Horizontal drop-down and choose **Right**.
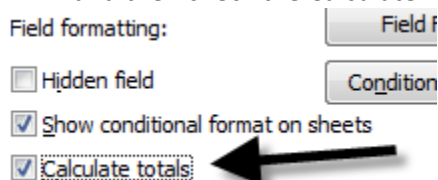

3. Repeat for column "C" (the Floor Perimeter column).
4. Click in the Level header and drag across the other two headers. (Do this in a single motion, click and drag across the columns together).

This will highlight all three headers

5. On the ribbon, click the Font button and choose Arial Black. Click OK.
6. Click the Align Horizontal drop-down again and choose **Center**.
7. On the Properties palette, click the Edit button next to Sorting/Grouping.
8. Check the Grand Totals box.

9. Click the Formatting tab, select Floor Area and then check the Calculate Totals box.
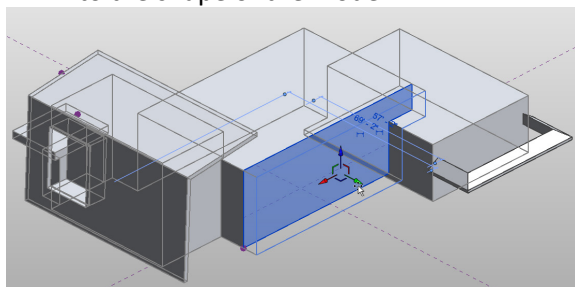

10. Click OK.


Exercise 9 – Update the model

Continue in the previous file.

Changes to the model are immediately reflected in the schedule and vice versa.

1. On the View tab, click the Tile button to tile the schedule and other views onscreen.
2. In the *Mass Model_V1* file, make a change to the shape of the model.

3. Reload the model into the project.
4. When prompted, choose Overwrite the existing version. (Watch the area values in the schedule view as you do).
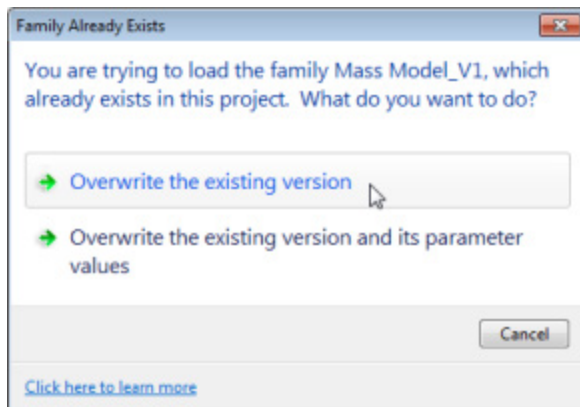
Exercise 10 – Energy Analysis

Continue in the previous file. If you prefer, you can open the file named *10_Schematic Project_V3* instead.

1. On the Analyze tab, on the Energy Analysis panel, click the Use Conceptual Mass Mode button.
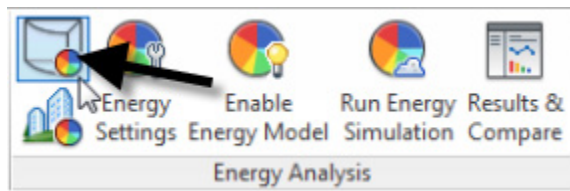

2. Click the Energy Settings button.
3. In the "Energy Settings" dialog, for the Building Type, choose **Hospital or Healthcare**.
4. Click in the Location field and in the dialog that appears, input the address of your project.
5. Review the remaining settings. Accept the defaults and click OK.
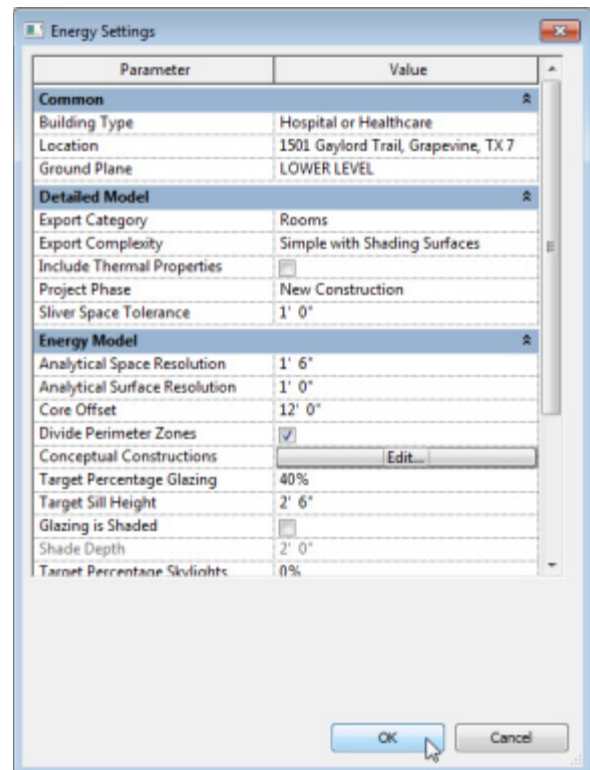
6. Click the Enable Energy Model button.
7. Click OK to dismiss the warning dialog.
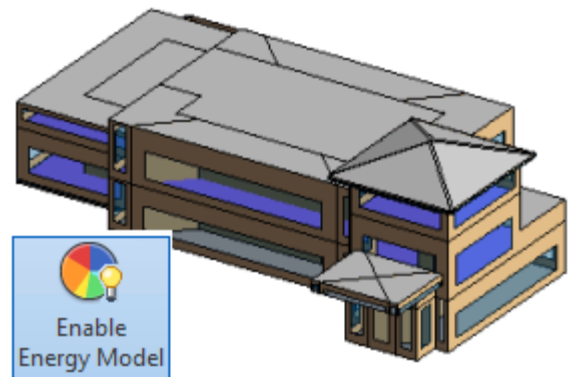
8. Click the Run Energy Simulation button.
9. If prompted, enter your Autodesk Sign in credentials and click Accept on the license agreement.
10. In the "Run Energy Simulation" dialog, click the Continue button.
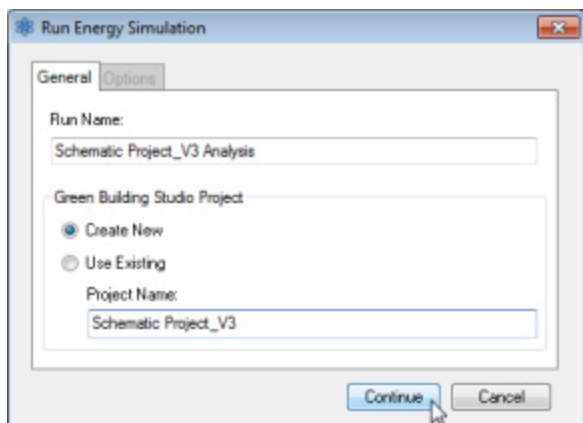
The model thus generated can be analyzed further in the viewport. Click to select various portions of the model and view their properties on the Properties palette.

Additional Schedules can be created to list each Mass Zone and its properties.

Click the Results & Compare button to see a report with comparisons to the various analysis run.
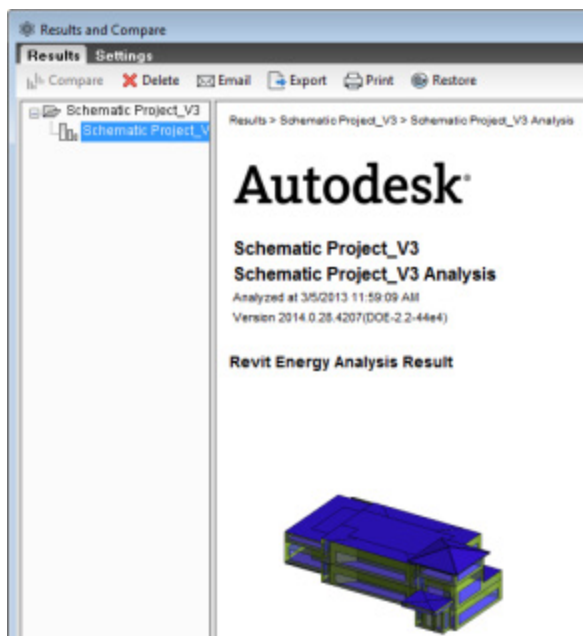

11. Close all files.

Using CAD Files in Families

In this exercise you create a new Family based on an existing CAD file. New in Revit 2014, you can explode a CAD file containing 3D solids and they become converted to Free Form elements in the Family Editor.

Exercise 11 – Using Solids in Families

New feature for building content.

1. From the Application menu, choose **New > Family**.
2. In the "New Family – Select a Template File" dialog, choose *Furniture* and then click Open.
3. Tile windows and zoom all to fit.
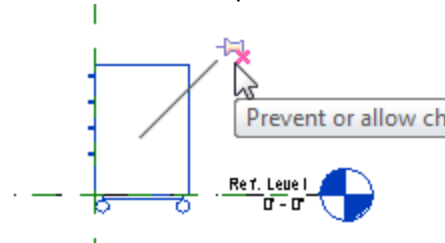4. On the Insert tab, click the Import CAD button.
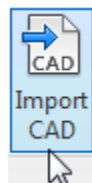
5. In the "Import CAD Formats" dialog, choose the *RollingFile.dwg* file.
6. Set the Colors to Black and White and the Units to Inch.
7. Set Positioning to Auto – Origin to Origin and then click Open.
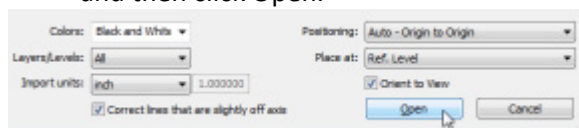
The file's origin places it a little below the level. We can move it up.

8. Select the imported CAD file and unpin it.

9. In one of the elevation views, select the CAD object and move it up **4"**.
10. Click in the 3D view. Select the CAD object and then on the ribbon, click the Explode button.

The exploded solids will become 3D Free Form elements. The exploded lines will become Model Lines.
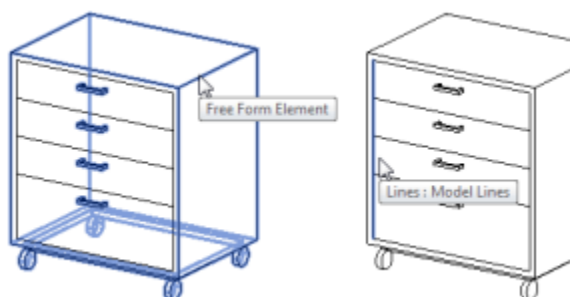
11. Save the Family As and give it a name.
12. Load it into a project to test it.

Exploded Free Form elements can have parameters applied to them to make them flex.

Developing your Design

In this exercise you refine your model by adding simple building elements like walls, doors, windows and stairs.

Exercise 11 – Adding Walls

This exercise shows basic Revit elements

1. From the Application menu, choose **Open > Project**.

- Browse to the file named: *11_Arch_Model_Start.rvt*.
- Select it and click Open.
2. Verify that the floor plan view named Basic Elements is open.
3. On the Architecture tab, click the Wall tool.
   - On the Properties palette, from the Type Selector, choose **I_MtlStud - 4 7/8" Partition**.
   - Near the bottom of the plan, draw a horizontal wall across the space from the centerline of the wall on the left to the centerline of the wall on the right.
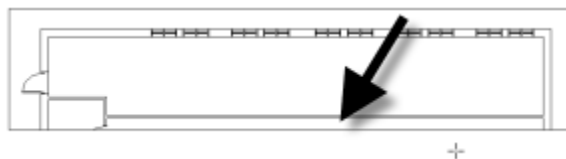
4. Repeat the process to create five vertical walls, making six rooms.
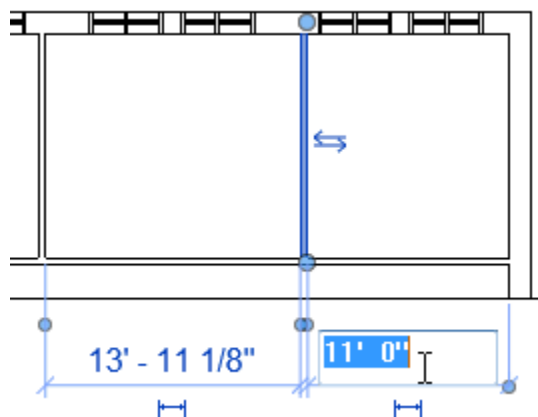

5. Click the Modify tool or press ESC twice to complete the command.
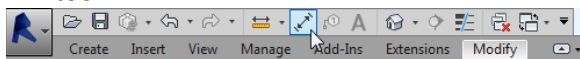
Exercise 12 – Using Dimensions

Continue from the previous file.
1. Select the new wall on the right.
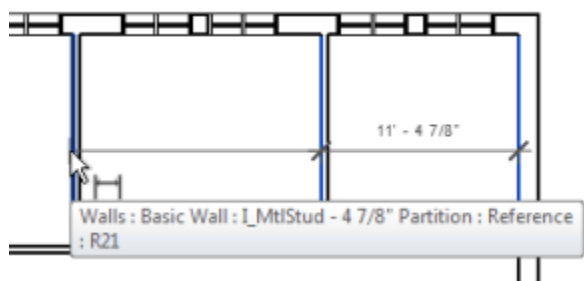2. Click on one of the temporary dimensions and edit the value to **11**.

This is a quick way to move elements precisely, but a permanent dimension is also effective and sometimes quicker.
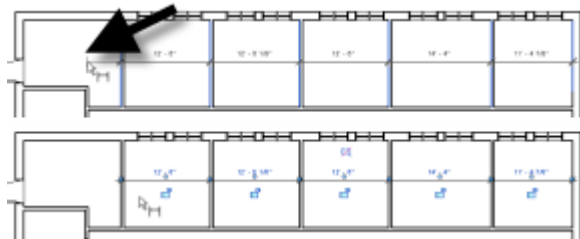
3. On the QAT, click the Aligned Dimension tool.

4. Click the left edge of each wall to create a continuous string of dimensions across the plan.


5. Continue clicking on the left edge of each wall until you reach the last wall you drew.
6. Click in empty space (not on a wall) to finish.

7. Above the dimension string, click the small equality toggle (the letters EQ with a slash through it).
8. Click the Modify tool (or ESC twice).
9. Select one of the walls in the middle.
10. On the Options Bar, click the Activate Dimensions button.
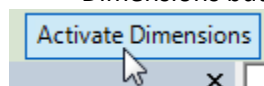
11. Locate the small boat anchor icon and drag it to the far right wall.
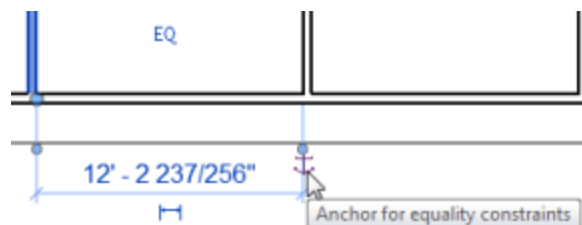
12. Select the first wall to the right of the exterior wall.
13. Edit the temporary dimension that appears to a value of **12**.
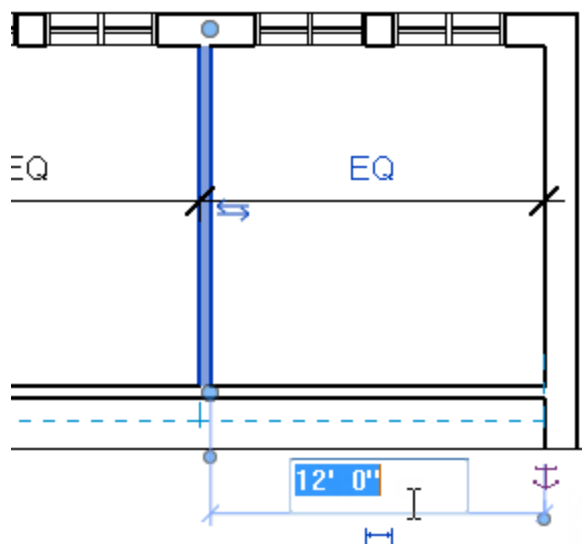
All of the other walls will shift with it to match the 12'-0" spacing.

Exercise 13 – Adding Doors

Continue from the previous file.

1. On the Architecture tab, click the Door tool.
    *   On the Properties palette, from the Type Selector, choose **Single-Flush-w-Metal-Frame: 36" x 84"**.
    *   Highlight the long horizontal wall drawn above and click to place a door in one of the rooms.
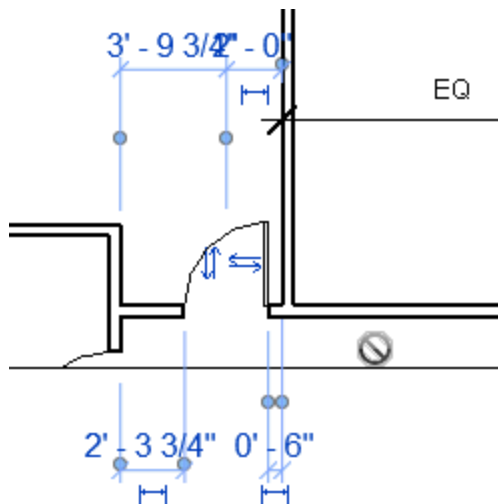
2. Repeat in each room placing a door at 6"
    from the adjacent walls.
    *   If necessary, use temporary dimensions
        to fine tune placement.
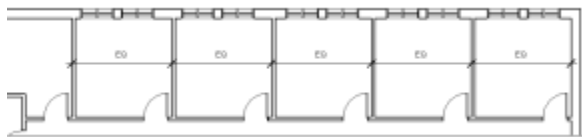
3. Click the Modify tool (or press ESC twice).

Revit will cut the holes in the walls automatically.

4. Select the horizontal wall.
5. Click the temporary dimension that appears
    and edit the value to **13**.

The adjacent walls will stay connected and the doors
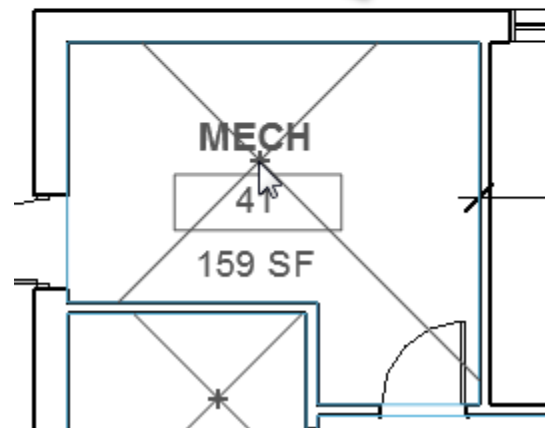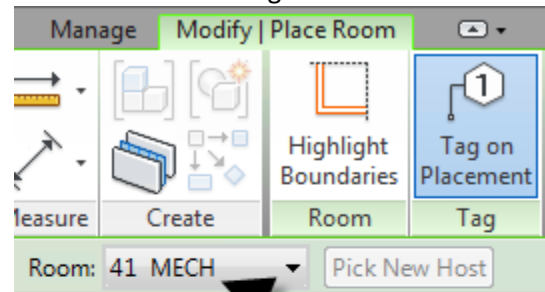will move with the parent wall.

Exercise 14 – Adding Rooms

Continue from the previous file.

1. On the Architecture tab, click the Room
    tool.
    *   On the Options Bar, next to Room, click
        the drop-down (labeled New) and
        choose: **41 MECH**.

(Note: The room was previously added to the file via a
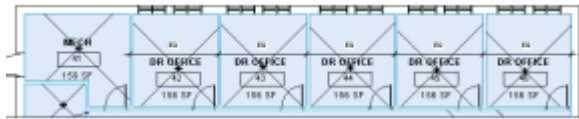Room Schedule – add new row).

2. Click in the space at the far left to place the
    room and its tag.

3. Change the Room to 42 DR OFFICE.
4. Click in the next space to add the room.
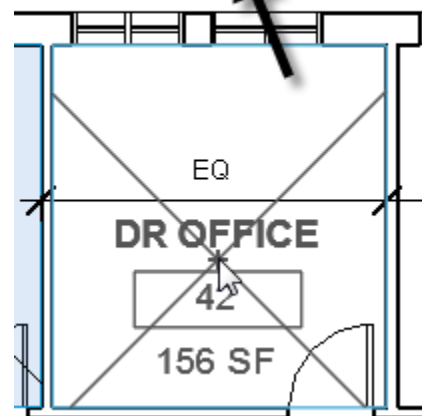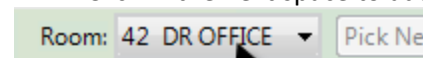
5. Repeat for the remaining doctor's offices.

6. Click the Modify tool (or press ESC twice).

Notice the square footage on the tags for all of the doctor's offices is equal. This is because of the equality constraint applied to the dimension above.

Exercise 15 – Changing Elements

Continue from the previous file. Or if you prefer, open *15_Arch_Model_V1.rvt*.

1. Select one of the walls separating the offices.
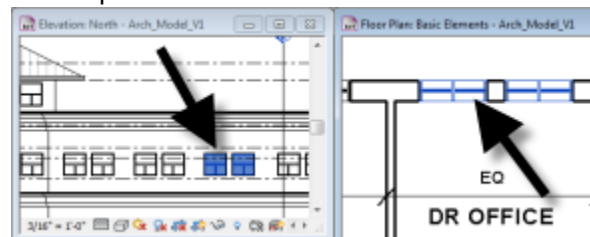2. On the Properties palette, from the Type Selector, choose**: Interior - 6 1/8" Partition (2-hr)**.
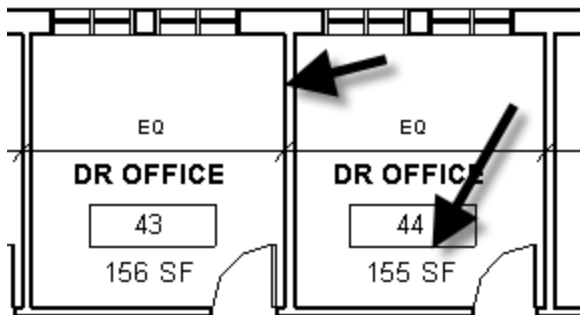
Notice the wall get a bit thicker and also the other walls adjust as well. This is again due to the constrained dimension. Notice the change in square footage in one of the offices.

3. Select each of the office doors (make a window selection or click with the CTRL key).
4. On the Properties palette, from the Type Selector, choose**: Door Single s Side Light: 36"x84"**.
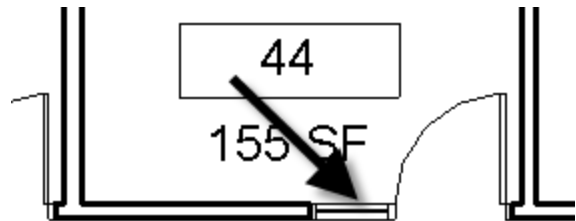

Note the change.

5. Select the windows in one of the offices.
6. On the Project Browser, double-click to open the *North* elevation view.

Note how the windows are still selected.

Sometimes the element type you want is not in the project. You can load families from outside files.

7. On the Properties palette, click the Edit Type button.
8. In the "Type Properties" dialog, click the Load button.
9. Browse to Windows folder and choose another window such as: *Archtop with Trim*.
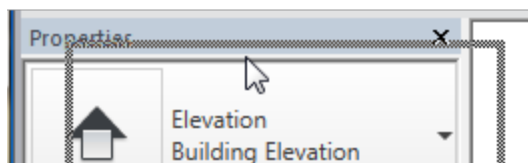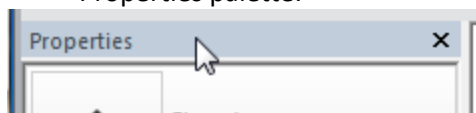10. Click Open, choose a size and then click OK.
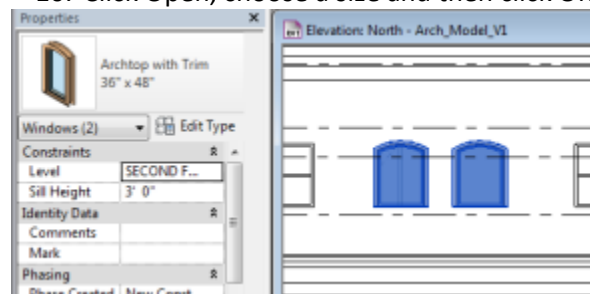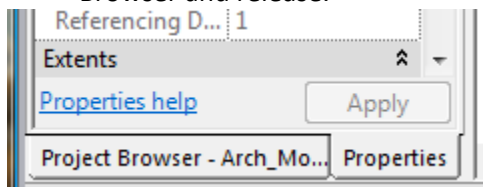
Exercise 16 – Using Dockable Windows

Continue from the previous file. Or if you prefer, open *16_Arch_Model_V2.rvt*.

New in this release, we can dock the Properties palette and Project Browser together into a single tabbed palette.

1. Click and drag at the titlebar of the Properties palette.

2. Drag it on top of the titlebar of the Project Browser and release.

The two palettes will now combine with tabs at the bottom to switch between them.

If you later decide to remove this, simply drag one palette away to "tear" it off (drag it away). Then drag back to your preferred location.
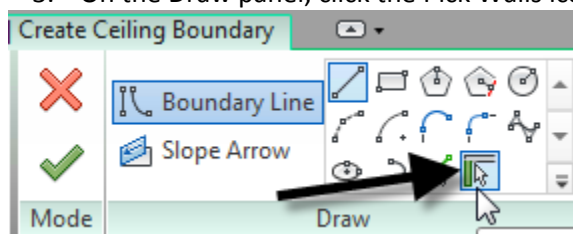
Exercise 17 – Interconnecting Elements

Continue from the previous file.

1. On the Project Browser, double-click to open the ceiling plan named: *Doctors Offices*.
2. On the Architecture tab, click the Ceiling tool.
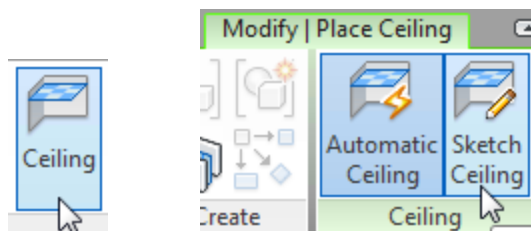
- On the Modify | Place Ceiling tab, click the Sketch Ceiling button.
3. On the Draw panel, click the Pick Walls icon.

- Click on the wall to the left between the MECH room and the office.
- Click on the lower horizontal wall shared by all offices.
- Click on one vertical and one horizontal exterior wall.

You will have clicked a total of four walls.

4. On the Modify panel, click the Trim/Extend to Corner icon.
- Clean up each corner to form a closed rectangle.
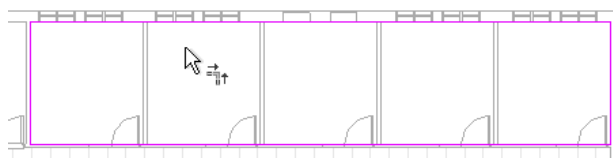
5. On the Properties palette, from the Type Selector, choose: **2' x 2' ACT System**.
6. On the Modify | Create Ceiling Boundary tab, click the Finish Edit Mode (Green checkmark) button.

This places a single ceiling across all of the offices. Let's connect the walls to the underside of this ceiling.

7. On the QAT, click the Section tool.
   - Click the first point inside the MECH room and the second point outside the rightmost office.
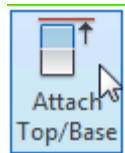

   - Open the new section.
8. Select just the four walls separating the offices on the second floor.

You can use a very thin crossing selection (drag right to left) across the very tops of the walls.
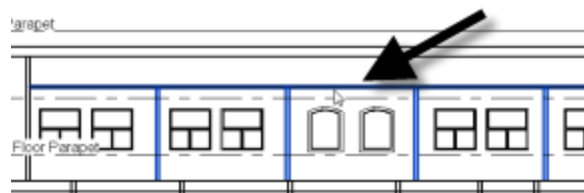
(If you have trouble getting just the wall, click the Filter button on the ribbon and uncheck everything except walls).
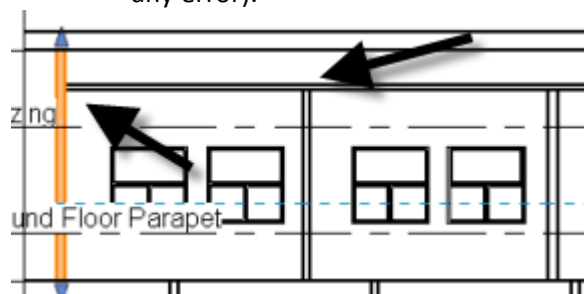

   - On the ribbon, click the Attach Top/Base button.

   - Click on the ceiling.

9. Select the ceiling.
   - On the Properties palette, change the Height Offset from Level to: **10'-0"**.
10. Select the far left wall (the one between the office and the MECH room).
   - Move it about a foot to the left. (ignore any error).

Notice how the connections to other elements are maintained in both the moving of the ceiling and the wall.

Exercise 18 – Add a Stair
Creating a new component-based Stair.

1. Open the file named: *18_Arch_Model_Stair_Start.rvt*.
   - Open the floor plan view named: GROUND FLOOR.
   - Open the 3D view named: 3D Stair.
   - Tile the two windows and zoom in on the lobby area.
2. On the Architecture tab, click the Stair by Component button.
   - On the Properties palette, verify that the type is: Assembled Stair: 7" max riser 11" tread.

- For the Base Level, choose GROUND FLOOR
- For the Top Level, choose SECOND FLOOR.

3. In the plan view, click a point in the lobby to start.
   - On the Options Bar, for the Location Line, choose: **Run: Left**.

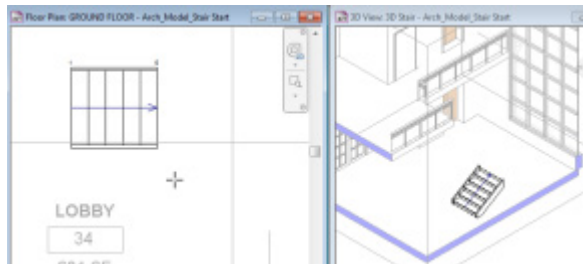Notice the cursor position relative to the stair run.

   - On the Options Bar, for the Location Line, choose: **Exterior Support: Left**.

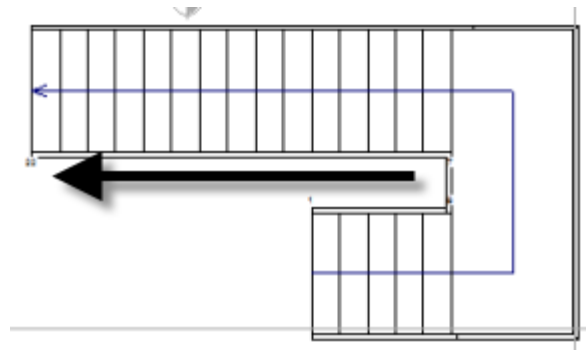Again notice the cursor position relative to the stair run.

   - On the Options Bar, for the actual Run Width, input **4** and then press ENTER.

4. Move the mouse to the right to create about 6 risers and then click.

5. Click the next point above the end of the first run and keep it lined up.
   - Move to the left until all the remaining risers are used up and then click.

11. Click on the small run. (Be sure to click the run and not the supports or landing).
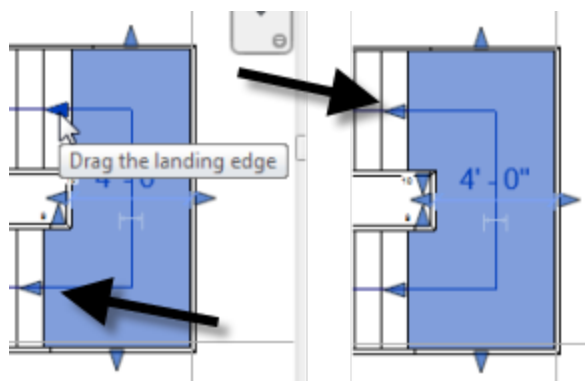   - Drag the small triangle grip at the end of the run slightly to the left.

Watch the 3D view as you drag. Notice that the long run will shorten by the same amount of risers and that the landing height will also adjust.
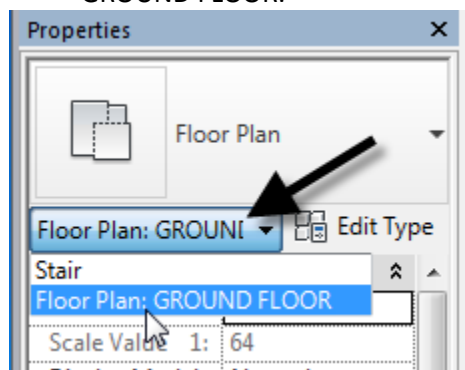

12. Click on the landing.
    - Drag the small triangle grip at the edge of the landing.
    - Drag it about the distance of one tread.
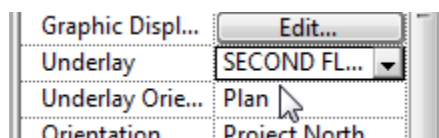   - Repeat on the other side of the landing.

Notice the runs will move with each adjustment to keep the stair components connected to one another.

13. On the Properties palette, click the drop-down at the top and choose Floor Plan: GROUND FLOOR.


- Change the Underlay to SECOND FLOOR.

This will display the outline of the floor slab above. You can use this to move the stair to the correct location in plan.

14. Create a window selection around the entire stair (drag from left to right to surround it).
15. On the Modify tab, click the Move tool and use object snaps to move the stair and snap it to the correct location relative to the floor above.
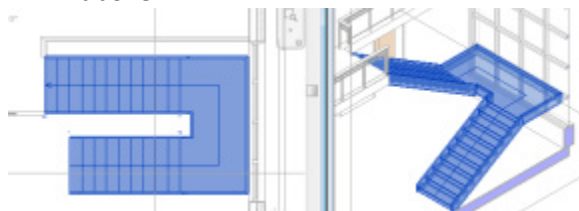
If necessary, move again to fine-tune the placement and/or use the grips to adjust the runs as desired.

16. On the Modify | Create Stair tab, click the Finish Edit Mode button (green checkmark).

Exercise 19 – Add Railing Extensions
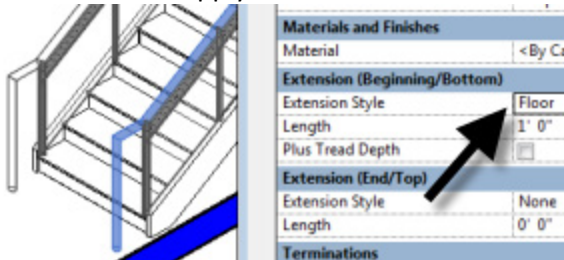Continue from the previous file or Open
19_Arch_Model_Stair_V1.rvt

1. Highlight the top rail of one of the railings.
   - Press TAB to highlight just the top rail and then click to select it.
2. On the Properties palette, click the Edit Type button.
   - For the Extension (Beginning/Bottom), change the Length to **1** and then click Apply.
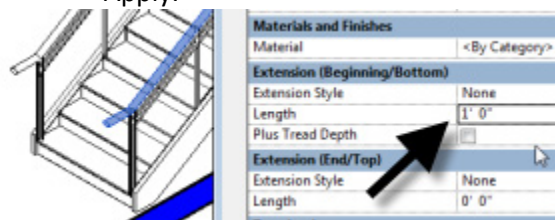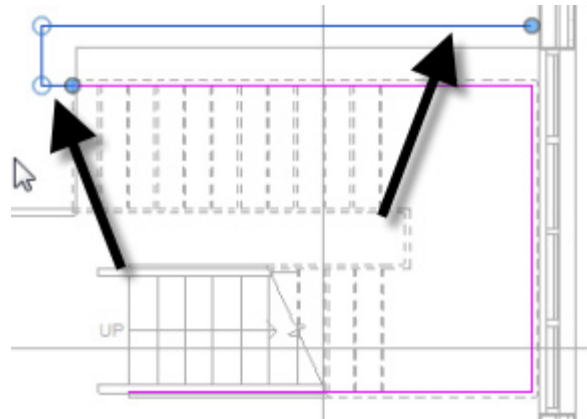

The extension will apply to both railings since we are editing the Type.

3. For the Extension Style, choose **Floor** and then click Apply.

4. Try Post next.
5. Click OK when finished.

Exercise 20 – Modify a Railing

Continue from the previous

1. Delete the guard rail at the top of the stairs at the second floor.
2. Select the stair railing on the outside edge of the stair.
   - On the Modify | Railings tab, click the Edit Path button.
   - On the Options panel, click the Preview checkbox.
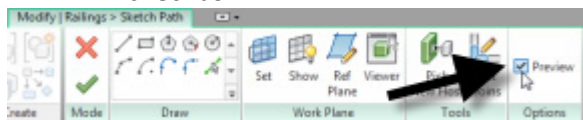
3. Starting at the end of the existing railing path sketch, add additional lines as shown.
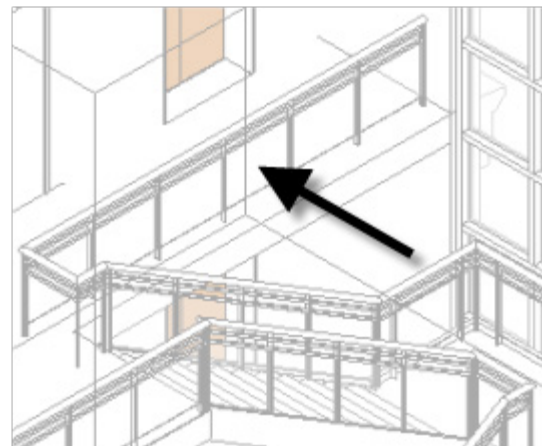
4. Click the Finish Edit Mode button.

Notice that the railing is now continuous from the stair up to the guard rail.

Exercise 21 – Select Lock Toggles

Open *21_Arch_Model_Lock_Toggles_Start.rvt*.

1. Open the file named:
   21_Arch_Model_Lock_Toggles_Start.rvt.
   - Open the floor plan view named: GROUND FLOOR.
2. On the Insert tab, click the Link Revit button.

- For Positioning, choose: **Auto – Origin to Origin**.
- Select the file named: *56750_S.rvt* and then click Open.
- In the warning, click OK.

The structural model will appear onscreen.

3. Move your mouse near the edge of the link.

It will highlight.

4. Click to select it. Try to move it.
   - Undo the move.
5. On the Status Bar at the bottom right, click the first toggle icon.
   - Try to select and move the link again.
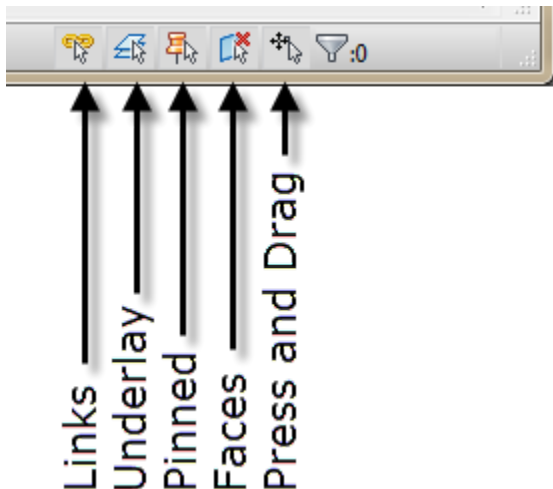
Notice that it will no longer select or move.

6. Zoom in at the lobby and notice the underlay linework (grayscale lines).
   - Try to select and move some of these.
   - Undo.

7. Turn off the next toggle.
   - Try to select and move again.

Notice that this time they will not select or move.

Three other modes are included:

- Pinned elements, prevents pinned elements from being selected.
- Faces allows you select elements in 3D by clicking on the surface rather than the edges.
- Press and Drag allows you to select and move in a single motion.

Documenting your Design

In this section we look at annotating you designs and creating documentation.

Exercise 22 – Create a non-rectangular callout

This exercise shows the process to set up a new view with annotation to document your project.

1. From the Application menu, choose **Open > Project**.
   - Browse to the file named: *22_Arch_Model_Doc_Start.rvt*.
   - Select it and click Open.
2. Verify that the floor plan view named GROUND FLOOR is open.
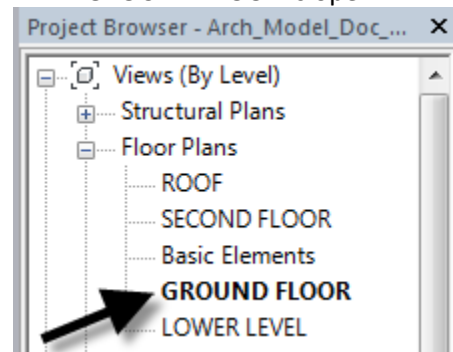
3. On the View tab, click the Callout drop-
    down button and choose Sketch.
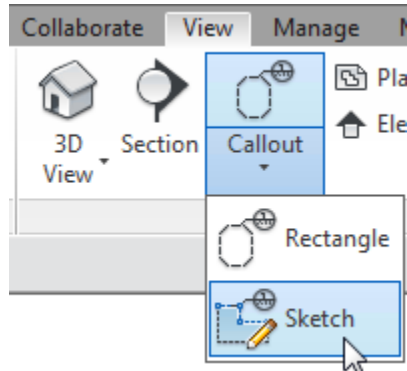

4. Sketch lines down the middle of the
    corridor on the right side of the plan.
    - Draw the first segment down, then
      turn to the right then continue down
      again following the shape of the
      corridor.
    - Complete the in a rectangular shape
      surrounding the right portion of the
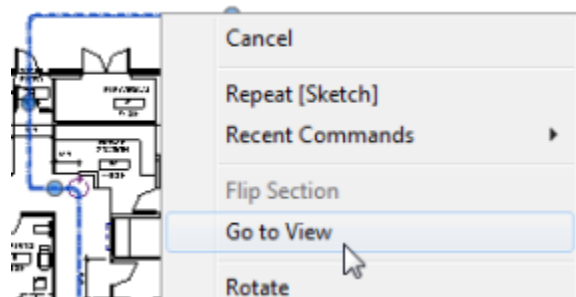   building.
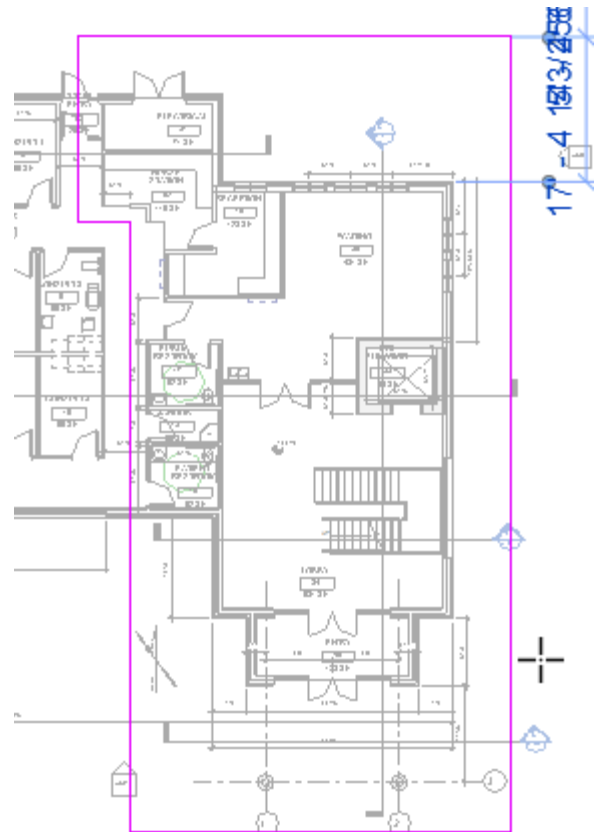
5. On the Modify | Edit Profile tab, click the
    Finish Edit Mode button.

Use the grips on the midpoint of each edge to fine-tune
the shape of the callout if desired.

Views : Floor Plan : Callout of GROUND FLOOR : Shape handle
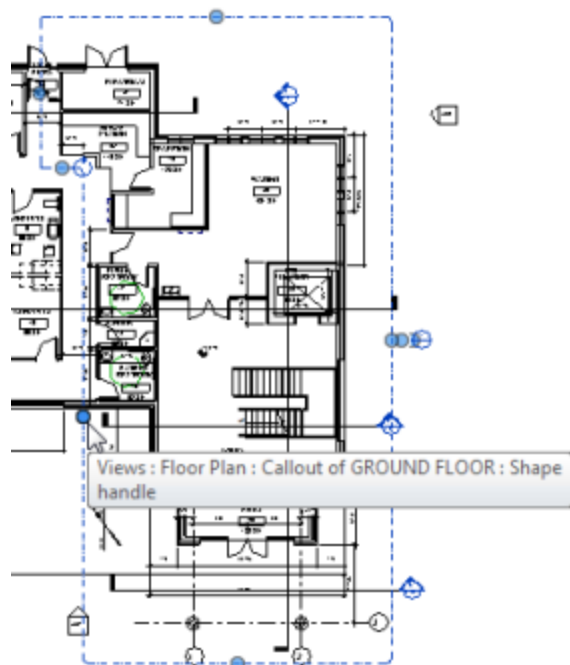
6. Select the callout, right-click and then choose Go to View.

Cancel

Repeat [Sketch]

Recent Commands   ▶

Flip Section

Go to View

Rotate

7. On the Project Browser, right-click the Callout of GROUND FLOOR view and choose **Rename**.
   - Type: **Enlarged Lobby Floor Plan** and then click OK.

## Exercise 23 – Add Room Tags

Continue from the previous file or Open
23_Arch_Model_Doc_V1.rvt

1. Make sure that the *Enlarged Lobby Floor Plan* is open.
2. On the Architecture tab, click the Tag Room button.
   - Click a point in the entrance foyer at the bottom of the plan.
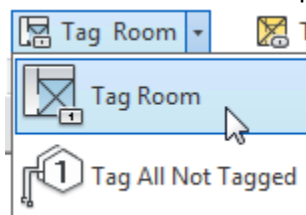
You can continue to click in other rooms to add their tags, or you can add them all at once using Tag All Not Tagged.

3. On the Architecture tab, click the Tag Room drop-down button and choose Tag All Not Tagged.
   - At the top of the "Tag All Not Tagged" dialog, be sure that the "All objects in current view" radio button is selected.
   - From the list of tags, choose the Room Tag:Room Tag With Area item.
   - Click OK to place the tags.

20
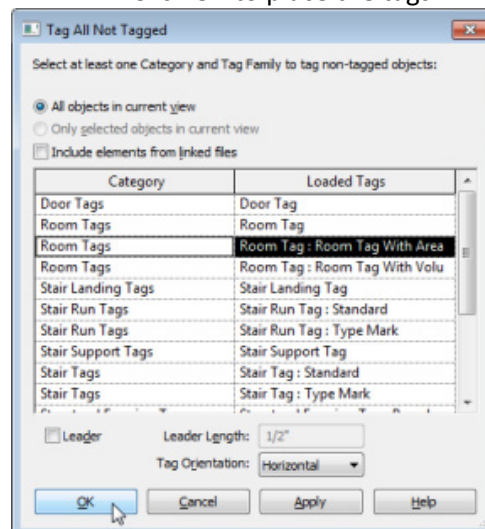
On the left side of the plan, some of the rooms that fall outside the crop region received tags. We can remove these by either manually deleting them or adjusting the annotation crop region.
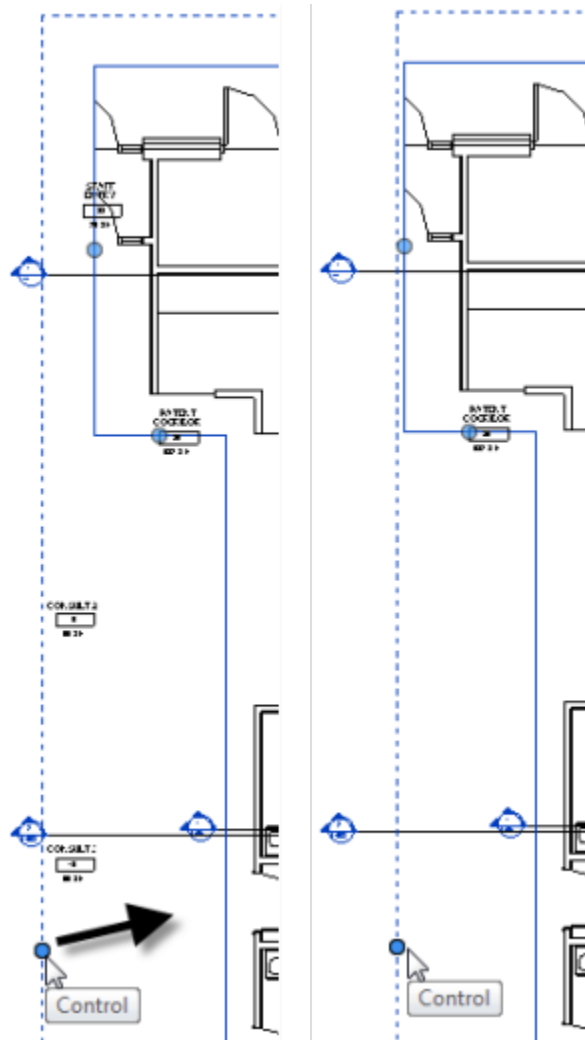

4. Click to select the crop region.
    *   Click and drag the control handle on the dashed rectangle surrounding the irregularly shaped crop region.
    *   Drag it closer to the plan.

Any tag intersected by this dashed annotation crop will disappear.

Exercise 24 – Add Door Tags
Continue from the previous file

1. Repeat Tag All Not Tagged (You can find it on the Annotate tab as well).
    *   At the top of the "Tag All Not Tagged" dialog, be sure that the "All objects in current view" radio button is selected.
    *   From the list of tags, choose the Door Tag:Door Tag item.
    *   Click OK to place the tags.
2. Zoom and pan around the view to check the tags.
3. Delete any tags you don't need.
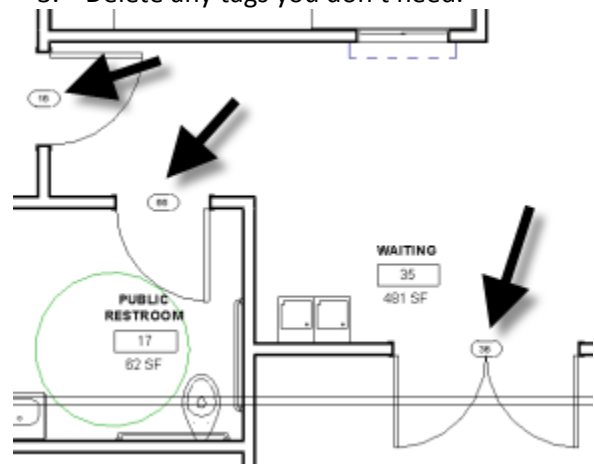
## Exercise 25 – Add Dimensions
Continue from the previous file

1. On the QAT, click the Aligned Dimension tool.
    *   On the Options Bar, choose Faces of Core from the first drop-down.
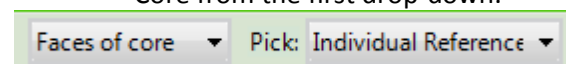
2. Click on the left vertical wall of PUBLIC RESTROOM 17.

- Click the next vertical wall on the other side of the room and continue with the two walls of the elevator.
- Click a point above the rooms in the empty space of WAITING 35 to place the dimension.
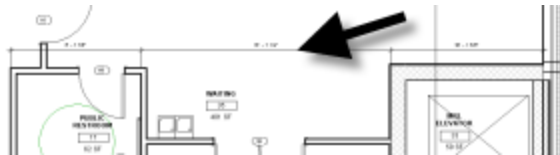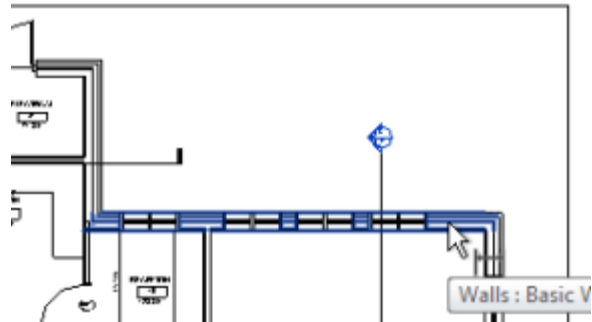

4. Repeat the process to add dimensions in other locations.
5. Return to the dimension tool.
   - From the second drop-down, choose Entire Walls
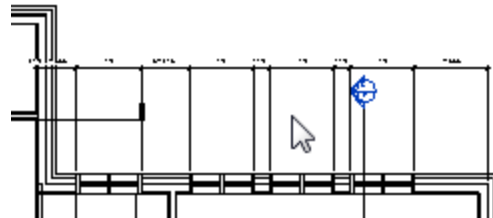

- Click the Options button.
- Check Openings and choose Widths.
- Click OK.
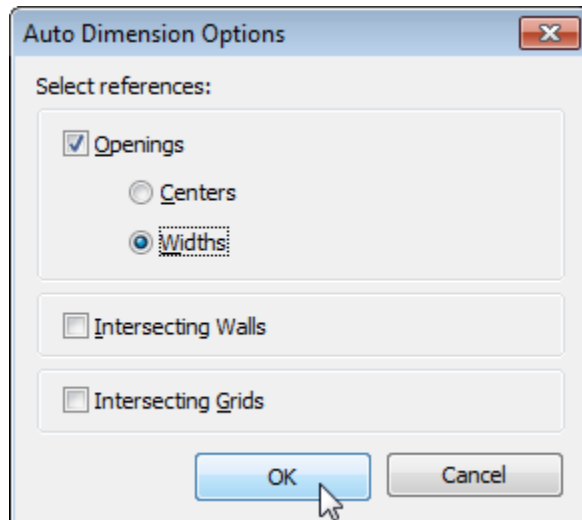
6. Click on the exterior horizontal wall at the top of the plan.

- Click above the wall to place the dimension.

- Click the Modify tool or press ESC twice to finish.
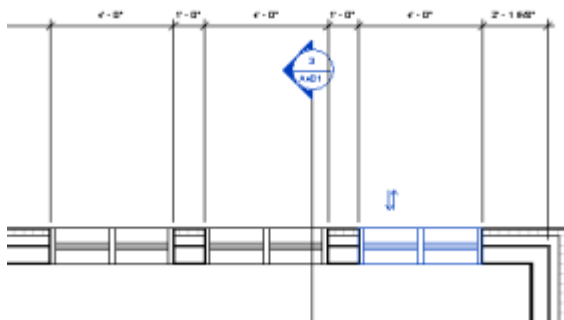
Exercise 26 – Make modifications

Continue from the previous file or open the file named *26_Arch_Model_Doc_V2.rvt*

1. Select one of dimensioned walls such as the one between the PUBLIC RESTROOM and the corridor.
   - Move the wall slightly.

Note the change to both the dimension and the room tag.
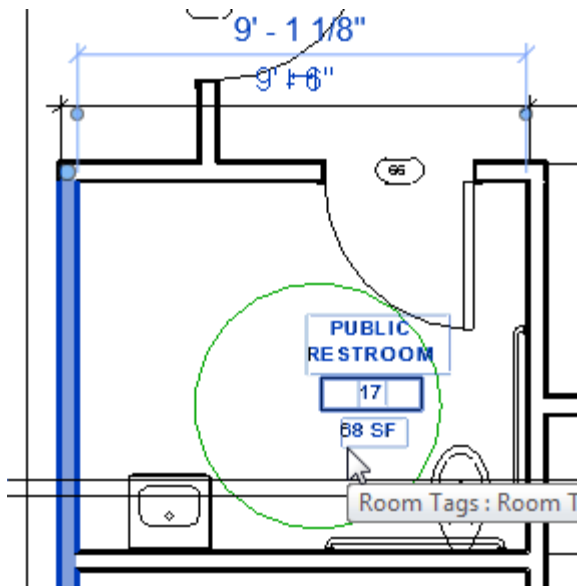
2. Select and move one of the dimensioned windows on the exterior wall.


3. On the Project Browser, open the floor plan view GROUND FLOOR.

As you might expect, all changes to the model are reflected here as well, even though the annotation may vary.

Exercise 27a – Alternate Dimension Text

Continue from the previous file

1. Reopen the view named Enlarged Lobby Floor Plan.
2. Select the dimension you added at the top.
3. On the Properties palette, click the Edit Type button.
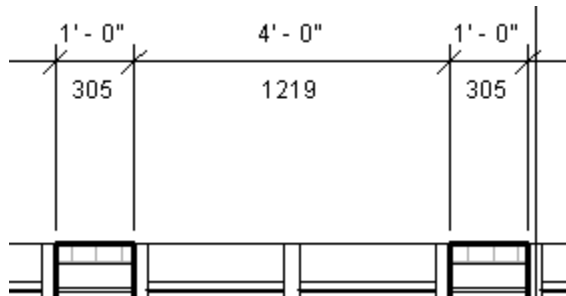   - Click the Duplicate button and add the suffix: **w MM** to the name.
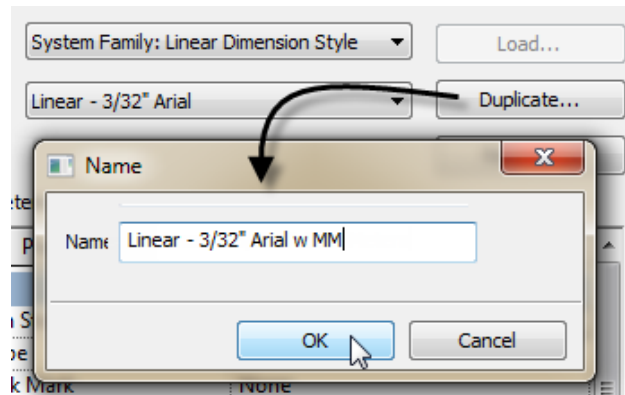
4. Scroll down and for Alternate Units, choose **Below**.
   - Verify that Alternate Units Format is set to MM.
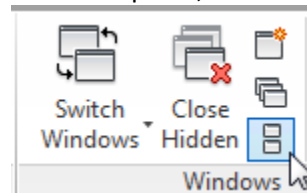

You can modify the settings if you like.

5. Click OK to see the results.

Exercise 27 – Working with a Schedule

Continue from the previous file

6. Verify that the floor plan view named GROUND FLOOR is open.
7. On the Project Browser, beneath the Schedules/Quantities branch, double-click to open the Room Schedule.
   - On the View tab, on the Windows panel, click the Tile button.

You should now have the floor plan and schedule views side by side.

8. In the schedule view, click to select the first room.

Notice it highlight in the plan as well.

9. Repeat by selecting a different room.
10. Click and drag through several rooms.

Notice them all highlight in the plan.

11. With the rooms still highlighted, click the titlebar of the floor plan view to switch focus to the plan.
    - On the Properties palette, change the Limit Offset to **10** and press ENTER.

Note the change in both the Properties palette and schedule. Note in particular the Unbounded Height which is tied to the Limit Offset parameter.

3. In the schedule view, click on the title.
    - Change the name to **Room List** and then press ENTER.
4. Click in the Level header field and drag through all of the headers. (They will all highlight)
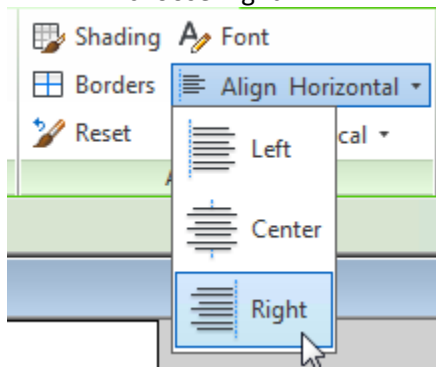

    - On the Modify Schedule/Quantities tab, click the Font button.
    - In the "Edit Font" dialog, change the Font size to **3/16"**.
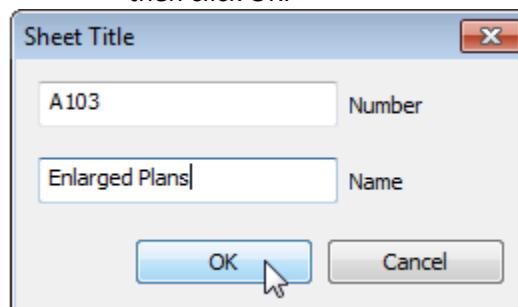   - Check the **Bold** checkbox and then click OK.

5. Click again in the title field at the top.
    - Click the Font button again.
    - Change the font to **Arial Black** and the height to **1/4"** and then click OK.

6. On the Modify Schedule/Quantities tab, on the Titles & Headers panel, click the Insert Image button.
    - Browse to the image file named: *patient_room_icon w Title.png* and then click Open

7. Click on the letter above the Unbounded Height column header (Letter E).

- On the Appearance panel, click the Align Horizontal drop-down button and choose Right.

8. Repeat for the Limit Offset column.
9. Click on Column F.
   - On the Columns panel, click the Delete button.

Exercise 28 – Adding a Sheet

Continue from the previous file or open the file named *28_Arch_Model_Doc_V3.rvt*

1. On the Project Browser, right-click the Sheets branch and choose New Sheet.

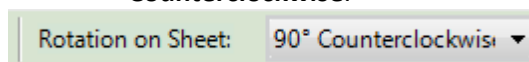   - In the "New Sheet" dialog, accept the defaults and click OK.

2. Right-click the new sheet and choose **Rename**.
   - Change the number to **A103**.
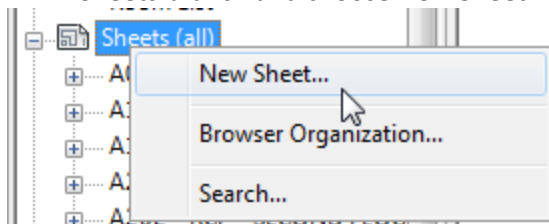   - Change the name to **Enlarged Plans** and then click OK.

3. On the Project Browser up under the Floor Plans branch, drag the Enlarged Lobby Floor Plan view and drop it on the sheet.
   - On the Options Bar, from the Rotation on Sheet drop-down, choose **90° Counterclockwise**.

4. Move the viewport to fit in the titleblock area.
5. Select the viewport and on the Properties palette, click the Edit Type button.
   - At the top of the dialog, click Duplicate.
   - In the Name field type **Viewport no Title** and then click OK.
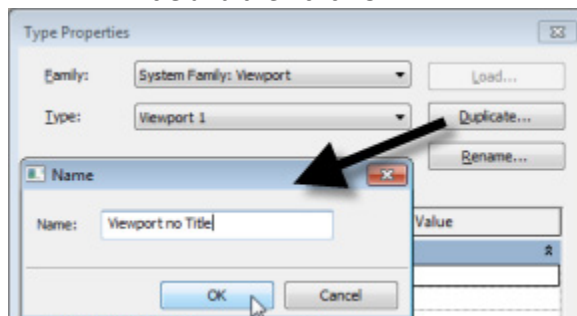
6. For the Show Title parameter, change it to **No** and then click OK.

Visualizing your Design

In this section we look at visualization tools and techniques you can use to present your designs.

Exercise 29 – Using Displace Elements

This exercise shows the process to create an "exploded" 3D view of a portion of your design.

1. From the Application menu, choose **Open > Project**.
   - Browse to the file named: *29_Arch_Model_Vis_Start.rvt*.
   - Select it and click Open.
2. Verify that the 3D view named *Displace* is open.
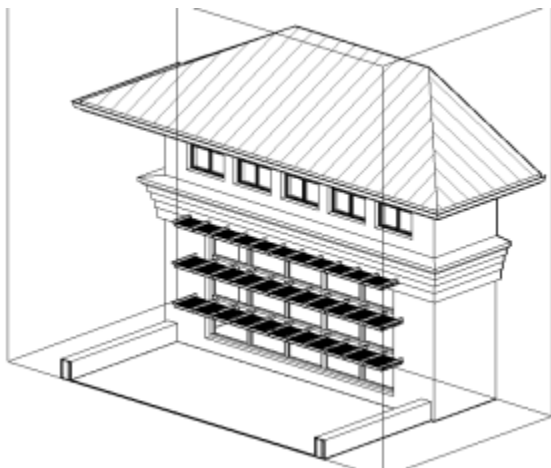

3. Select the top shading device element.
   - On the Modify | Generic Models tab, on the View panel, click the Displace Elements button.
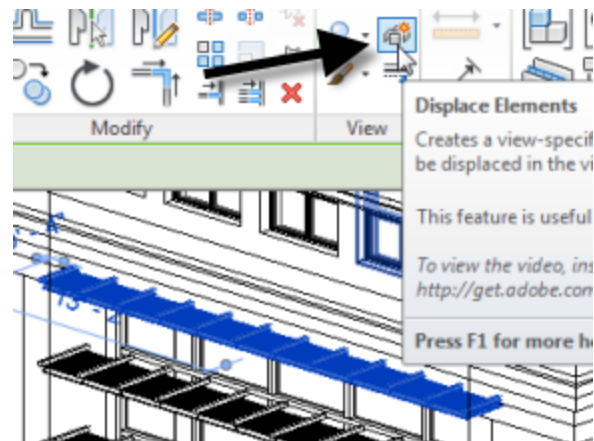

A small colored displacement icon will appear on the selected element. Red moves along the X, green moves along the Y and blue moves along the Z.
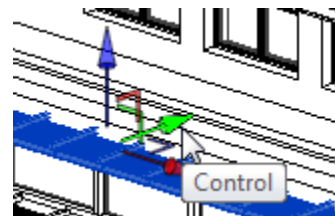

4. Highlight the green arrow and drag it away from the face of the building.
   - With the element still selected, drag up slightly with the blue arrow.
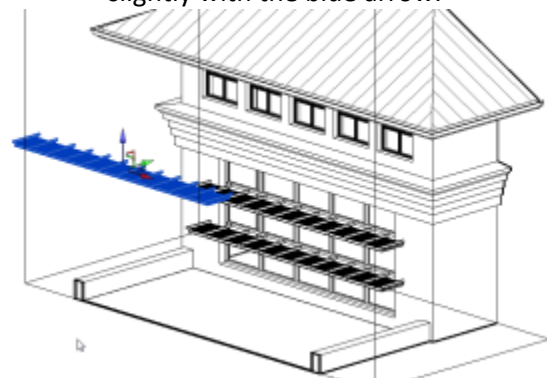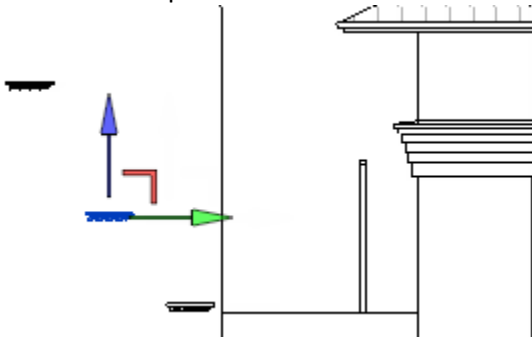
5. Repeat the steps with the other two
    shading devices.
    • Move the middle one in the Y direction
      only away from the face of the building
    • Move the lower one away from the face
      of the building and down slightly.
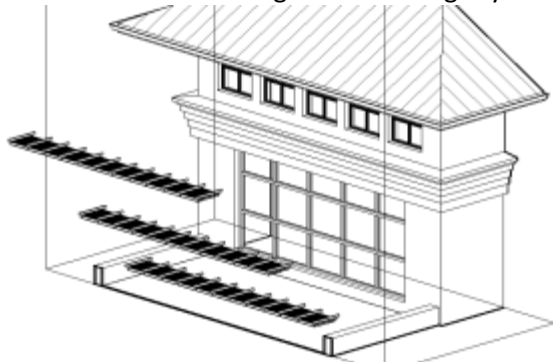
6. To fine-tune placement, click the Right face
    of the ViewCube.
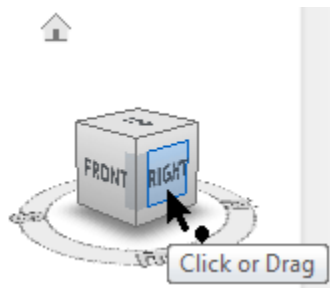
    • Click on each shading device and use
      the green and blue arrows to fine-tune
   the positions.

    • To return to the previous axonometric
      view, highlight the ViewCube and then
   click the Home icon that appears.

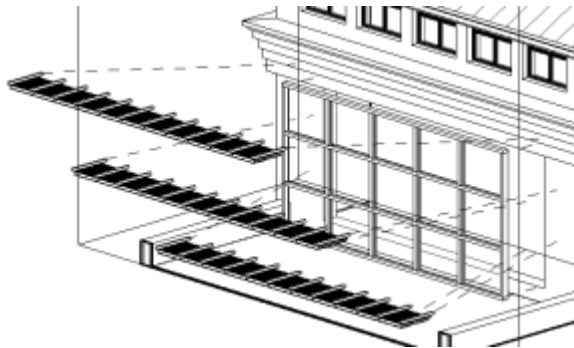Displace one more element.

7. Select the Curtain Wall. (Be sure to click the
    curtain wall itself – dashed outline – not the
    mullions or glass).
    • Displace this element and move it
      slightly away from the exterior wall with
      the green arrow.
    • Make any further adjustments to the
      positions of any of the four displaced
      elements.
8. Select one of the displaced elements.
    • On the Modify | Displacement Set tab,
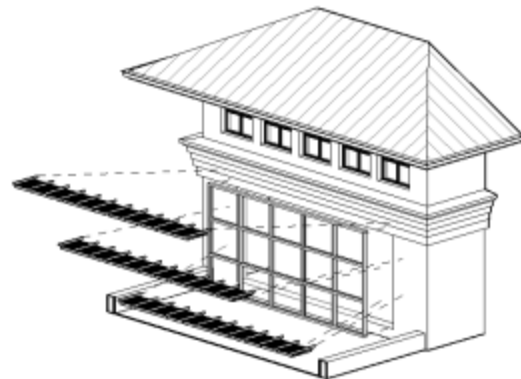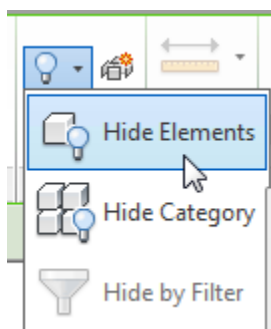   on the Displacement Set panel, click the
      Path button.
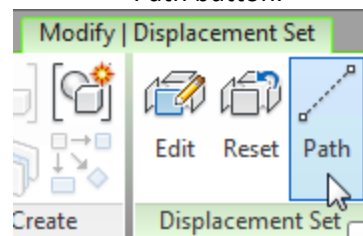
    • Click near the ends of the shading
   device to add a few paths.
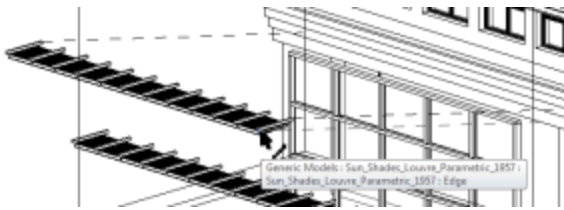
- Continue clicking at the edges of the other displaced elements.
- Click the Modify tool or press ESC twice to finish.

Try orbiting the view. Notice that the displaced elements and lines orbit with the rest of the model.

9. Select the Section Box surrounding the view.
10. On the Modify | Section Boxes tab, on the View panel, click the light bulb icon and choose Hide Elements.
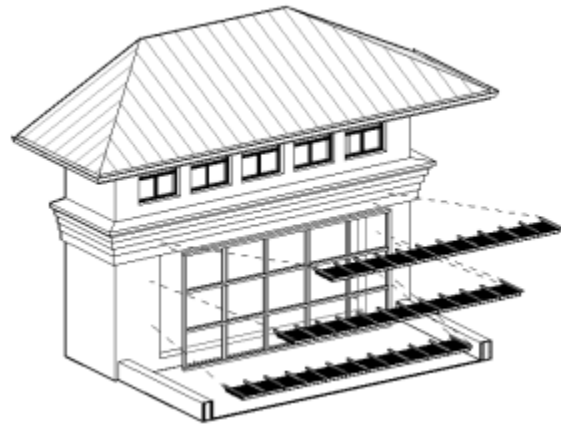
11. Open another 3D view.

Notice that the elements are not displaced elsewhere.

Try duplicating the view.

- **Duplicate** will not copy the displacement.
- **Duplicate with Detailing** will also duplicate the displaced elements.

Exercise 30 – Accessing Materials

Continue from the previous file or open the file named
30_Arch_Model_Vis_V1.rvt

1. On the View Control Bar, click the Visual
   Style pop-up and choose Realistic.
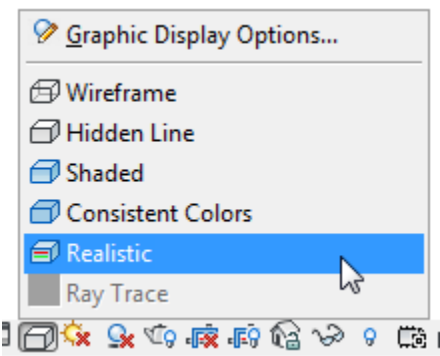
Realistic mode displays the materials live in the shaded
viewport. If you want to edit the materials, use the
Material Browser.

2. On the Manage tab, on the Settings panel,
   click the Materials button.
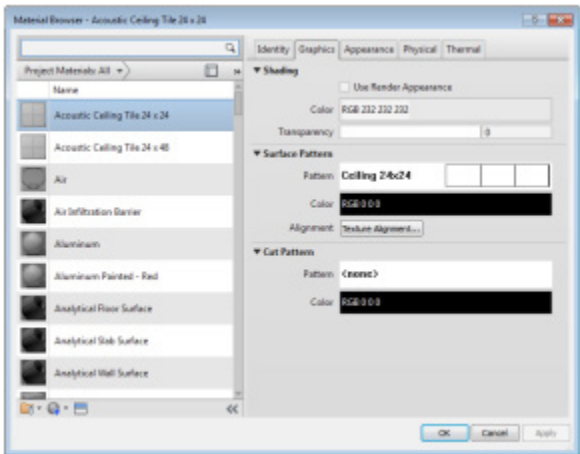
Materials in the current project are listed on the left. Edit
the currently selected material on the right in one of
several tabs.

3. Scroll down and select the material named:
   Render 255-0-0.

Notice the red color assigned to the Shading value. This
material is assigned to the blades of the shading device,
however this color is not being used to render it.
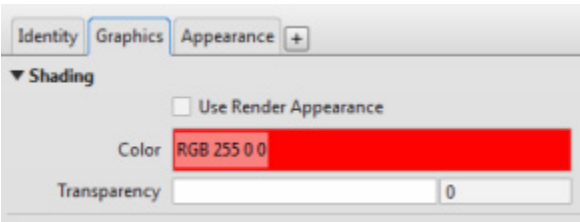
4. Click OK to dismiss the dialog.
   • Change the Visual Style to Shaded.

Notice that the shading devices now use the red color.
When rendering however, Revit will use the same
settings shown in the Realistic visual style.

5. Change back to Realistic Visual Style.
   • Reopen the Materials dialog and select
     the material named: **Render 255-0-0**
     again.
   • Right-click it and choose Rename.
   • For the name type: **Shading Louver
     Blades**.
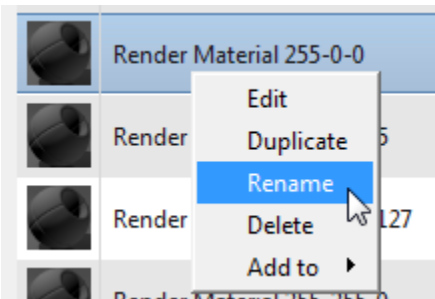

   • Click the Appearance tab.

Here you can see that the color is dark gray instead. Appearance settings are used for rendering and Realistic shading.

- Click on the color swatch.
- In the "Color" window that appears, choose a color that you like.
6. Click back on the Graphics tab.
    - Check the "Use Render Appearance" checkbox.
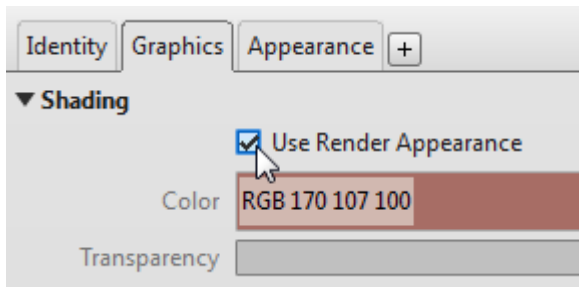
- Click OK to see the result.
7. Zoom in on the louvers
    - Try both shaded and Realistic Visual Styles.
Notice that the color will now display in both modes.
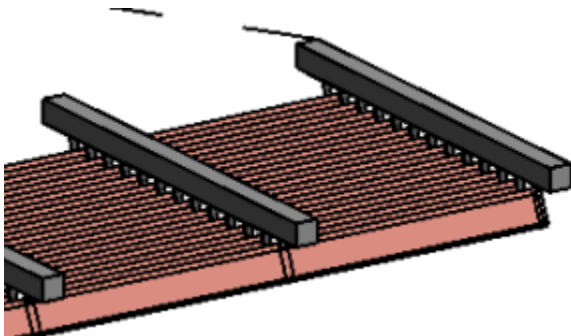
Another way you can access the materials on an element is to select it and edit its properties. The shading device is part of a displacement set, so to edit it, we need to use the TAB key.
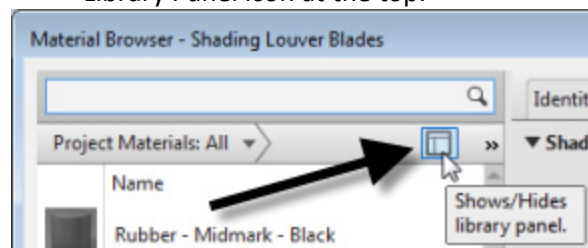
8. Highlight the shading device, press the TAB key. Verify that the Status Bar shows that the Generic Model is highlighted and then click.

- On the Properties palette, click the Edit Type button.
- Click the small browse button in the field next to Support Material.
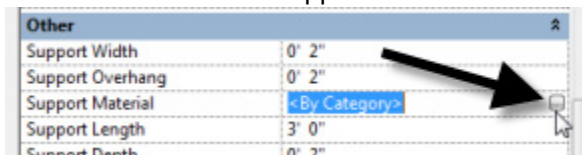
9. In the "Material Browser" click the Show Library Panel icon at the top.

- At the bottom of the dialog, on the left side, scroll down and select the Metal category.
- In the right panel, scroll down and locate a metal material you wish to use like **Steel, Polished**.
- Place your mouse over the material and when the small arrow appears, click it.
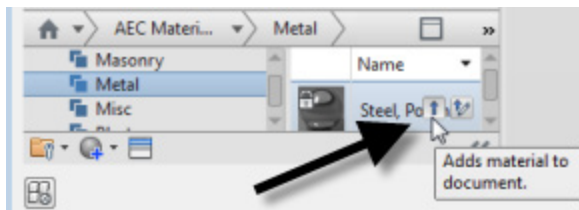
This adds the material to the current document.

If an error appears, click Replace.

10. Click OK to assign the material.
    - Click OK twice more to dismiss the "Material Editor" and "Type Properties dialogs.
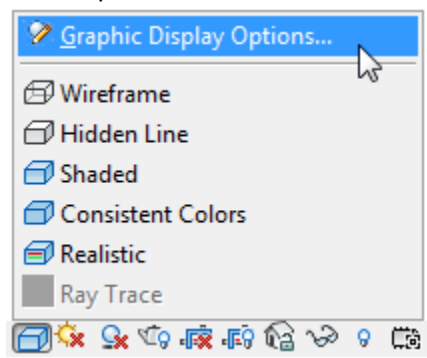
Exercise 31 – Create a Cloud Rendering

Continue from the previous file or open the file named *31_Arch_Model_Vis_V2.rvt*

1. On the Project Browser, verify that the Displace 3D view is open.

First prepare your settings for Rendering.

2. On the View Control Bar, click the Visual Style pop-up and choose Graphic Display Options.

3. In the "Graphic Display Options" dialog, configure the following settings:
    - Under Model Display, choose **Realistic** for Style.

- Under Shadows, check the Cast Shadows box.
- Under Lighting , for the Scheme, choose **Exterior: Sun only**.
- Under Background, choose **Gradient** and accept the default colors.
- Click OK to dismiss the dialog and apply the changes.
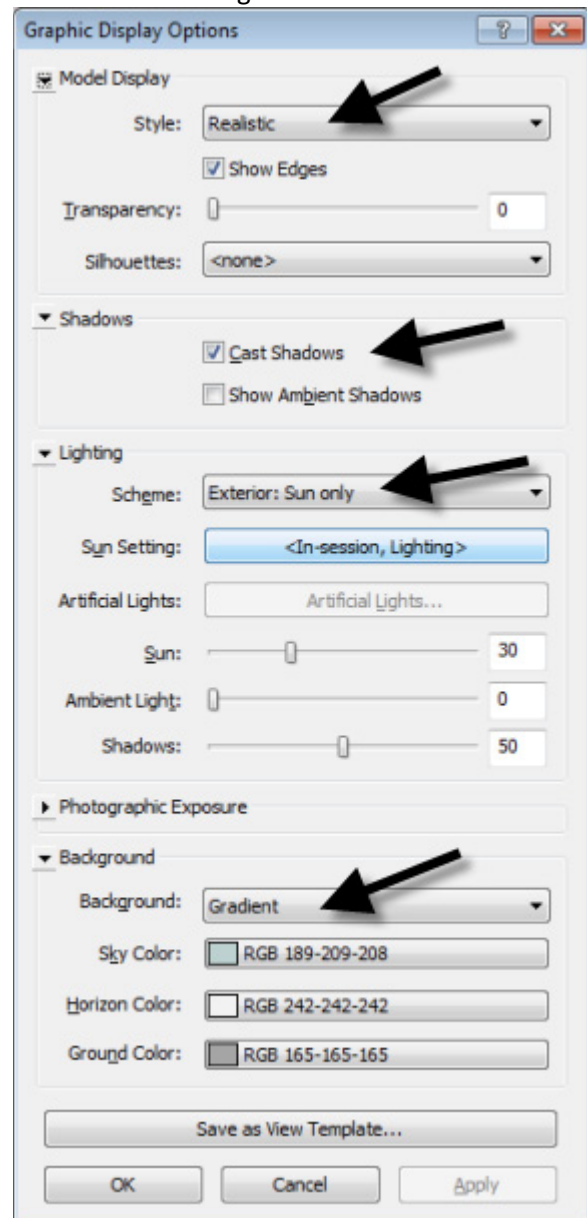
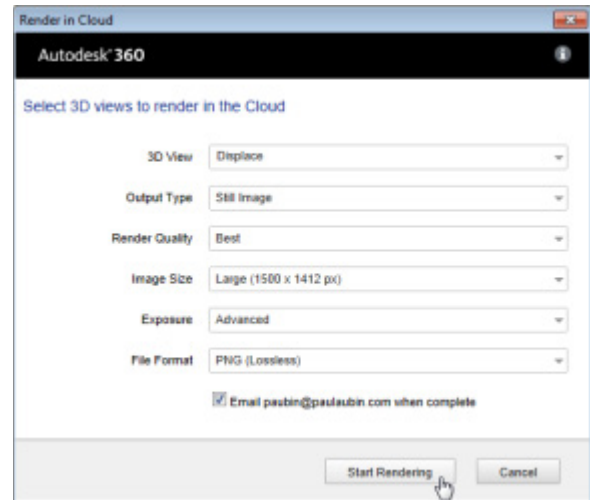4. On the View tab, on the Graphics panel, click the Render in Cloud button.
    - If prompted, log into your Autodesk account.
5. In the "Render in Cloud" dialog, click Continue.

If you check the box, Cloud Rendering will email you when the rendering is complete.

6. In the second "Render in Cloud" dialog, configure the following:
    - For the 3D View, choose: Displace.
    - For the Output Type, choose: Still Image.
    - For the Render Quality, select your desired quality. (Higher quality takes longer).
    - Choose an Image size. (Larger image size takes longer).
    - Choose an Exposure setting and preferred File Format.
7. Click Start Rendering.

8. On the View tab, on the Graphics panel, click the Render Gallery button.
    - Login to your 360 account.
   - View and/or download your rendering.
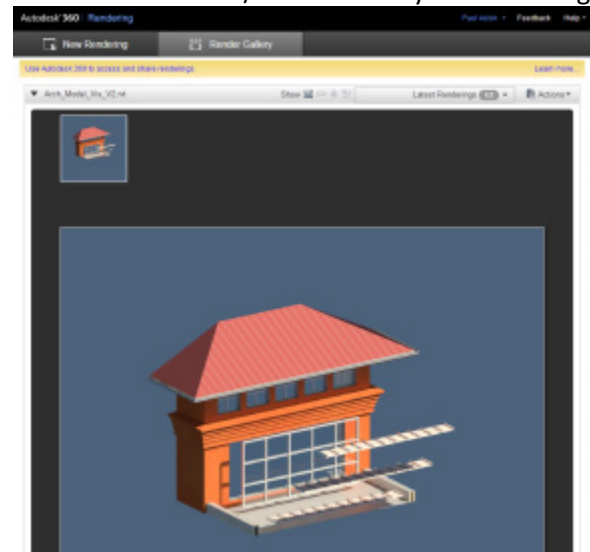
Further Study

You can find more information and tutorials in
The Aubin Academy Master Series: Revit Architecture.

If you want a deep dive into the Family Editor try my new book:
Renaissance Revit: Creating Classical Architecture with Modern Software.

Past Autodesk University Class:

"Autodesk® Revit® Families: A Step-by-Step Introduction" visit: www.pauluaubin.com/au *to learn more.*
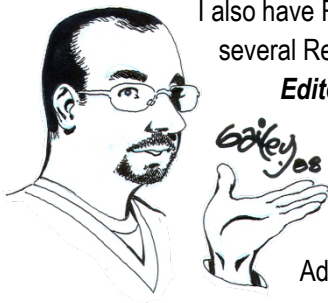
I also have Revit video training available at: lynda.com/AU2013/PaulFAubin. I have several Revit courses at lynda.com: *Revit Essentials (2011 and 2013)*, **Revit Family Editor**, *Revit Architecture Rendering* and *Advanced Modeling in Revit Architecture*, *Phasing and Design Options*, *Up and Running* and more on the way soon.

The Revit Family Editor course is devoted entirely to the Family Editor and content creation. The Advanced Modeling course covers the Massing Environment as well as many other related topics.

If you have any questions about this session or Revit in general, you can use the contact form at **www.paulaubin.com** to send me an email.

Follow me on twitter: **@paulfaubin**

All of your lab monitors from today also have resources available and teach classes here at Autodesk University. Do a search for:

Brian Mackey, Founder, BD Mackey Consulting, Desiree Mackey, Professional Engineer, BIM Manager: Martin/Martin, Steve Stafford, CEO, AEC Advantage.com