

AGENDA:

1. Editing Wall Profiles
2. Joining and Cutting Geometry
3. Adding Wall Openings
4. Hosted Sweeps for Walls and Roofs

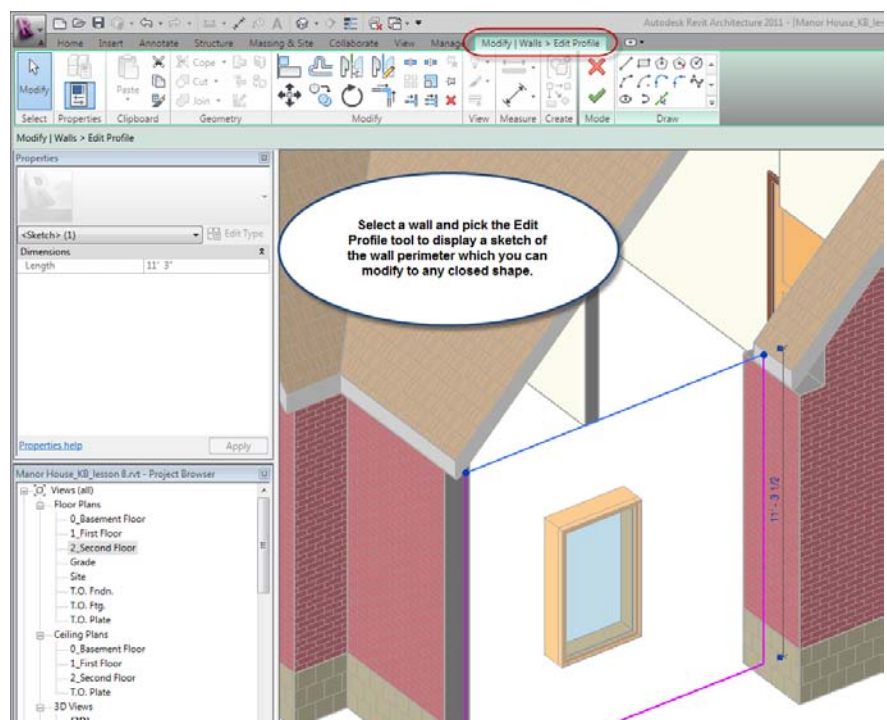
1. Editing Wall Profiles

Revit allows you to customize the shape of a wall by editing the profile. This lets you sketch curved or even circular wall objects and fine-tune the shape of a wall to accommodate steps, jogs, or angled edges anywhere around its perimeter.

If you select a wall and choose Edit Profile from the Ribbon, you will be placed in Sketch mode and the existing wall shape will be displayed as a rectangular sketch.

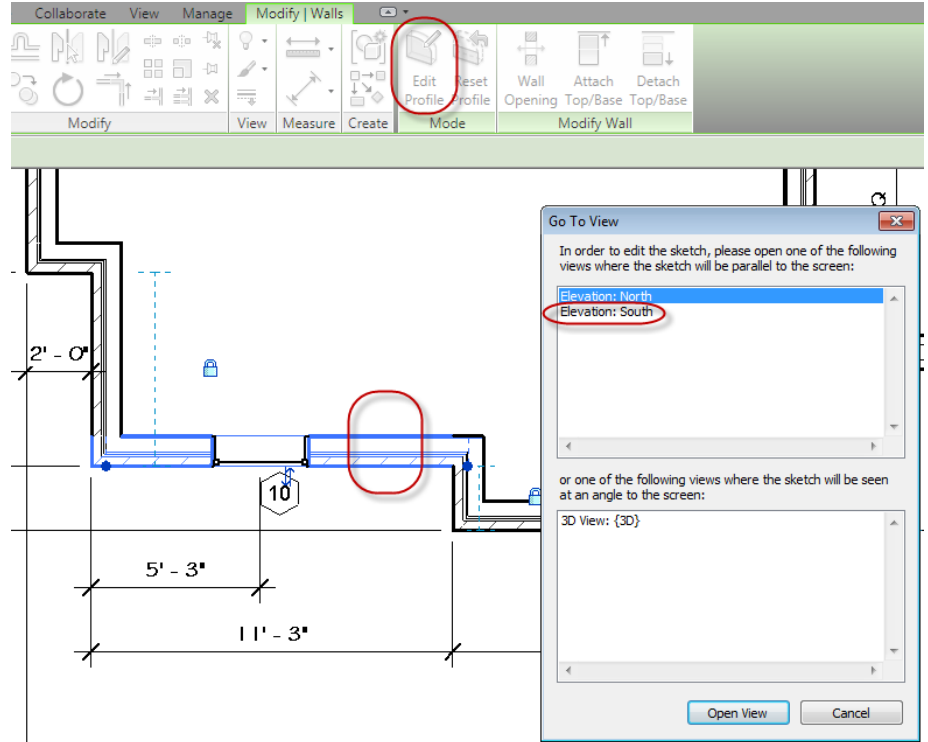
When you edit the profile of a wall, any attachments to the top or the base of the wall will be removed while you edit the profile. When you finish the sketch, depending on the edits you have made, the previous attachments may be permanently discarded.

To revert a sketched wall profile to its original shape, pick the wall and from the Options Bar, choose Remove Sketch.



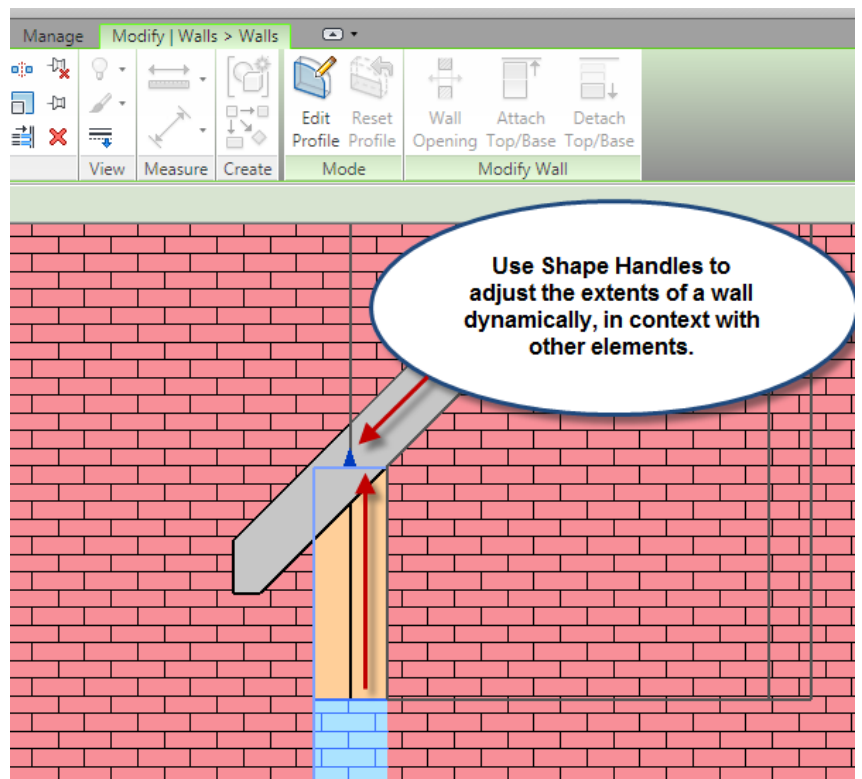
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Editing a wall profile is best done in an elevation view. If you start the process in a 3D view when you select the wall, switch to the appropriate elevation view to perform the edit. If you select a wall in a plan view and choose the Edit Profile option, a Go to View dialog will appear allowing you to choose an appropriate view in which you will be able to edit the sketch. In the



example shown here, since the selected wall is on the South side of the building, I would choose the South Elevation as the best choice to display the most complete context.

Wall shape handles appear at the default top and bottom elevations for a wall. Selecting the shape handle allows you to drag the top or bottom of the wall up or down, dynamically modifying the height or base elevation offset.



Walls that have had their profile edited will display extra edges and outlines in all views. The overall extents of the wall will be shown with additional shape handles in an elevation view, a blue dashed line in a plan view, and as a blue dashed outline in a 3D view.

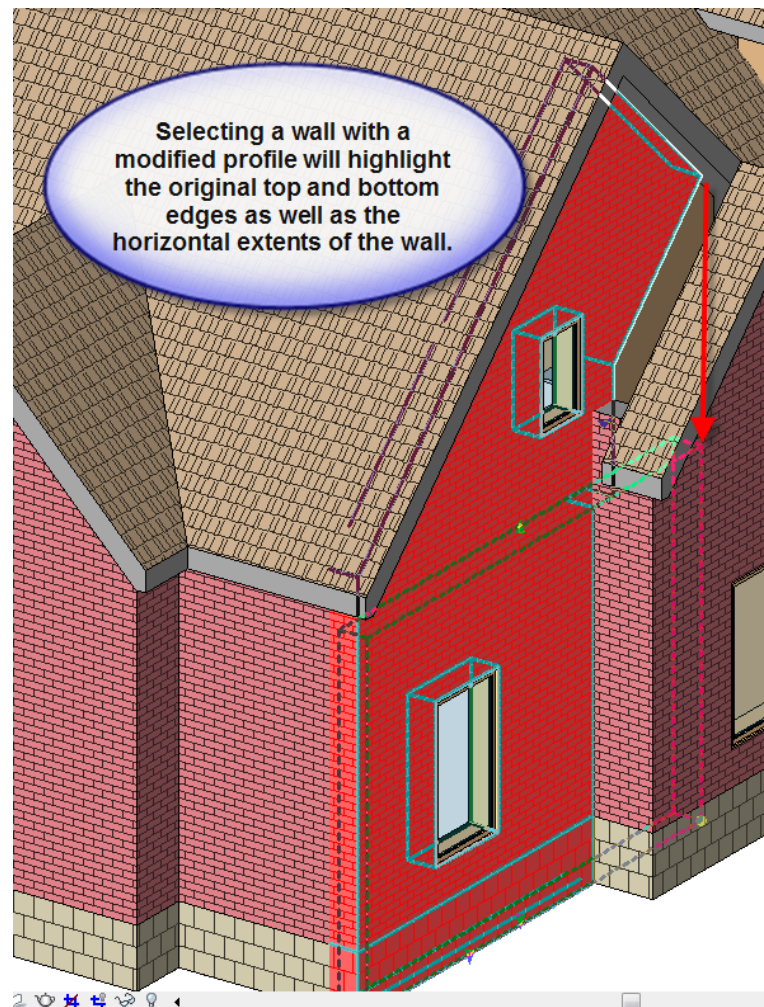
While editing the shape of a wall profile, you can use the Pick edges tool to copy lines from existing building elements around the wall being edited. When you pick edges you can optionally lock the sketch line to the picked element so the wall profile will update if the adjacent elements are moved or reshaped.

You can also create dimensions and use the Align tool while sketching a wall profile to create additional constraints.

Use the control grips at the ends of wall sketch segments to drag and reshape the sketch.

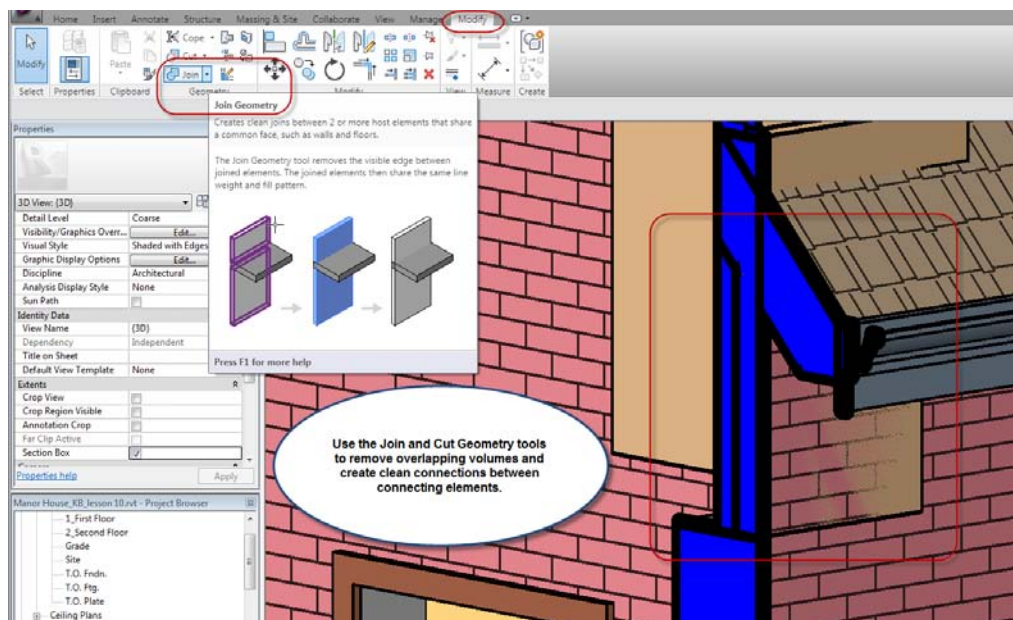
When you drag the endpoint of a closed sketch into an open loop, you may be prompted to delete an existing lock or constraint. You can safely ignore this message as you will be adding new segments to close the loop.

If the edit profile attempt fails, examine the sketch and ensure you have clean connections at all corners with no openings and no overlaps. Nested loops inside the outer loop will define holes in the wall.



2. Joining and Cutting Geometry

The Join Geometry tool lets you create a clean connection between 2 or more host elements that share a common face. This tool also allows you to join hosts and in-place families. You can also use the Cut tool, which although primarily intended for use with modeling geometry in the Family Editor, may also be used to embed one wall in another.

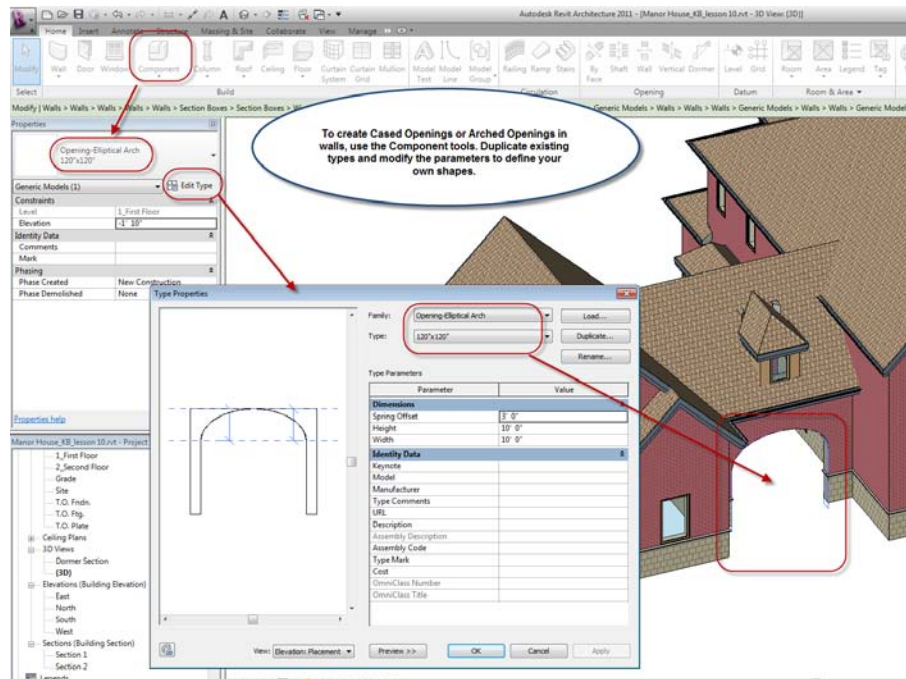


Joining Geometry in the Family Editor environment will create a union between two different shapes or volumes. In a regular project environment, one of the joined elements will cut the other volume, removing the overlapping portion.

When you join geometry in a project, floors, ceilings and roofs will always cut walls. Walls will cut columns and structural elements will cut host elements such as walls, roofs, etc. When you join two walls, the order that you select the elements will determine which will be cut by the other. The first object that you pick is going to stay the same and cut a hole in the second selection. In the image above, if I want the brick component to cut away the bottom of the frame wall where it is showing through the brick, I will pick the main brick wall first. If I join the wall to the roof, the overlapping lines at the sectioned area will be removed with the roof cutting the wall regardless of the selection order.

3. Wall Openings

Openings may be created in walls a number of different ways. Doors and Windows, of course, cut openings in walls automatically. They will be moved along with their host element and will be deleted automatically if the door or window is removed.

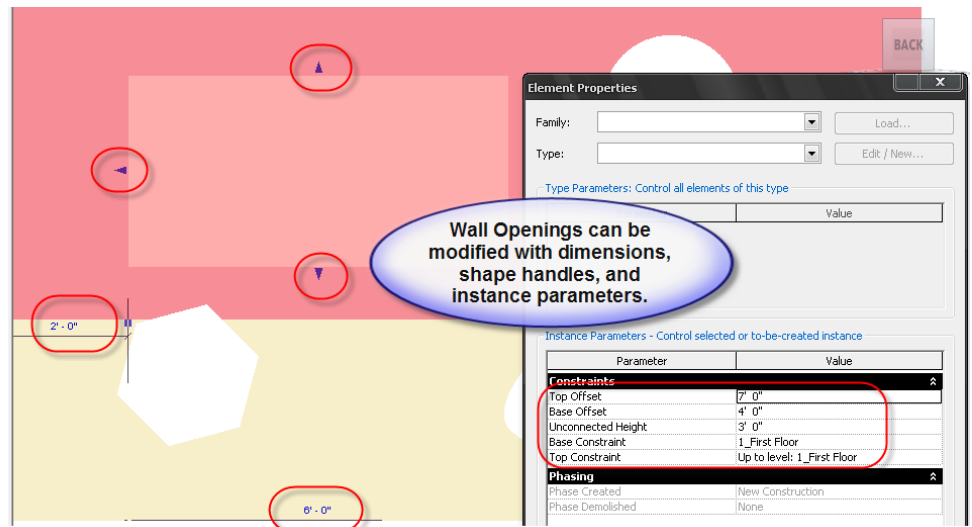


To create openings such as interior arches or cased openings that do not include doors, you can insert a special type of component family defined with a void extrusion and typically called `Opening_Shape`.

Various opening families are available to define standard flat openings, with or without trim elements included. The complexity of the opening is dependent on the component family. Duplicate an opening and set the dimension and shape parameters included with that family to create any required size or variation that the family parameters support.

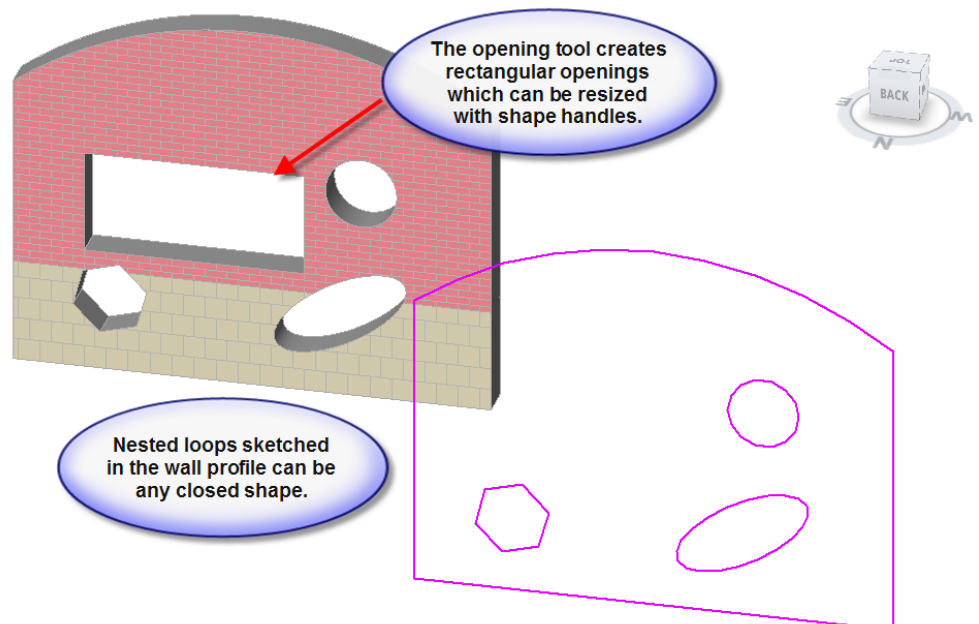
Component openings usually include plan view symbolic lines as are typically depicted on architectural drawings. Openings in walls usually show the outline of the opening with hidden lines to indicate the overhead edges.

A second way to create openings in a wall is to use the Opening tool on the Home tab of the Ribbon. This is the same tool that is used to create Dormers. When you select the Wall Opening tool you



specify the start and end point of the opening. It may be drawn in an elevation view where you can see the scope of the opening or in a plan view where you can choose the start and end point of the opening and then specify the top and bottom locations via the element properties dialog box.

To lock a wall opening's size or position in the wall, add dimensions and lock them.

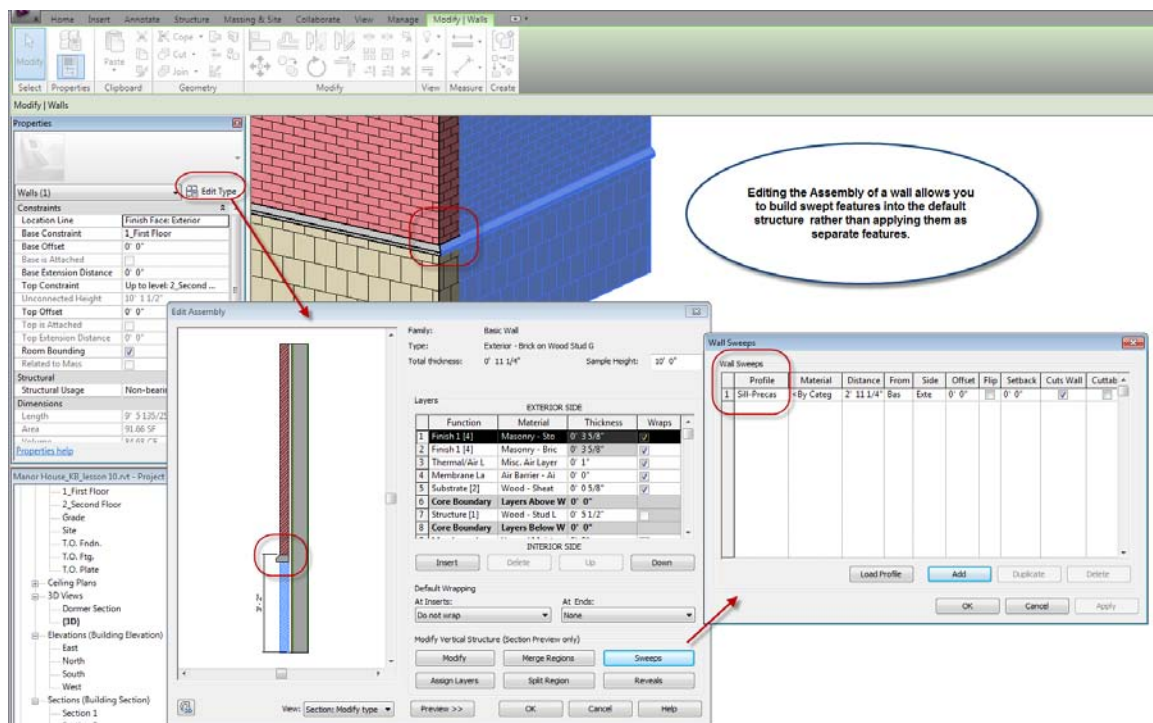


You can create detail lines or reference planes to assist in positioning the opening if desired.

To create non-rectangular openings in a wall, edit the Wall Profile and draw closed shapes inside the outer perimeter. Any closed, nested loop will produce a hole in the wall.

4. Hosted Sweeps for Walls and Roofs

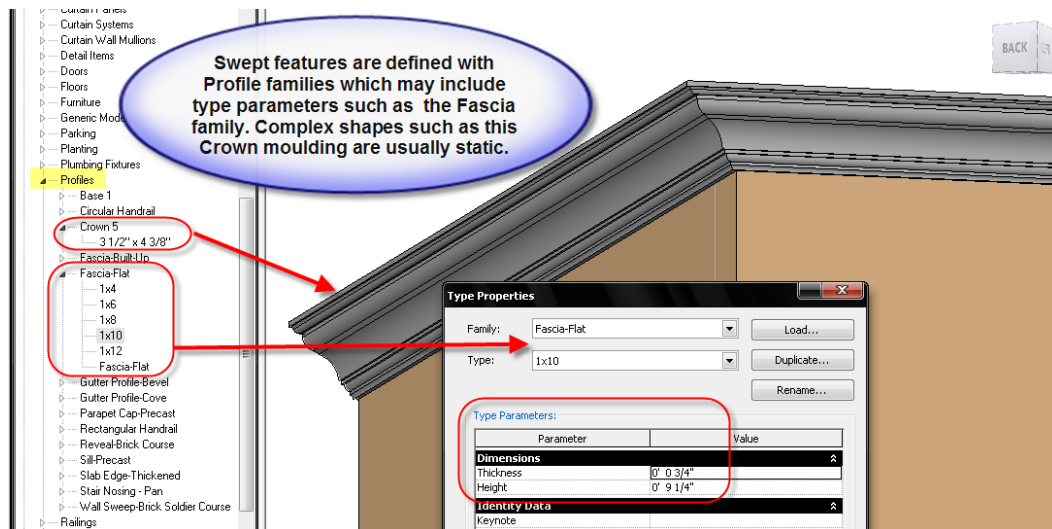
A sweep is a tool for creating an extruded shape that will follow a path. Sweeps may be created with the Family Editor, as In-place families or by using the Hosted Sweep tool from within a Project. Sweeps added to a wall with the Hosted Sweep method can be selected independently of the wall and can be repositioned or modified.



Sweeps may also be defined as a constant feature for an element such as a wall by adding the sweep through editing the assembly of the wall type and opening the Wall Sweeps dialog where you can select a profile, set its material, its location and orientation, and how it reacts to walls and inserts when it intersects them.

Wall sweeps may be set to Cut Walls (recommended) and optionally to be cuttable by inserts such as doors and openings. If a sweep is cuttable, a window frame that intersects the sweep will cut a portion of the sweep away and it is not possible to force the sweep through the insert. If a sweep is not cuttable it will still stop at openings but a control grip will be added to each end of the sweep allowing you to drag it and reposition the end.

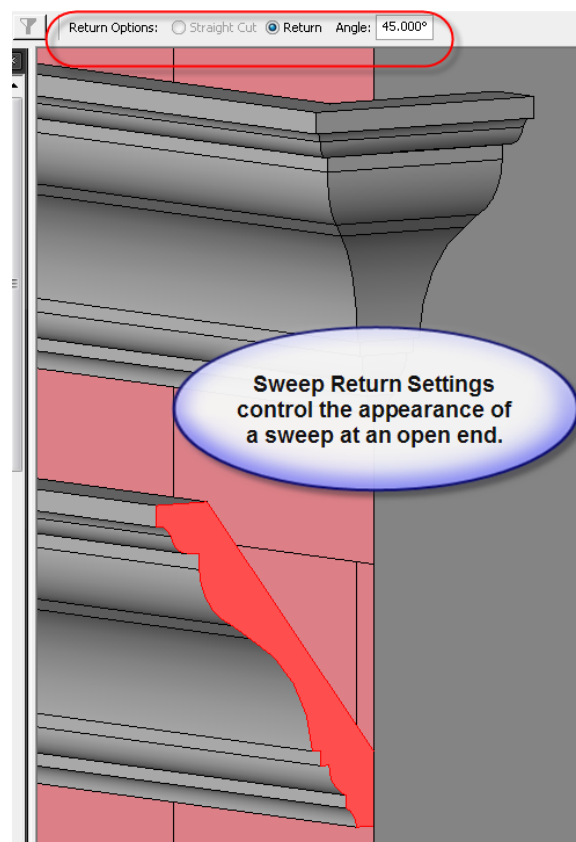
Sweeps rely on Profile families which are created in the family editor from closed loop sketches. Various types may be defined for a single family so you can load a profile and then use several different sizes within the project.



Some Profiles include parameters to control the dimensions of the shape by duplicating and creating your own profile types. Instance parameters for hosted sweeps allow you to set the position and offset for the sweep relative to a base level and the surface of the host. Changes to the actual size or shape of the Sweep are derived entirely from the Profile.

When you add wall sweeps one at a time, they will be created as separate elements. After adding one or more segments to a sweep, if you want to continue the sweep on adjacent walls, modify the sweep and pick add/remove wall segments.

Use Sweep return options to control how a sweep will wrap at an open end.



Wall Reveals are very similar in function and application to Wall Sweeps, but instead of using a profile to add a built up section to the wall, a Reveal uses a profile to remove or cut away a portion of the wall. Reveals are typically created with rectangular profiles using sizes of brick multiples such as 2 courses, rowlock course, or soldier course.



Roof Objects support two varieties of Sweeps to create Fascia and Gutters. Fascia and Gutters may be added to edges of Roofs, Soffits, and other Fascias.

Fascia sweeps may be added in any type of view, but to get the best feel for the result as you are placing the sweeps, use a 3D view. This method will also allow you to orbit the view direction and continue to pick a series of edges all the way around your building.

If you add edges, stop, and then need to continue the Fascia, select the existing section and from the Options bar choose, Add / Remove Segments.

When you add Fascia, you can access the element properties during or after creation and access Vertical and Horizontal offset values which will allow you to shift the entire sweep up and down or in and out from the selected edge.

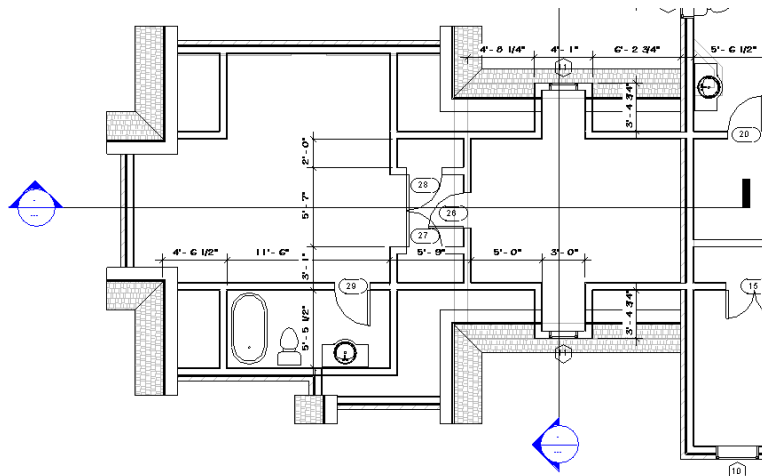
Fascia and Gutters may be flipped or reversed by selecting the Sweep and Picking the Flip control arrows.

Exercise Notes

In the following exercise you will continue to develop the Manor House project, editing the wall profiles where they meet the roof, adding wall openings and a Bay window projection, modifying wall types to include wall sweeps, and wall extensions, and joining geometry to create clean connections between overlapping elements. Finally, you will add Fascia and Gutter host sweeps to the roof edges.

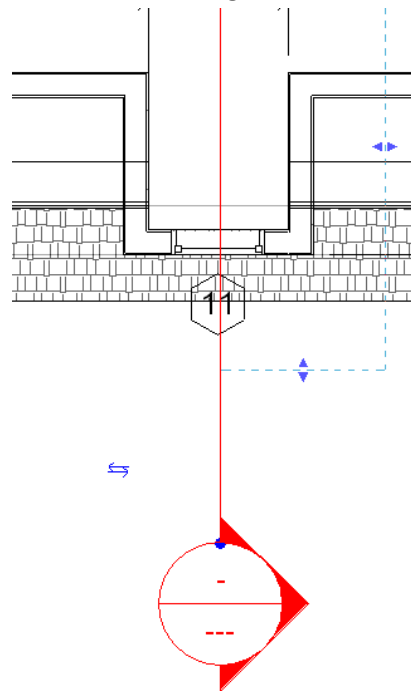
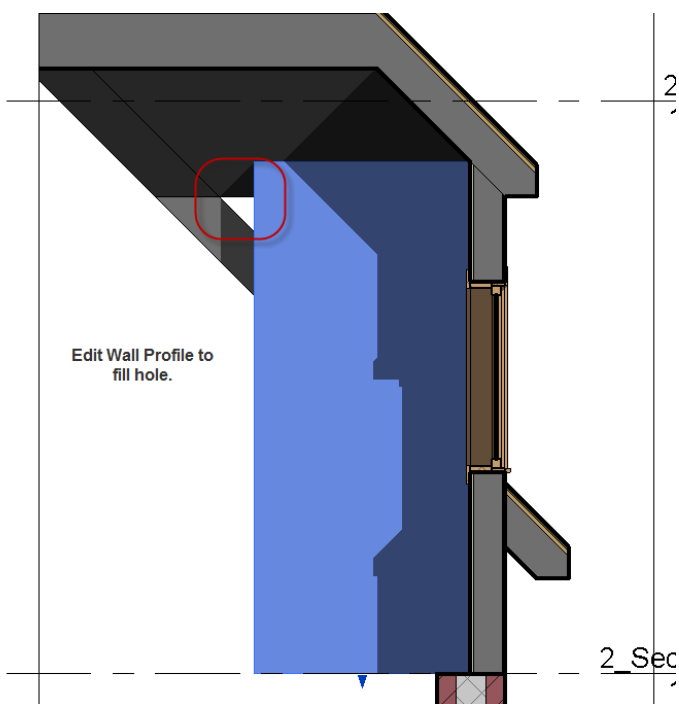
1. Open the Manor project and set the 3D view current. At this point we have added both dormers and dormer openings to the roof over the den and finished laying out the interior walls for the guest suite. Let's look at how to get a better view of our developing model.
2. Select the roof and from the View Control bar, choose Hide element so you can look down into the space. A floor would help but that will come in the next lesson. For now, orbit the view and try looking into the rooms from different angles. Reset the temporary visibility.
3. Pick the roof and from the Temporary Hide/Isolate tool, choose Isolate Element. Examine the roof from various angles and check your dormer openings to see how they cut through the walls and roof. Switch to the Second Floor view and zoom in over the garage.

4. Section Views can be very useful to help understand how spaces are fitting together. From the Quick Access Toolbar, choose the Section tool and draw two section lines as shown at right, through the den and guest suite area we have been working on. Draw the horizontal one first.



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5. Float your cursor over the blue section head for the horizontal section line and when it highlights, double-click to go to the section view. Type SD to shade the display. Turn the Shadow display on just for fun. If your computer starts to slow down, disable shadows. Pick the two dormer roofs and set their Base Offset to -1'-6".
6. Switch back to the Second floor view. Pick the section line and use the Flip arrows to reverse the direction so it is looking toward the front of the building. Double-click the section head again to switch to the new section view to the South. In this view you should see the second section line cutting through a dormer and extending above the roof. Double click the section head on this section line to switch to its linked view. Shade the view and optionally turn on shadows to see how they enhance the sense of depth in the section.
7. Switch back to the second floor view again. Select the section line through the dormer and reduce its extents as shown. Double-click the Section head to switch to the section view.



8. In the section view you can easily see the opening where our dormer wall does not fill the gap to the

main roof. One solution is to edit the wall profile to cover the hole.

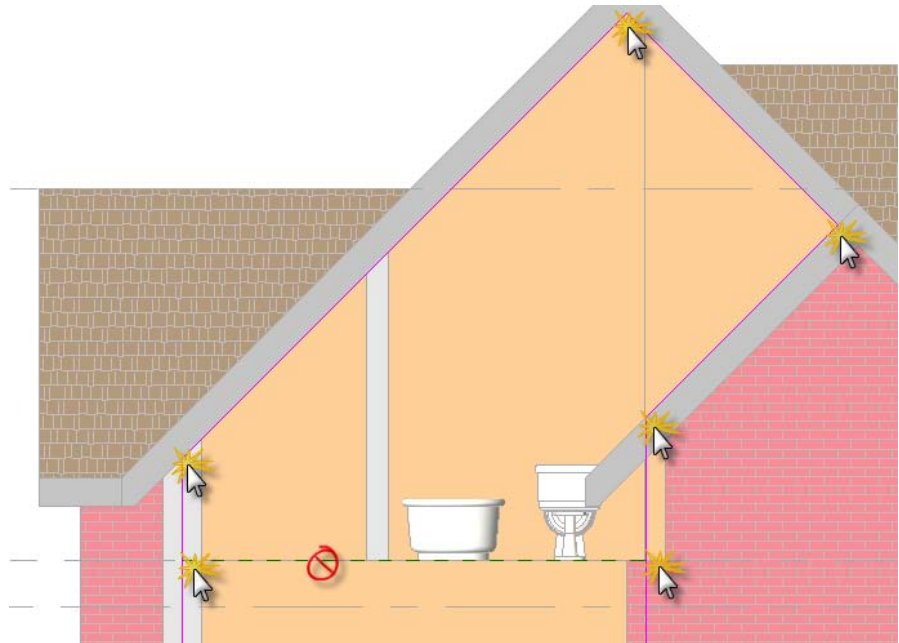
9. Select the dormer wall and on the Ribbon choose Edit Profile. Pick Ok to accept the warning about losing our top and base attachments temporarily. Select the left, vertical segment and drag its top control point down until it snaps to the roof.
10. Drag the left end of the top line to the left until it intersects the inside of the roof at the dormer opening. From the Sketch bar, pick Lines and connect the two edited segments with an angled line. Drag the top edge down until it is inside the roof at the front corner. Pick Finish Sketch.
11. Switch to a 3D view. Right-click over the View cube and choose Orient to View / Sections / Section 2. It looks like a 2D view but place your cursor over the upper left corner of the View Cube and pick it to switch to a southwest isometric, cutting through the dormer. Try clicking on all 8 corners of the box, to switch to the various vantage points.
12. Right-click on the 3D View in the Project Browser and choose Duplicate. Name the new view, Dormer Section. Right-click on the View Cube and choose Orient to View / Sections / Section 1. Use the view cube to change your view of the section.
13. The box-shaped frame around the view is called a Section Box. Select the edge of the section box to display its shape handles on each face of the box. Move your cursor over the down arrow on the top face of the Box and pick and drag it down into the model. Try adjusting some of the other faces, increasing and decreasing the extents of the visible area. The section box works like a crop region in a 2D view, allowing us to limit the scope of the displayed area.
14. In the properties palette, disable the Section Box option. Turn on the Crop region which is still available in 3D Views and try orbiting the view. Turn the crop region off.
15. Switch to a Southwest isometric view and zoom in on the garage.

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16. Pick the short wall between the two main walls at the front of the garage and from the Options bar, choose Detach and then pick the roof. Pick the main front wall on the left that extends up to the high point on the roof and on the Ribbon, choose Edit Profile.

17. Switch to the South Elevation View and delete the top horizontal sketch line.

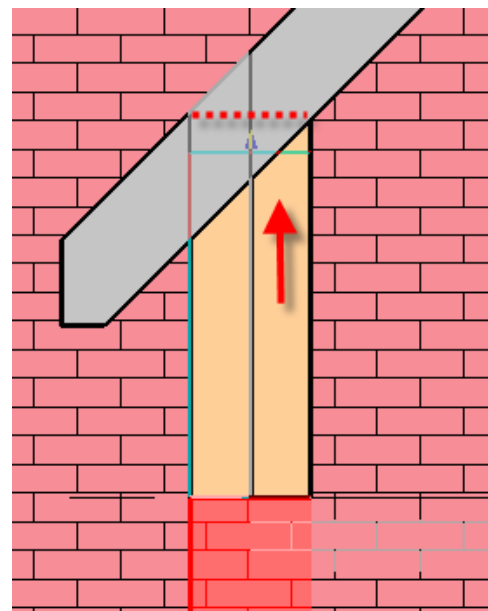
18. Drag the two side segments up to the eaves above and then add the remaining three lines by tracing the edges.



19. When you have closed the profile, Finish Sketch and accept any warning that may appear about objects not remaining joined.

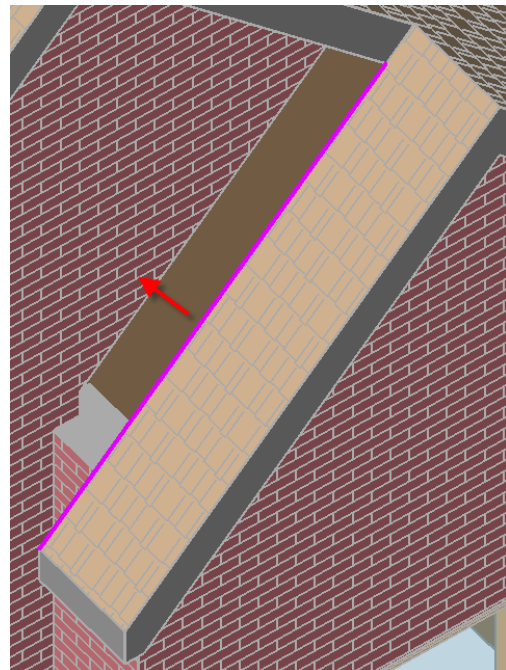
20. While still in the same view, drag the short section of wall upwards, using the shape handle to bring the wall up to the eaves level. Use Join geometry to clean up the overlapping portion.

21. *****Experiment with the Wall Joins tool when presented with this type of condition. Adjusting how the front and side walls join at the corners will affect how gaps or profile edits will work in situations like this.***

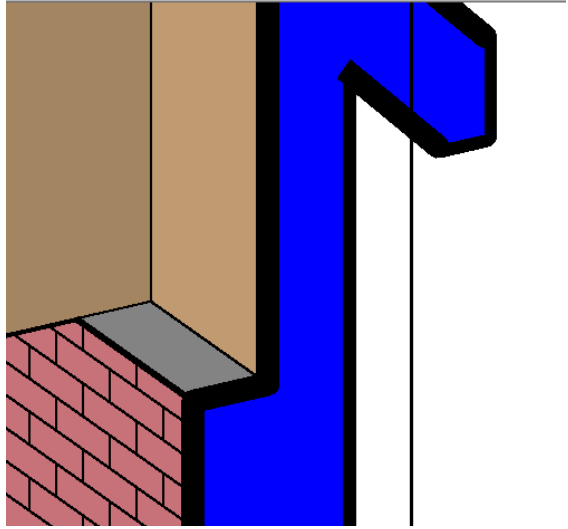


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22. If you switch to a 3D View and pick the wall you just edited, you may see a warning marker appear on the options bar. This would be related to the position of the interior wall at the back of the guest bathroom overlapping a portion of the exterior wall that was just extended in the previous step. Depending on your wall attachments in this area, you may not have an overlapping condition. If this is the case, you can skip steps 22 and 23.
23. Yellow Warning icons appear when walls overlap. If you pick the warning icon on the options bar, a dialog box will appear with a text description and a show button which can be used to highlight the problem area.
24. One Solution to overlapping walls is to use the Cut geometry tool to remove the overlapping portion. The order you select the walls will affect the outcome. Try it both ways to see the affect.
25. Select the roof and hide it temporarily. Take a look at the walls from both sides and decide which wall you need to be cut by the second wall. The first selection will get smaller. If it doesn't work as expected, hit CTRL-Z and reverse the order. 😊
26. After cutting the overlapping walls, zoom in to the low roof that should extend into the wall we just edited. Select the Roof by Extrusion method and when prompted for a work plane choose the Pick a Plane method and select the back vertical face of the existing roof section. The top edge of the correct plane is also the one highlighted to the right.
27. Use the Pick tool to select the edge of the existing roof as shown here. Use the TAB key to cycle the available selections if the top face of the roof is highlighting. After picking the line, lock it to the existing edge.

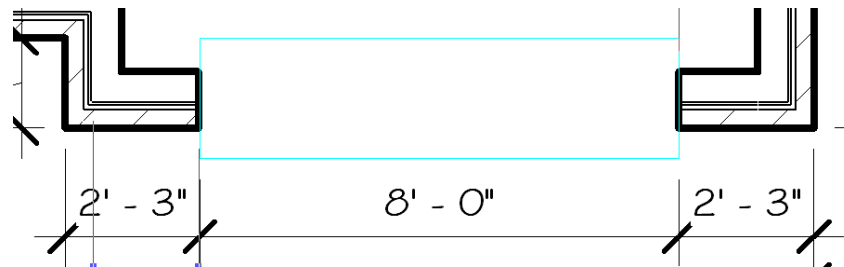


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28. In the Properties palette, set the Extrusion end value to 1' 0". Set the Rafter cut to Two Cut Plumb with a Fascia height of 6". Pick the green arrow on the Ribbon to Finish Sketch.
29. From the Modify tab on the Ribbon, pick the Join Geometry tool. Pick the extruded roof and then pick the main roof to combine the two.
30. Pan the view over a bit to the Porte Cochere walls below the dormer. These walls have not yet been attached to the roof above.
31. Switch to the Dormer Section view. Because these walls do not have an interior finish, If we simply raise the top of this wall the brick finish will appear inside the room. To get the brick to move up in the front section under the roof, but still retain an interior finish in the dormer, unlock the brick component on one side of the wall and then move it up with a 2' 6" top extension to the wall. After adding the extension, use Join geometry to clean it up.
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32. Switch to the First Floor view. Type CM to access the Component tool and from the Type Selector, choose Opening – Elliptical Arch: 36"x84". Add the opening in the wall leading into the Powder room on the first floor. Add a second opening in the wall from the Entrance hall to the Great Room. Pick this opening, and in the Element properties palette, pick Edit Type and then Duplicate. Create four new sizes for 72"x84", 96"x84", 120"x84" and 120"x120".
33. Add the 72" opening to the Great Room, the 96" opening to the Living Room, and the 120"x84" opening to the Dining Room. Use the 120"x120" opening to create the passageway arches through the Porte Cochere. For the latter, set the base elevation offset to -1'-10" to place the bottom of the opening at grade level.
34. Switch to a 3D view so you can see the large arches. Switch to an elevation view. Select one of the large openings, edit the type parameters, and change the Spring height to 3'-0" to make the arch on these openings more pronounced.

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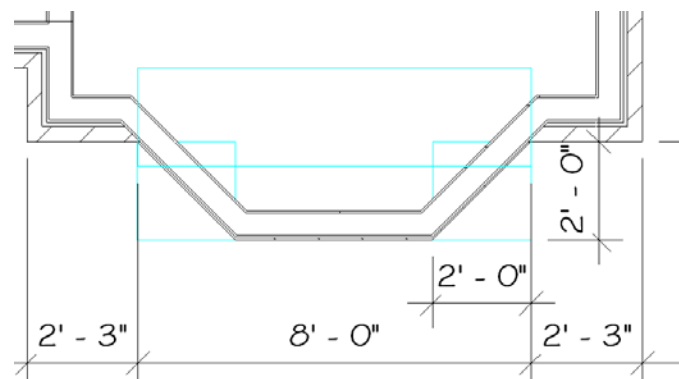
35. Go back to the First Floor view and zoom in around the living room. We are going to cut an opening in this wall to lead out to a Bay window. It will be a different type of opening in this location. We want an 8 foot wide opening in the middle of this wall, extending from the floor to the ceiling. Placing a wall opening at floor level will also cut away the section of wall extending down to the foundation level so we can add a new angled set of walls to define the Bay. This type of feature is easier to place if you draw a couple of detail lines or reference planes first and dimension them to set the locations for each end of the opening. Since we will be covering reference planes and work planes a bit later in the course, use detail lines from the Annotate tab on the ribbon to add lines which will only be visible in one view. Use the Line Style settings to create a linestyle called Blue Lines.



36. Set the color to a light blue. Later, when we are ready to plot the drawing we can modify this linestyle and change the color to white making the lines not plottable. Sketch and dimension a rectangle guideline as shown above.

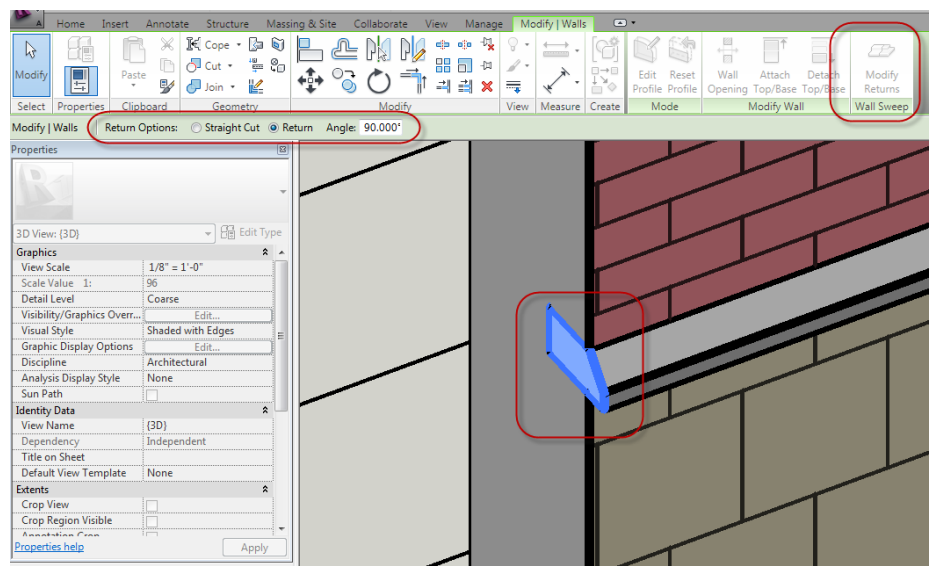
37. From the Home tab, choose Opening / Wall Opening and carefully pick the start and endpoint of the line to coincide with the rectangle guidelines. Pick Modify and then select the opening and look in the properties palette. Set the Top Offset to 0 and the Top Constraint to 1st Floor Clg. Pick Ok.

38. Draw two more rectangles as shown at right, to act as guidelines for sketching in the bay walls.



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39. Duplicate the interior partition wall and create a new type called Exterior: 7" Wood Frame. Replace the gypsum board on one side with a wood finish material. Use wood siding as a starting point but disable the surface pattern display for the horizontal siding. Add a ½" Substrate layer of wood plywood to support the exterior finish. Add the three walls, using a Base offset of -1' 2" and a top constraint of 1st Flr Clg.
40. Add a Footprint roof with a 6" overhang, using the Wood Rafter roof type. In the roof properties, set the Base level to 1st Flr Clg, the base offset to 0'-0", rafter cut to two cut plumb with a fascia depth of 6", and the slope to 12"/12". Make sure you disable the slope for the back face of the roof where it will attach to the wall. Add windows to each of the 3 bay walls. Switch to a South view and then a 3D view to admire your handiwork.
41. We will now add some sweep features. From the Insert tab on the Ribbon choose, Load from Library, Load Family. Browse to the Profiles folder. Find the Sill-Precast profile and pick Open to load it into the current project.
42. On the Home tab of the ribbon, from the Wall dropdown, choose Wall Sweep and in the properties palette pick Edit Type. Duplicate, create a new type called Sill and change the profile to Sill-Precast: 5" wide.
43. Pick ok and then float your cursor over one of the garage walls and pick to place the first sweep. Pick two more connecting wall sections and then pick Modify.
44. Select the wall sweep and on the options bar pick Modify Returns. Float your cursor over the open end of the sill at the arch opening to add the return as shown at right. (not complete yet.)



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45. Pick the sweep and open the Element properties to view the constraints, level and offsets. Change the offset to 2' and pick ok to move the sweep down on the wall. Hit delete to remove the Sweep.
46. Pick one of the main, house walls and open the type properties. Pick edit structure to access the Edit Assembly dialog. Set the preview to section and pick the Sweeps button. Pick Add and under Profile, change Default to Sill Precast 5" wide. Under distance enter 2' to set the insertion height 2 feet from the Base. Pick Ok and you should see the sill appear in the preview window. Pick Ok three times to exit and apply the sweep.
47. Zoom in on a window and you can see an overlap where the stone sill is cutting through the window frame at the bottom. Edit the wall type, set the sweep height to 1'10" and enable the Cuttable option for this profile in the Sweeps dialog. Zoom in on the base of the window to see the affect this option has had. Edit the type one more time and set the height of the sweep to 1' 9 ¼" to drop the top of the sill just below the window frame. Modify the garage wall type to include the sill sweep as well and delete the hosted sweep you added.
48. Load two new profiles from the Profiles / Roofs folder called Fascia-Built-Up and Gutter Profile –Cove. Use the CTRL key to load both profiles at one time.
49. From the Home tab's Roof dropdown, choose Fascia. In the properties palette pick Edit Type and create a new type called Fascia-Built up 1x10 w 1x6. Pick OK and zoom in on one of the existing roof edges and pick the top edge of the eaves to add the first section of Fascia.
50. Continue to orbit the view of your model picking additional segments. If you need to stop picking segments while changing your view, make sure you pick the existing fascia and choose Add / Remove segments on the Options bar to continue adding the remaining sections. You should have one continuous fascia sweep for each roof.

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51. After adding the fascia boards you can add gutter sweeps to any horizontal sections of fascia to aid in directing rainwater from the roof to a downspout location we can add later. From the Home tab's Roof dropdown, choose Gutter and open element properties. Duplicate the Bevel 5" x 5" type and create a new type called Cove 4"x4" which references the appropriate profile. Pick Ok, close the dialog and start picking the top edges of the Fascia which we added in the previous step. Do not add the gutter to the dormers but do add it to all other horizontal fascia boards.
52. Well. This has been a marathon of a lesson with lots of new features to practice. Continue to apply the techniques outlined in these notes to the remaining sections of the building. Edit the wall profiles where required to close all walls to roofs including the dormer walls. Use the Join geometry or Cut geometry tools to clean up all overlapping elements. Add the sill profile to the remaining main floor, exterior wall types. Continue to add any interior walls, openings, and doors as well as windows to the guest suite. Check building elevation views frequently while adding windows on the second floor and use alignment constraints to align the windows between the two floors.
53. Save and close your project. Always be sure to make backups of your work. At this point you have a considerable amount of effort tied up in this project and it would be tragic to lose it. We will continue in the next class by adding floors to the project and tying up any other loose ends in the building envelope.