SWITCHING FROM RHINO TO VECTORWORKS

VECTORWORKS®
ARCHITECT

TUTORIAL 1 – MODELING AN INTERIOR SPACE

INSTALL THE WORKSPACE

To complete this tutorial you will need to download three Vectorworks files located on the "Transitioning from Rhino" guides page. There is a file for the tutorial, a template file, and a custom workspace. To install the workspace 3D Modeling.vww, place it in your User Folder, in the "Workspaces" folder. If you don't know where your User Folder is located, within the Vectorworks application, go to Vectorworks > Preferences and click the "User Folders" tab. The path to your User Folder displays in the first section of the dialog box. After you place the .vww file into the Workspaces folder in your User Folder, from the Vectorworks Menu bar, select Tools > Workspaces > Workspaces, and in the list of workspaces, the 3D Modeling workspace should be visible. Click in the column to the left of the workspace to make it the active workspace (a check mark is added) and click "Done."

EXERCISE 1: STAIRS

Tools and menu commands used: Rectangle, Extrude, Polyline, Fillet, Reshape, Offset, Add Surface, Push/Pull, Add Solids, Working Plane, Extrude Along Path, Fillet Edge, Create Symbol

We are going to model a simple stair using extrudes. In Vectorworks, make sure you are in Top/Plan view. First, we are going to lay out our stair in plan. Draw a series of rectangles as shown in FIGURE 1.

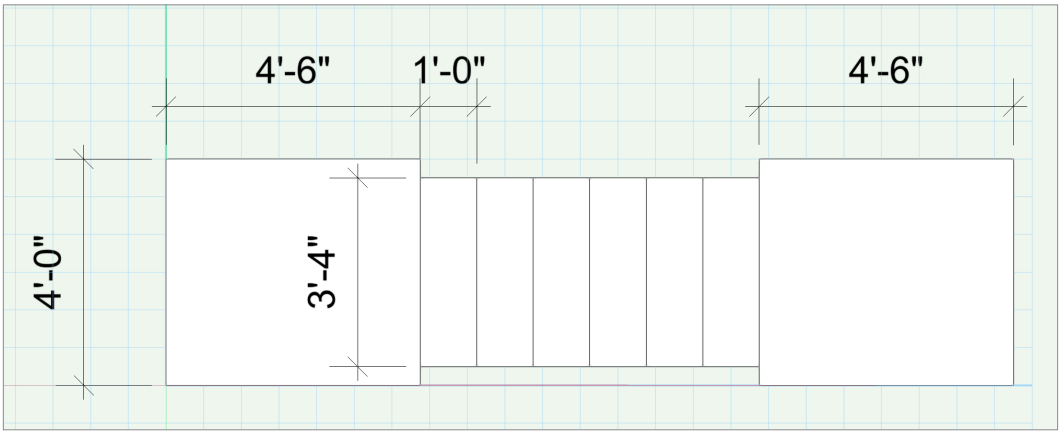


FIGURE 1

Next, select all the rectangles and from the Menu bar, select Solids > Extrude (or press Cmd/Ctrl+E; Mac/Windows respectively), then in the Extrusion field, type 3. This will extrude all of the rectangles 3 inches. (If your document units are not inches, it will extrude the objects three document units.) When extruding multiple 2D shapes with one operation, the end result is a group of extrudes. To continue, ungroup the extrudes by selecting the group and selecting Transform > Group > Ungroup or press Cmd (Mac)/Ctrl (Windows)+U. This will give you eight separate extrudes. Now, go to an isometric view by choosing a view from the Current View menu in the View bar, or you can use the numeric keypad on your keyboard to toggle views. I prefer a Left Isometric view, which is 1 on the numeric keypad. Select the far right extrude, and select Transform > Move >

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Move 3D. Since this landing of our stairs is seven steps above the other, we can enter our riser height and multiply it by seven, so in the field we can type 6 * 7 and it will give us the appropriate height. Click OK. Now that our stair landings are the appropriate distance, we can distribute the other treads. First, switch to a Front View (2 on the numeric keypad). Select all eight extrusions and select Transform > Align > Align/Distribute and choose the Distribute checkbox in the far-right column. Because all of the items are the same height, it doesn't matter which setting is highlighted below that. Make sure that both Align and Distribute in the bottom row are unchecked, and click OK. (It is important to be in Front View with this tool, because it is dependent on the angle of your screen. The Align/Distribute 3D tool in the same menu is not dependent on view, but does not have a graphic preview.) Now, your extrudes should be arranged like stair treads. Select both landings and all the treads and use the Move 3D tool to move them all up 3'9". See **FIGURE 2**.

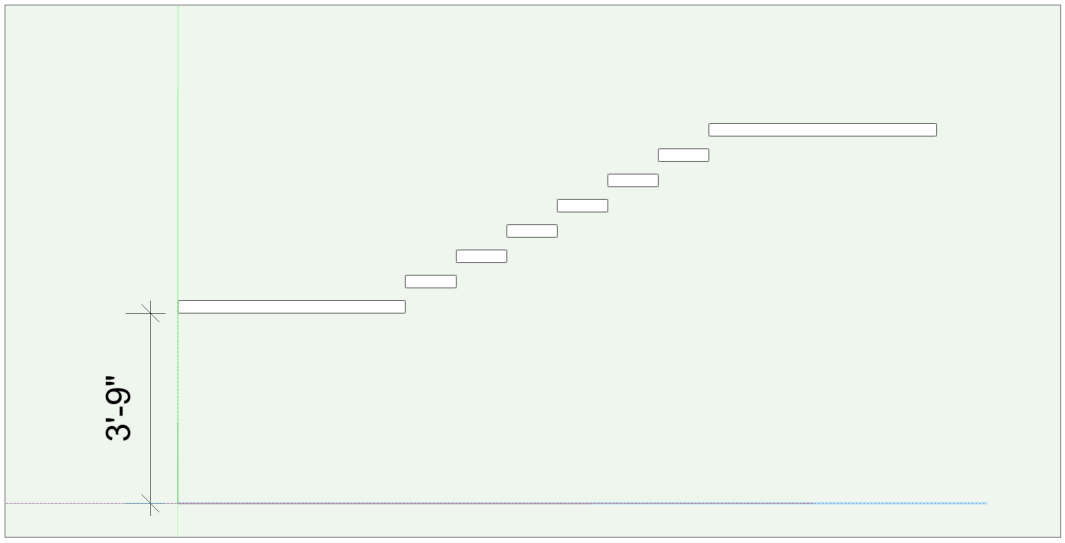


FIGURE 2

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Next, we will build a profile for the risers that come before the first landing and after the second landing. First, select the 2D Polyline tool from the Basic tool palette. When you select the tool, make sure that the Active Plane menu on the View bar is set to "Automatic." This will allow you to draw directly on the faces of 3D objects. Trace the bottom edge of the first landing by clicking on the bottom left point, the bottom right point, then up to the bottom left point of the upper landing, and double-click on the bottom right point of upper landing to end the polyline. If the class you are drawing in has a fill, it will look like the polyline automatically closed itself but it didn't. See **FIGURE 3**.

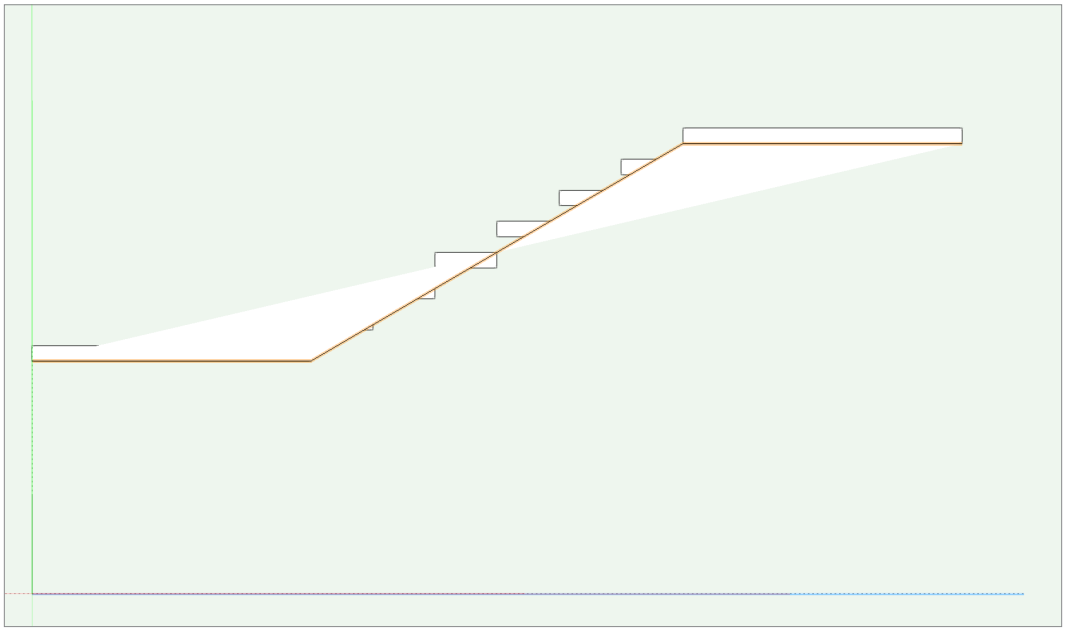


FIGURE 3

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Next, we will fillet the corners of the polyline. Select the Fillet tool from the Basic tool palette, select the third mode of the Fillet tool in the Tool bar and make the Fillet Radius 12". To fillet the polyline corners, double-click on the polyline and the fillet will be automatically applied to all corners of the polyline in one operation. (To fillet corners individually, select first the left edge, then the right edge of each corner.)

Next, we will offset the polyline. Select the Offset tool from the Basic tool palette. Click on the preferences (wrench and pencil) icon in the Tool bar to open the Offset Tool Preferences dialog box. Choose "Offset by Distance" and make the distance 3". Make sure that "Offset Original Object" is selected and also check that "Close Open Curves" is checked, then click "OK." Click anywhere above the polyline on the drawing to offset the polyline. See **FIGURE 4**.

FIGURE 4

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Now that we have our basic shape, we want to make some minor modifications to create a stair stringer. We want to use this profile as the basis for our steps, so let's first make two copies and paste them in place (Shift+Option+V). Next, to edit the shape of our profile you can simply double-click on the top copy to invoke the Reshape tool. Make sure that the second mode, Move Edges Parallel mode, is selected as well as the Rectangular Marquee mode. Select the upper interior vertices by drawing a marquee around them. Click and hold, dragging your mouse to the left. While still holding, press Tab to access the floating Data bar, and press Tab again to access the length field of the floating Data bar. Type 12, and press Tab again. Release the mouse button, and click once more. All of the selected points will have been moved to the left 12 inches. Repeat the operation by selecting the lower interior points and moving them 3 inches to the left, see FIGURE 5.

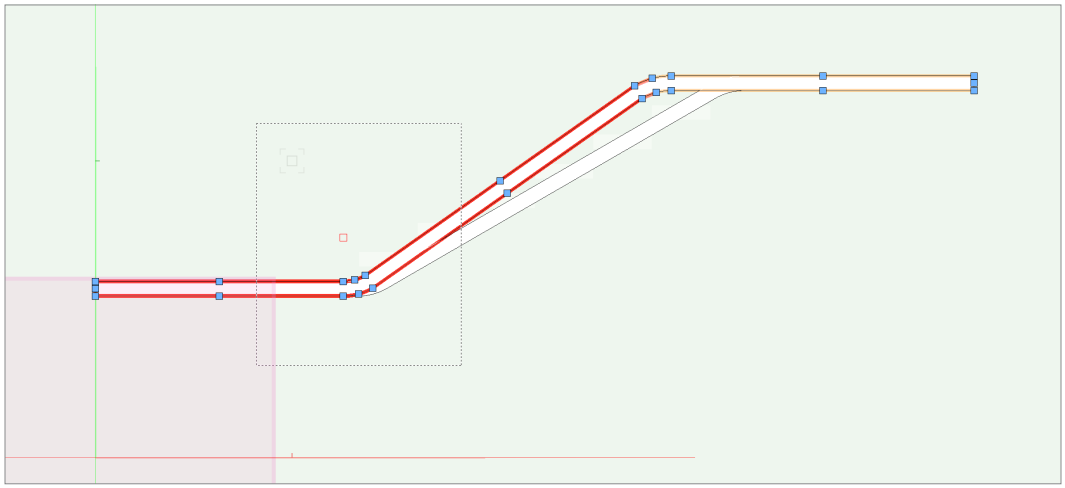


FIGURE 5

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Type X to exit the Reshape tool, and select **one** of the original stair stringer shapes, as well as the shape that you just edited. From the Transform menu, select Add Surface. This will create a single polyline from the two polylines.

Return to an isometric view, and select the Push/Pull tool from the Basic tool palette. Mouse over the polyline until it highlights red, then click. Extrude the polyline horizontally toward the interior of the stair — invoke the floating Data bar by pressing Tab and enter 4 into the Distance field. SEE FIGURE 6.

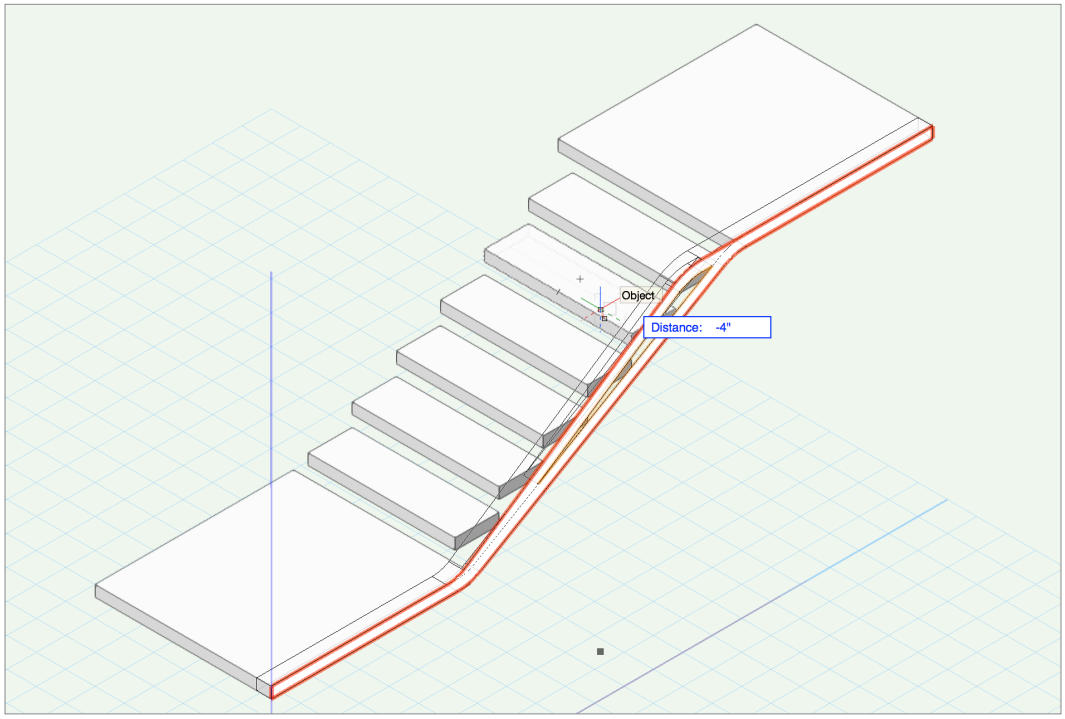


FIGURE 6

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Press the X key to exit the Push/Pull tool. Now you have a single 3D object that is the stair stringer. Go to a top view and use the Mirror tool in Duplicate mode to copy the stringer to the other side of the stairs. The stairs with their rails should still be 4'6" wide. We can combine the upper and lower landing with the stair rails by selecting all four objects and selecting Solids > Add Solids. Now the object is a solid addition, and if you double-click it, you can still edit the individual objects.

Take the one polyline that we haven't edited and use that to make an upper and lower stair. To do this, we can move the interior vertices to the left 12 inches using the Reshape tool, and move all of the vertices associated with the top horizontal up 6" and do the same to move the bottom horizontal down 6". See FIGURE 7.

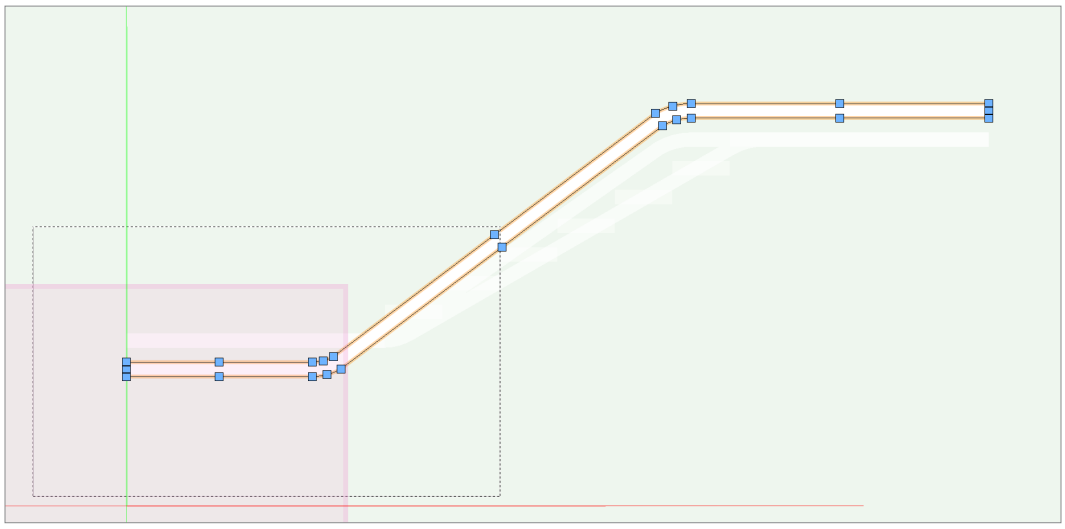


FIGURE 7

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Return to an isometric view, and select the Push/Pull tool to extrude the polyline away from the stair 12 inches. Now you have an object that is a connected lower and an upper tread. See FIGURE 8.

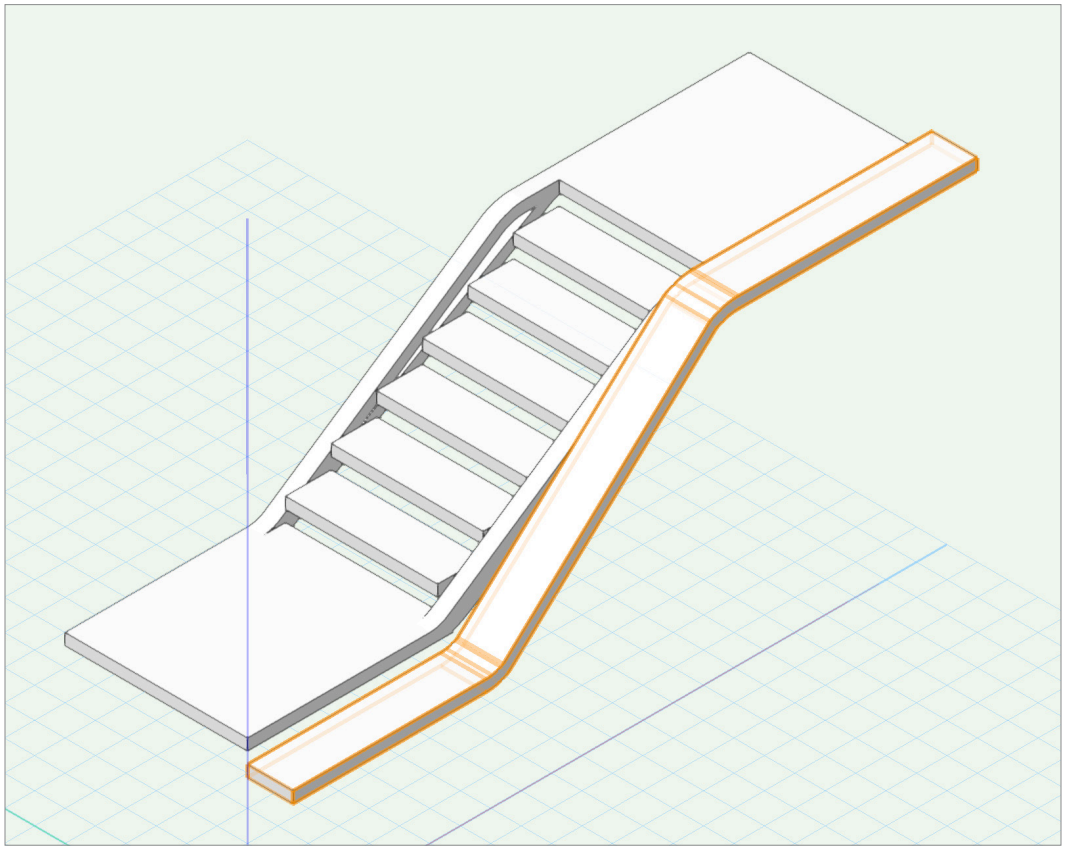


FIGURE 8

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Click and drag the object from the bottom left corner while pressing and holding the Option (Mac) or Control (Windows) key to copy the object. Snap to the bottom right corner of the original object and place the copy. To edit the profile of this new object, simply double-click on the object. A yellow editing box displays around your drawing window, indicating that you are inside a container. You can edit this polyline the same way that you edited the last one. Switch to a Front View, and double-click on the polyline to invoke the Reshape tool. Marquee-select the interior vertices and move them right 6", next select the upper vertices and move them up 6", and last select the lower vertices and move them down 6". Click the yellow "Exit Extrude" button at the top right corner of the screen. You have created a second set of risers. Repeat these steps twice more to create more risers. SEE FIGURE 9.

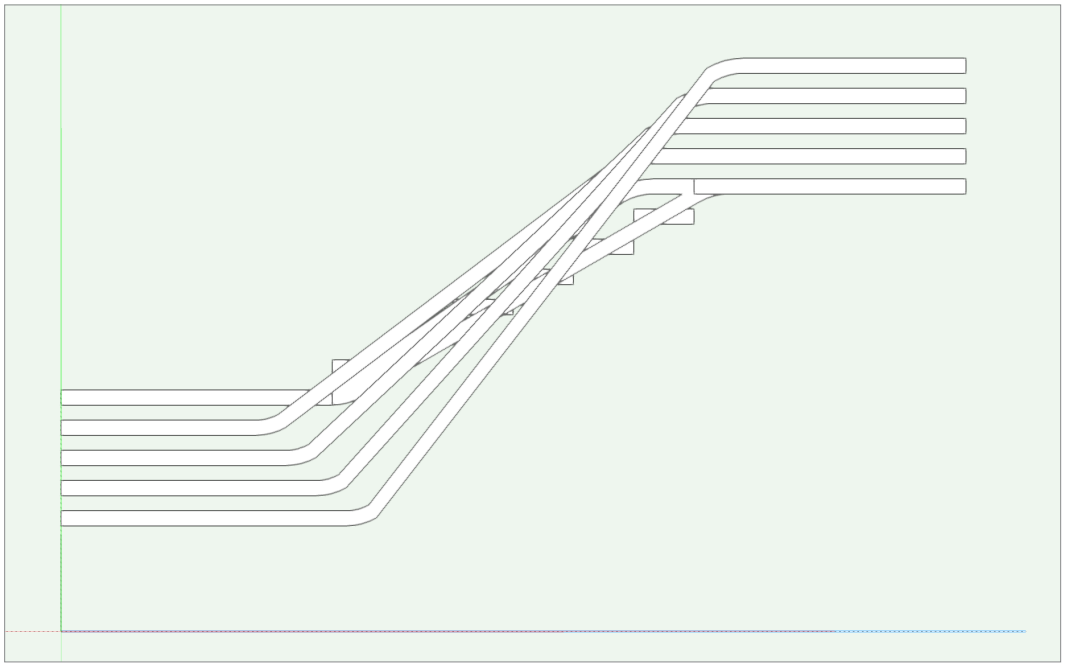


FIGURE 9

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

We still have room for three more treads at the bottom of the stairs. We will model those using the Extrude Along Path command.

Select the Working Plane tool and select Planar Face mode. hover the cursor over the lowest tred, make sure that the front face of the tread is highlighted blue, then click the lower-left side corner of the tread to set the working plane. Select the Polyline tool and draw a polyline that looks like this (FIGURE 10):

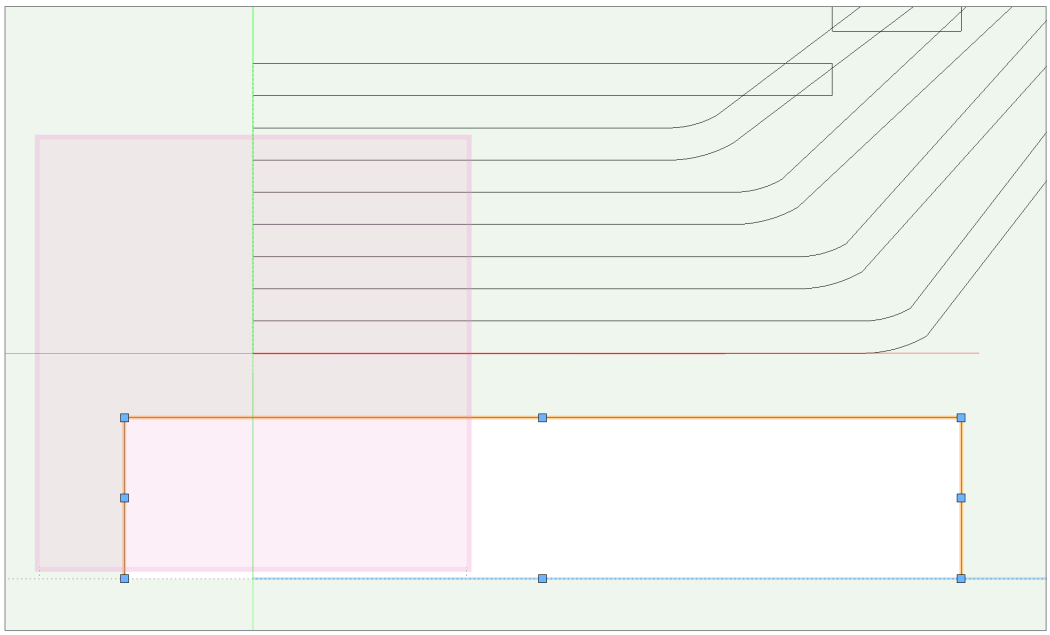
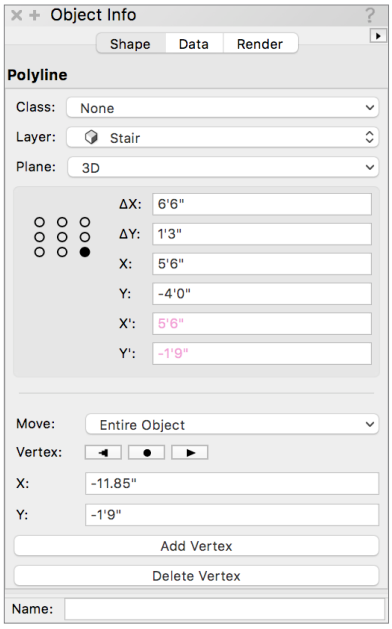


FIGURE 10

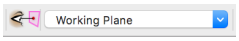
TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Place the polyline at the coordinates shown in the OIP in FIGURE 11.



The grid of nine circles to the left shows the different anchor points on the object's bounding box, and the black circle marks the point on the bounding box that the coordinates are referencing. The X and Y fields are the object's distance from the document's origin and the X' and Y' fields are its distance from the working plane's origin.

FIGURE 11

Switch to a Left Isometric view and make sure that the Working Plane tool is **not** selected. The Active View menu in the View bar should say "Working Plane." 

Switch this to "Layer Plane" in order to remove all working plane settings. Draw a rectangle from the bottom left corner of the polyline that will serve as the tread profile (FIGURE 12):

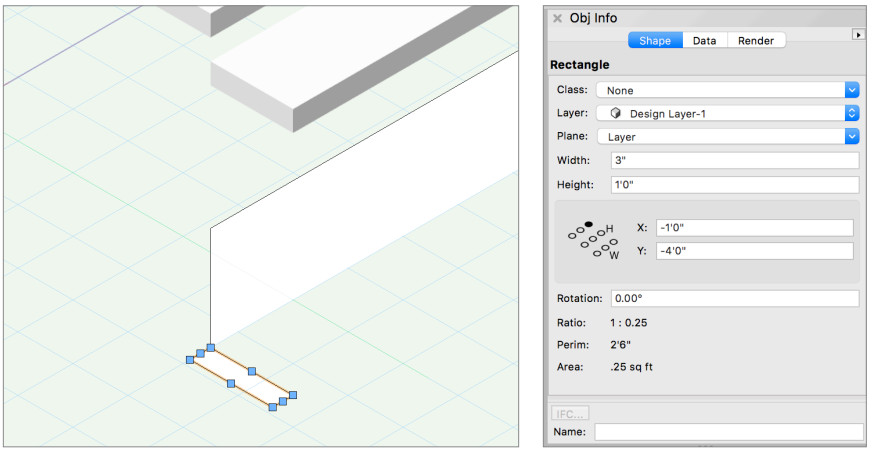
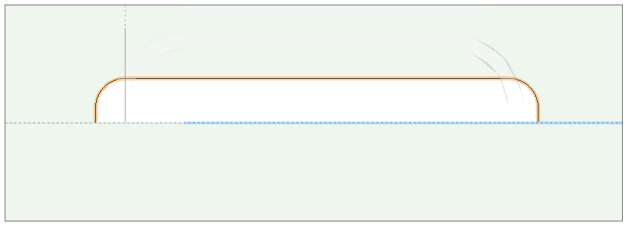


FIGURE 12

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Select both the rectangle and the polyline, and select Transform> Extrude Along Path. When the dialog box opens, check to see that the polyline is highlighted red (this is your path object). If it isn't, click "Next" or "Previous," whichever is clickable. These buttons allow you to cycle through the selected objects. Once the polyline is highlighted red, select "Fix Profile." This will ensure that the profile's position remains relative to the path. If not selected, the profile will be normal and centered on the path. Click "OK" to finish using the Extrude Along Path command. To change our path by adding a fillet, simply double-click on the Extrude Along Path (EAP) object. A dialog box will open, asking which aspect of the EAP to edit, choose "Path" and click "OK." Now add fillets with 12" radii to the two corners of the polyline. Click the yellow "Exit Path" button at the top-right corner of the screen to finish.

Create a copy of this EAP object by option-dragging it directly in front of the original. Double-click on the new EAP object and choose to edit its path. Delete the old path and draw a new polyline with corners filleted at a radius of 6" and to the specifications shown in FIGURE 13.



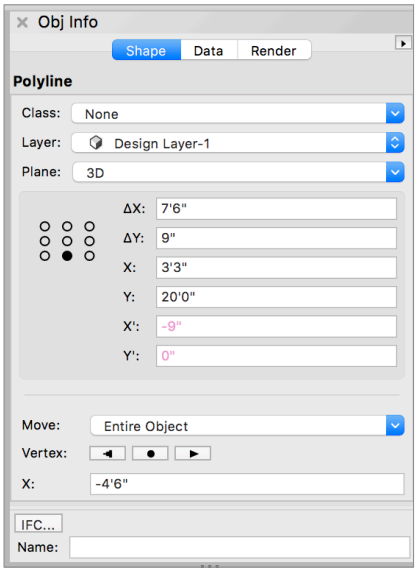


FIGURE 13

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Now exit out of the path. Although the path was made wider, the EAP object was not, because the profile is still in the same location relative to the old path. Double-click on the object again and this time choose to edit the profile. Move the profile to the left 6" and exit the profile.

Repeat these procedures to create a third step that has a path that is 8'6" wide and 3" high, but do **not** fillet the path this time. Also, try moving the profile 6" to the left **before** creating a new path. Now you should have an EAP that looks like FIGURE 14.

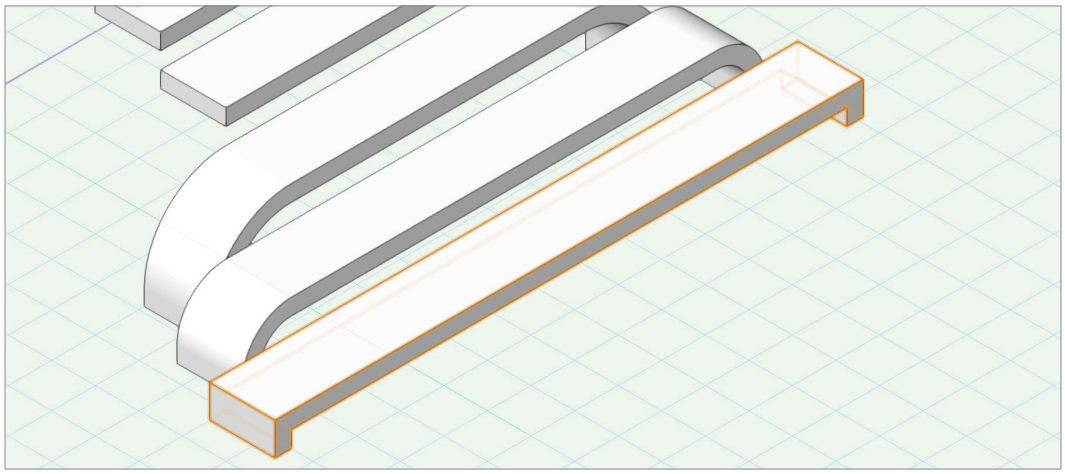


FIGURE 14

Fillet these corners with the Fillet Edge tool  , located in the Basic tool palette. Click the tool, and change the value in the "Constant Radius" box to 1 inch and click one of the interior corners of the shape. The edge will highlight in red. Press and hold the Shift key, click the other interior corner and then click the green check mark at the right side of the Tool bar. The object has now changed to a solid fillet object from an Extrude Along Path object. It's fillet as well as its dimensions are editable in the OIP. With the Fillet tool still selected, change the "Constant Radius" to 3 inches, select the two exterior corners of the object, and click the green check mark. To undo the fillets, you can simply undo, but if you come back to the object later, you can still revert the object to an EAP by ungrouping the object.

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Now that we have this staircase, we need to put it somewhere. First, we can save it as a symbol to easily place it in another part of the drawing or in another file. To do this, select all of the components of the stair and select Transform > Create Symbol and use the settings pictured in FIGURE 15.

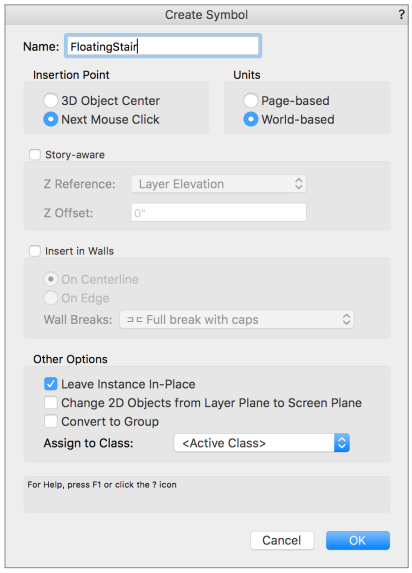


FIGURE 15

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

After you click "OK," move the cursor to the top-left corner of the lower landing, until a datum appears. Move the mouse down until it snaps to "Z/ Working Plane" and click to set the insertion point. See **FIGURE 16**.

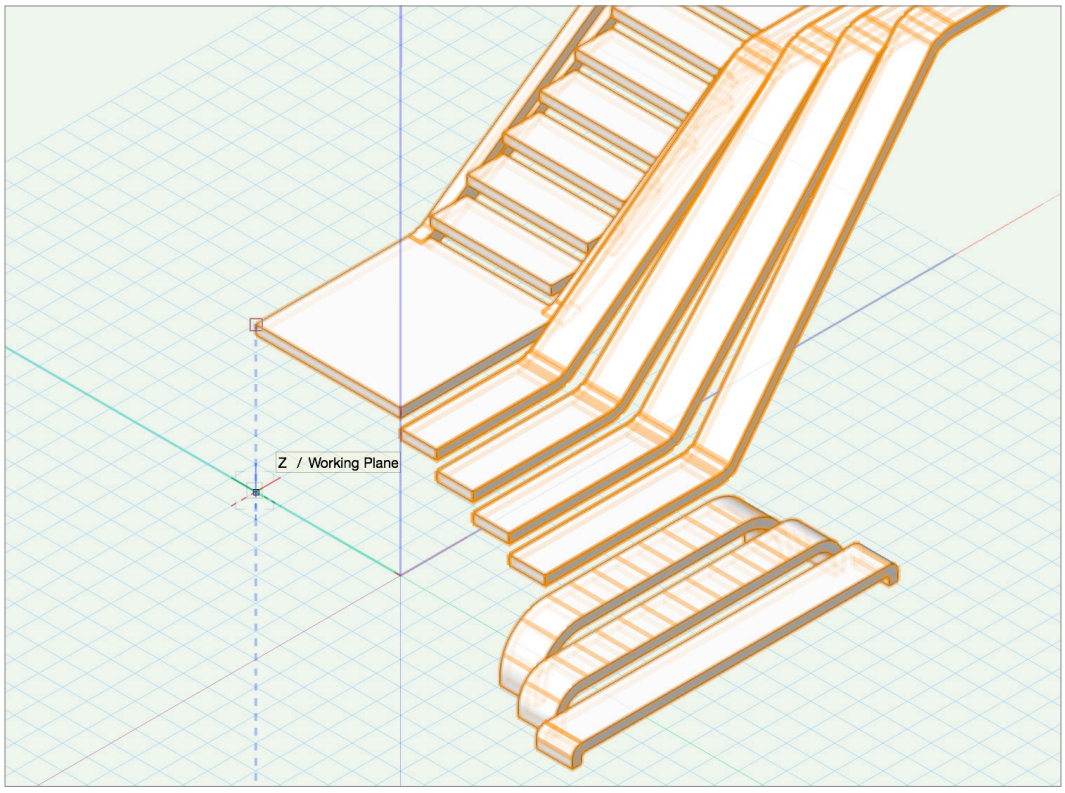


FIGURE 16

From the Resource Manager, you will see the FloatingStair symbol in the active file's folder. If there is no palette on your screen, you can open it by selecting Windows > Palettes > Resource Manager and make sure "Resource Manager" is checked.

Now that your stair is a symbol, you can move on to Exercise 2.

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

EXERCISE 2: NURBS TABLE

Tools and menu commands used: Create Interpolated Surface, Contour, Offset, Loft Surface, Oval

In this exercise, we are going to model a table using NURBS surfaces and curves. Our final result should look like FIGURE 17.

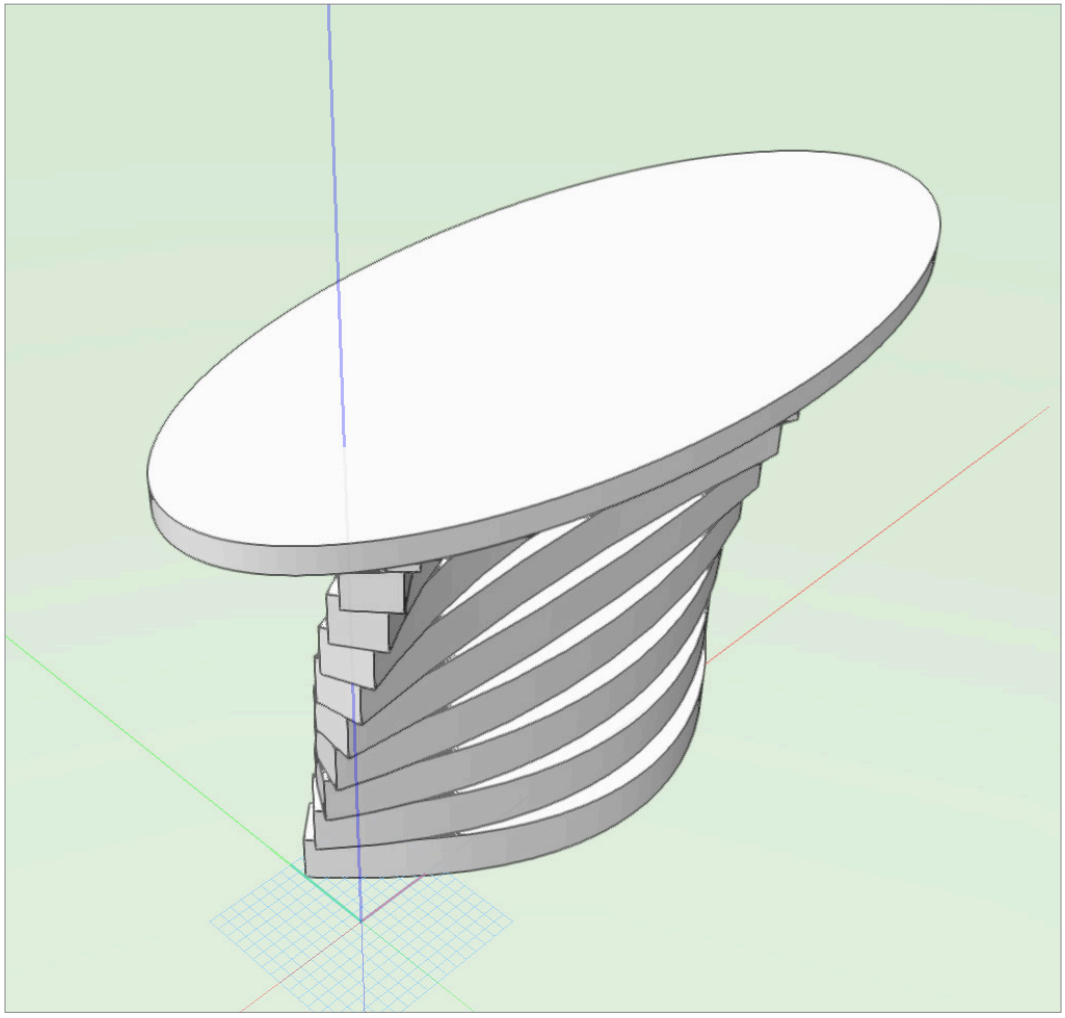


FIGURE 17

First, we need a surface. In a front view of an empty file, select NURBS > Create Interpolated Surface and draw the bottom edge and right edge of a square that is 18 inches by 18 inches. The dialog box that opens asks you to define the number of points and degree of the surface in both the U and V directions. Make the number of points equal to 3 for both directions and the degree equal to 2 for both directions. See FIGURE 18.

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

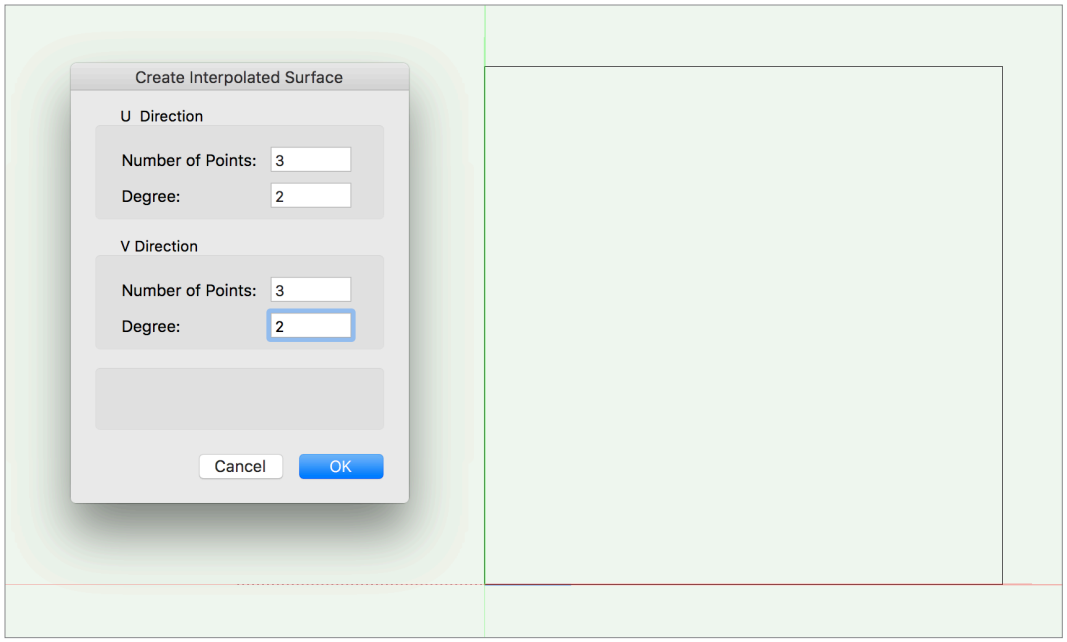


FIGURE 18

This will give you an interpolated surface with nine control points. Double-click on the surface and adjust the individual points so your surface looks something like FIGURE 19.

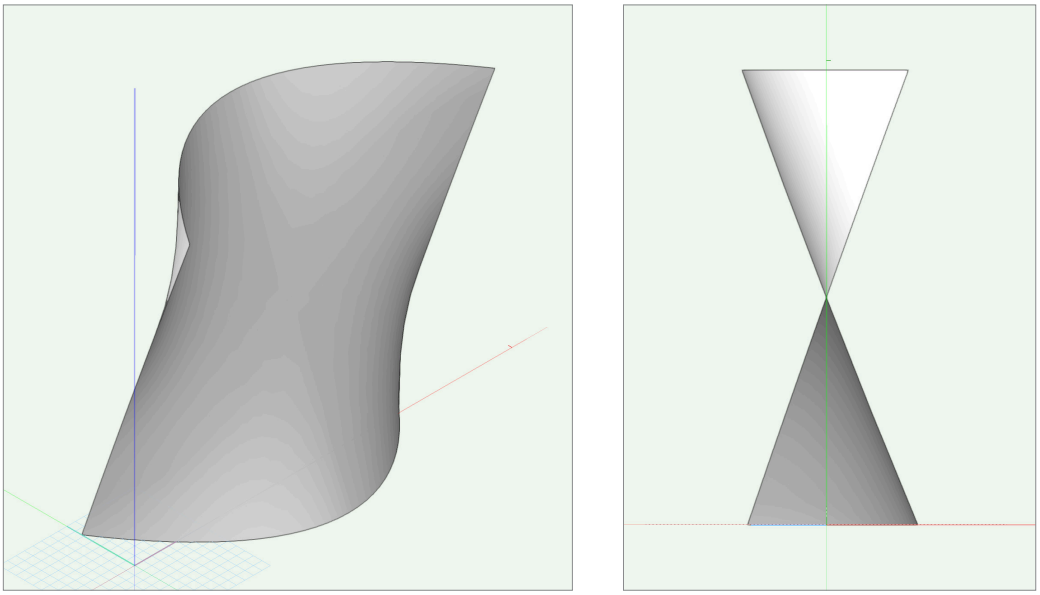


FIGURE 19

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Return to a front view. Choose the Contour tool from the Basic tool palette, and click the preferences (wrench and pencil) icon in the Tool bar. Change the increment value to 2 inches and click OK. Draw a line along the bottom of the surface to define the axis of the contour lines. There should now be a group of curves that go across the surface at 2" intervals. See FIGURE 20.

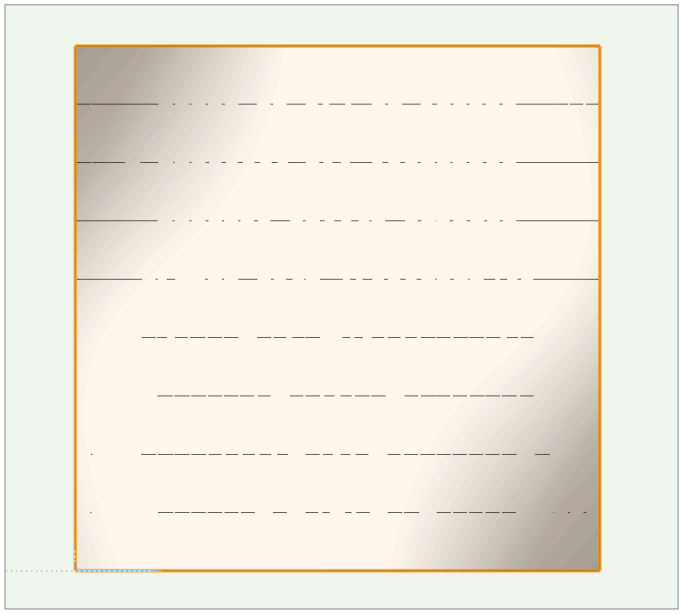


FIGURE 20

Double-click on the group to edit the curves. Next, we will offset the curves. From a top view, select all of the curves that are bowing up, then select the Offset tool. Set the offset value to 2" and click above the lines. (Ensure that "Close Open Curves" is still selected in the Offset tool's settings.) See FIGURE 21.

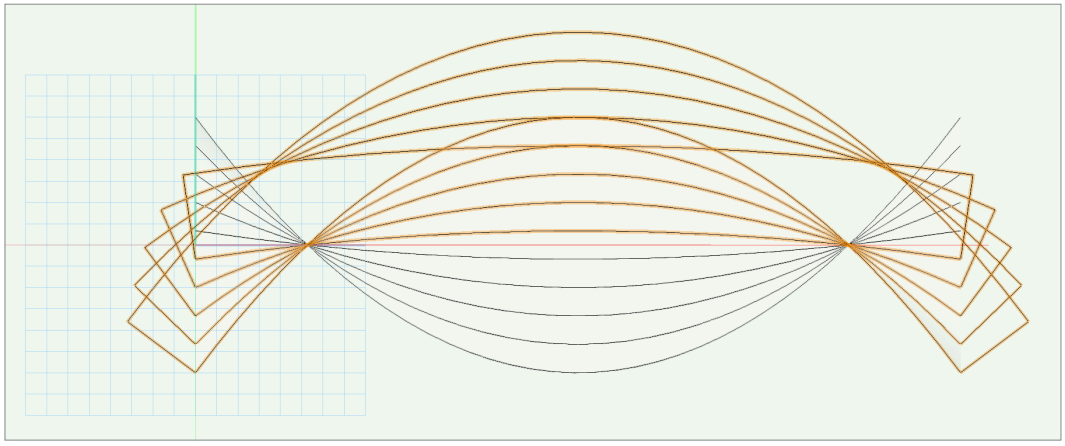


FIGURE 21

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Select the rest of the curves and offset the same amount and in the same direction. To select objects while the Offset tool is activated, press and hold the Command (Mac) / Control (Windows) key when selecting.

Switch to a front view, select all of the curves and while holding the Option key, drag the curves up two inches to duplicate them. Now you have a second set of curves — you can differentiate them from the originals by changing the pen color in the Attributes palette. Switch to a left isometric view, your curves should look similar to **FIGURE 22**.

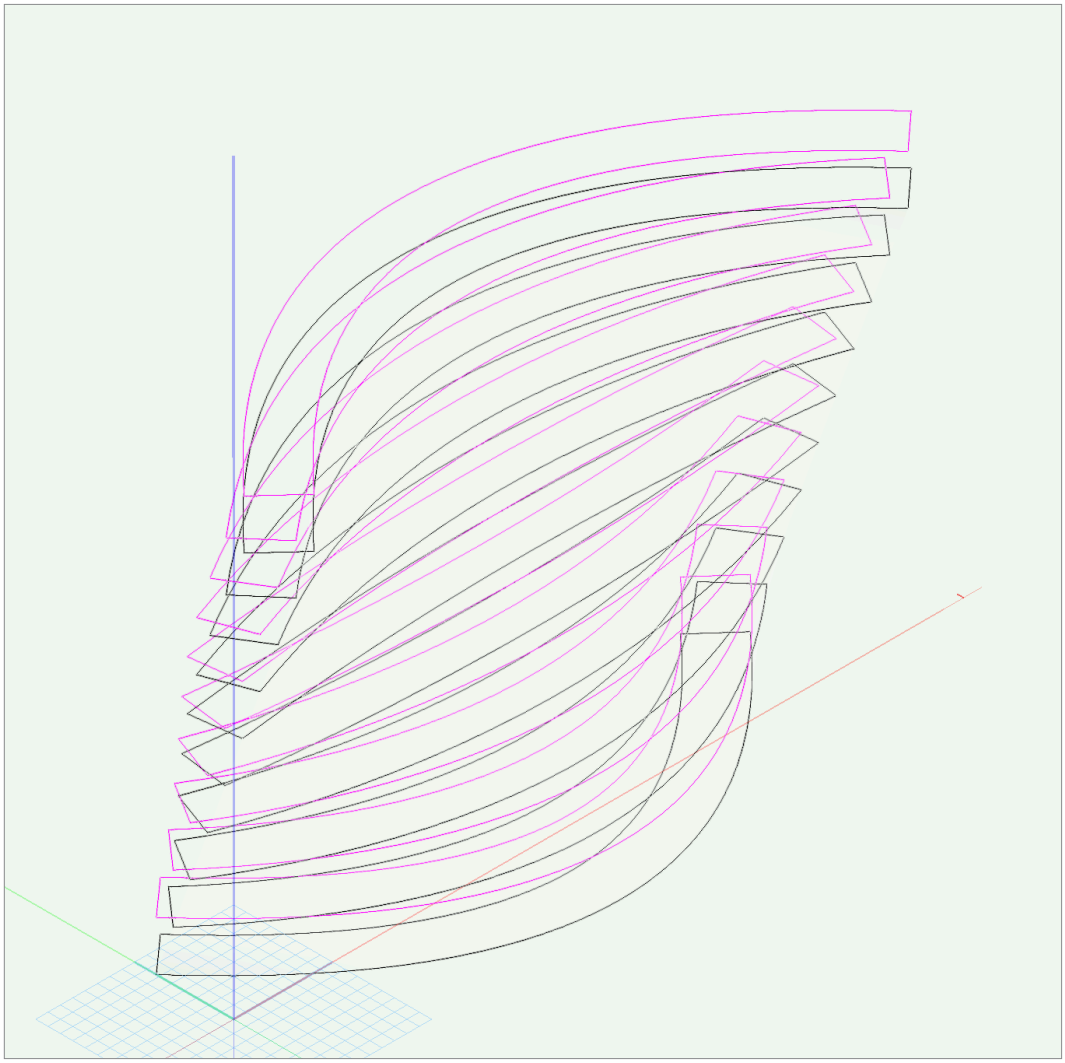


FIGURE 22

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Now you can loft each pair of curves together. Select the Loft Surface tool in the Basic tool palette and make sure that the first mode — No Rail mode — is selected. Click on the bottom curve and then click the copy of that curve near the same position that you clicked on the first, and either click on the green check mark in the Tool bar or press Return/Enter. There should be a thin red line connecting the two curves — this line represents how the points of each corresponding curve will align in the loft. If the line is not perfectly vertical, click either the Previous or Next buttons in the Loft Creation dialog box until it is. See FIGURE 23. Select Create Solid, and click OK.

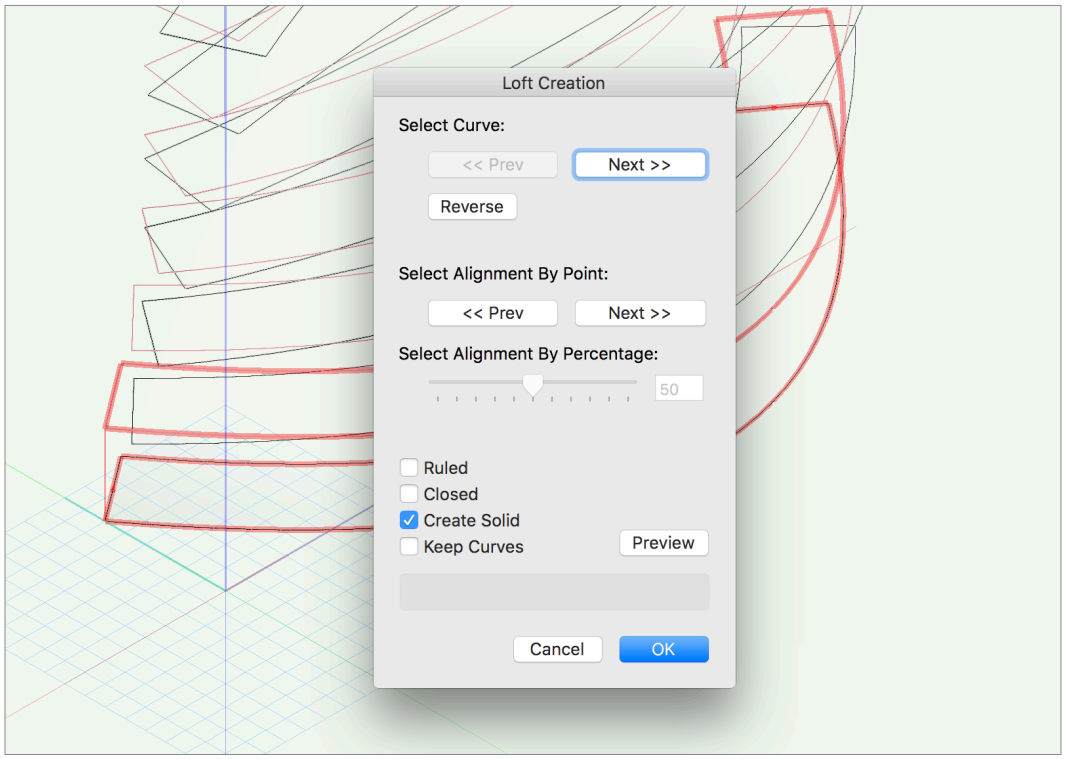


FIGURE 23

Your loft has been converted to a generic solid. Repeat these steps for each pair of curves. All of these steps should have taken place inside the group — now click the Exit Group button in the top-right corner of the drawing window. Instead of having a group of curves, you now have a group of generic solids.

Place a working plane at the top of the stack of generic solids and then select the Oval tool from the Basic tool palette. Select the third mode – Center mode – in the Tool bar, and using smart points, find the center of the stack. Draw an oval that has a long radius of 18 inches and a short radius of about 8 inches, or at least long enough to cover the stack of solids. See FIGURE 24.

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

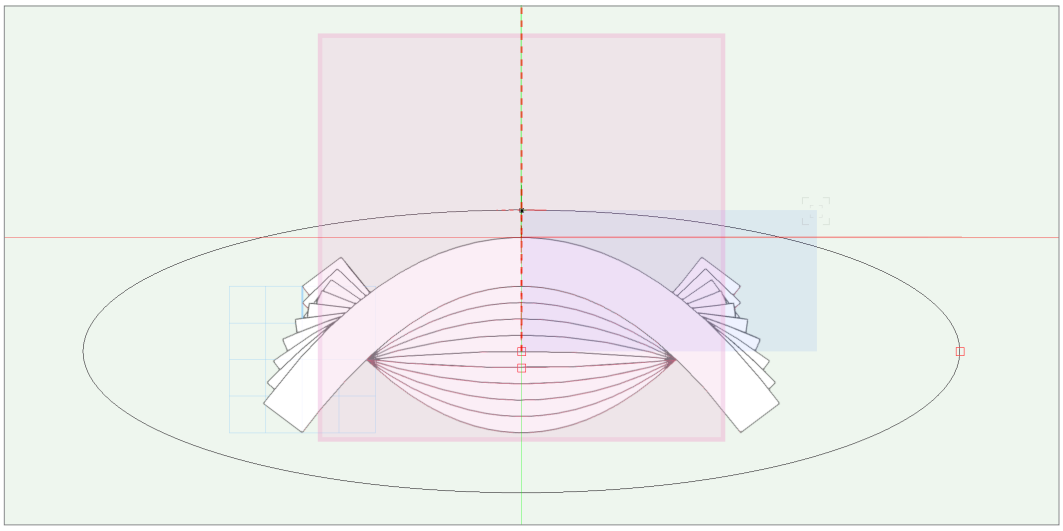


FIGURE 24

Then using automatic Push/Pull, extrude the oval by 1 inch. Select the group of generic solids and the extrude and create a symbol. Now you have a table that can be placed in another file.

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

EXERCISE 3: ARCHITECTURAL OBJECTS
Tools and menu commands used: Create Objects from Shapes, Edit Curtain Wall, Wall Join, Slab, Clip Surface

To begin, open the file InteriorLayout.vwx as well as the file with the FloatingStair symbol. To learn more about how to set up a model file, go to the Model Setup Tutorial on the Vectorworks BIM page. In the file, there is a polygon representing the interior footprint of a room. We can use this to quickly make walls. Right-click on the polygon, and select the Create Objects from Shapes command, or from the Menu bar, select AEC > Create Objects from Shapes. See FIGURE 25.

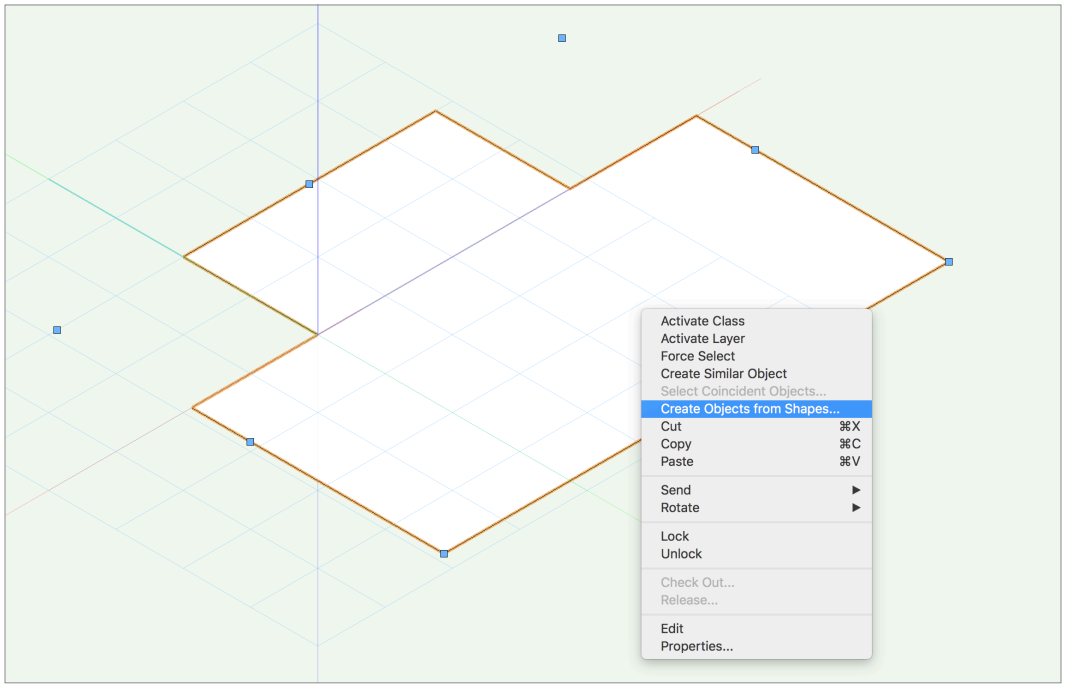


FIGURE 25

Click the Object Type dropdown menu to see the myriad of intelligent objects that can be created from 2D objects. For this exercise, choose Walls at the bottom of the menu. From the Offset menu which becomes available, select Left. Walls are drawn clockwise when generated automatically, and since our polygon is our interior footprint, we want the walls to be to the left of the polygon. Make sure that Delete Source Shapes is left unselected, and click "OK." Now you have simple walls that are the height of the layer they are on. If you want your walls to be a different height, a different thickness, or to have components, you can change the settings of the walls without ever having to draw new objects. Once you have the walls set as you like, you can save that wall as a style and apply that style to other walls in this document or another.

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

From the original polygon, we could also create a slab using the same command, Create Objects from Shapes, but now that we have walls, there is a much simpler way. Make sure that 1-Slab is your active layer by clicking to the left of the 1-Slab layer under the Layer tab of the Navigation palette. Select the Slab tool from the Building Shell tool set, and select Inner Boundary mode (the one that looks like a paint bucket). Click anywhere inside the walls of your room to create a slab that is associated to the walls.

By changing the settings in the OIP, we can make our walls and slabs different styles. We can also change some of our walls into curtain walls. Let's make the back wall of the bump out a curtain wall. To do this, select it and in the OIP, change the Type from Standard Wall to Curtain Wall. A curtain wall style has already been provided in the document. To apply this curtain wall style, click the Style menu in the OIP and select Replace. In the Wall Replacement dialog box, match your settings to those shown in FIGURE 26.

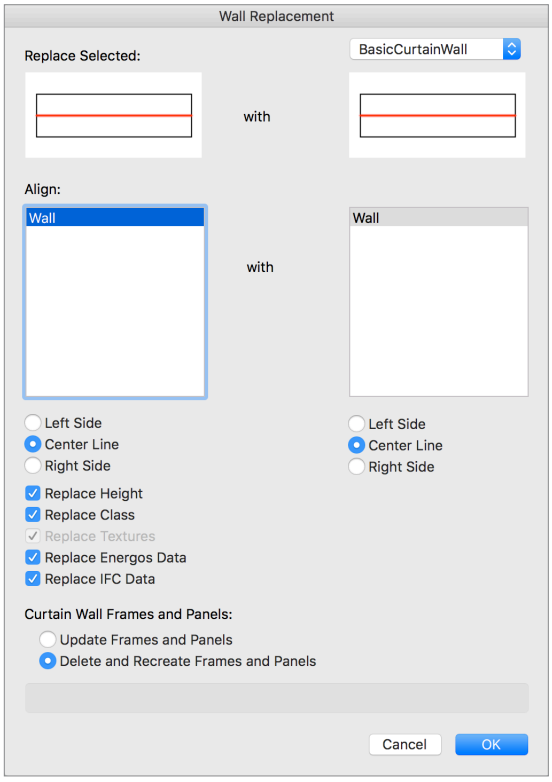


FIGURE 26

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

This wall style provides basic settings for the curtain wall, but to modify the frames or panels, double-click on the curtain wall, and in the dialog box that opens, choose Edit Curtain Wall and click "OK." You can also get the same result by clicking the Edit Curtain Wall tool in the Building Shell tool set. Once you have invoked the tool, you can move, add, or delete frames and panels. Delete every other horizontal frame in alternating rows to get the result shown in FIGURE 27.

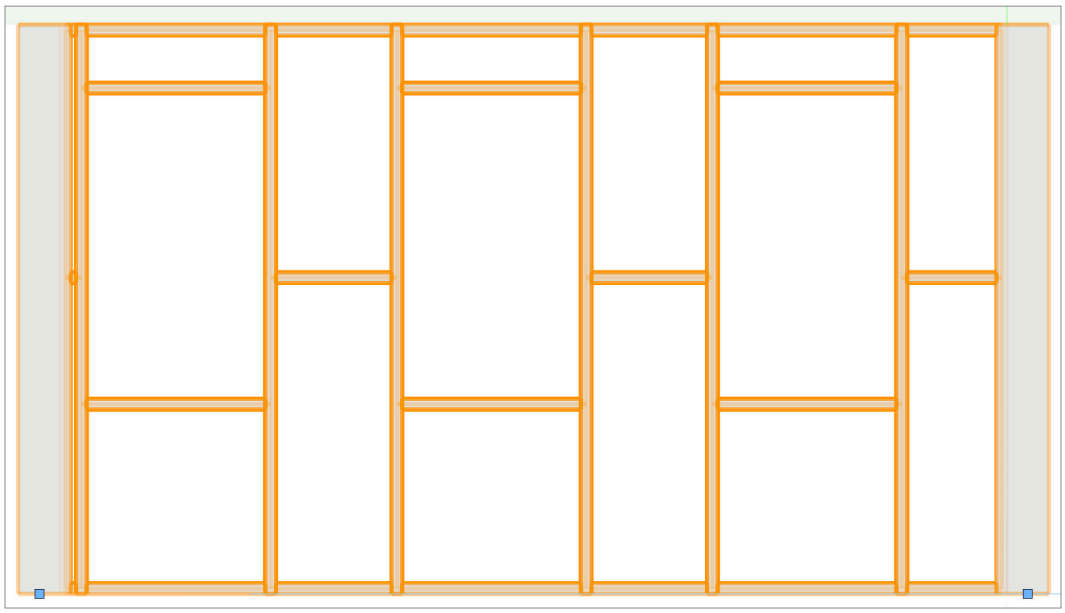


FIGURE 27

If you want to edit this wall's wall style again for any reason, just select "Update Frames and Panels" instead of "Delete and Recreate Frames and Panels" in the Wall Replacement dialog box (FIGURE 28). This will ensure that you do not lose your previous edits.

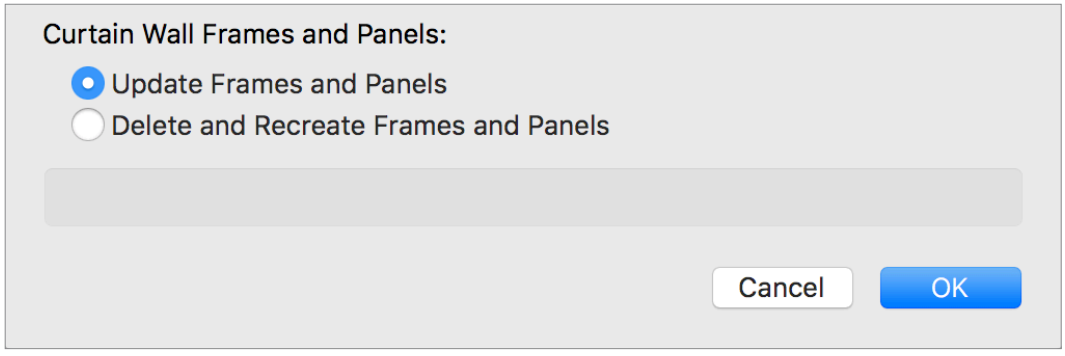


FIGURE 28

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Now that we have a room, we can place our stair symbol in the room. To do this, access the Resource Manager and click on the FloatingStair.vwx file in the left (file browser) pane of the Resource Manager. The resources available in that file will now be visible in the center pane. Right-click the floating stair symbol and select "Import." Now click the InteriorLayout.vwx file in the left (file browser) pane — the stair should now be visible in the center pane along with the curtain wall style.

To place the stair in your document, first select the Layer 1-floor to be the active layer, then simply double-click the stair in the Resource Manager to place it in the drawing. To place it in the correct spot, snap to the top-left interior corner of the bump out in the floor plan. See **FIGURE 29**.

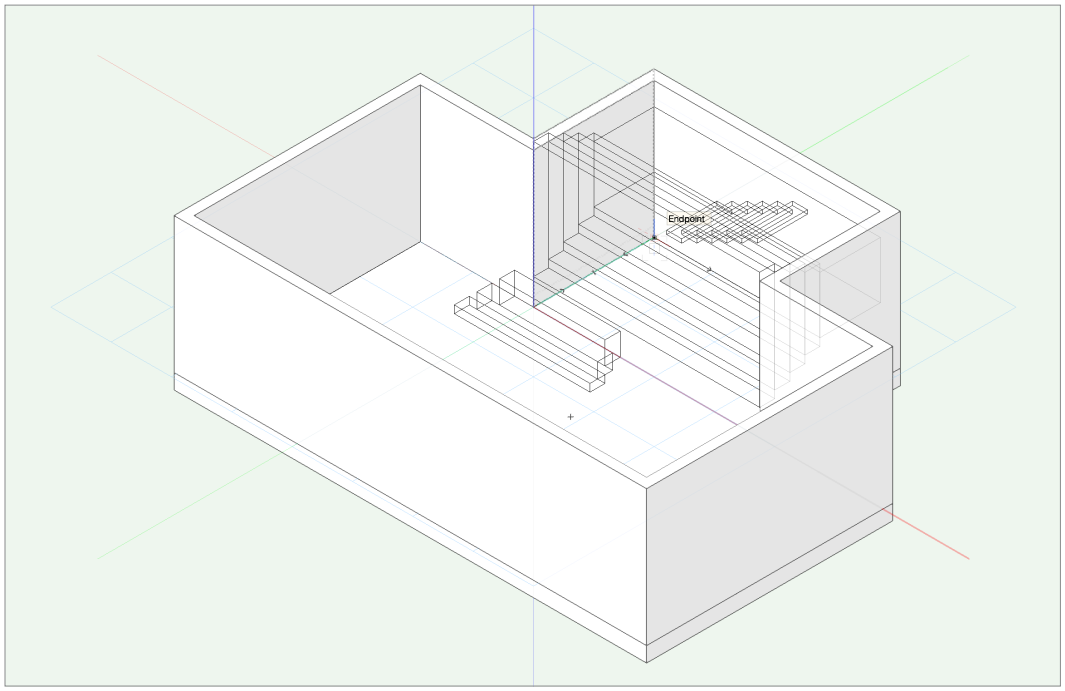


FIGURE 29

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Now that we have stairs, we need a second floor. We can copy/paste in place our walls from the 1-Floor layer to the 2-Floor layer and use the Inner Boundary (paint bucket) mode of the Slab tool to place a new slab on the 2-Slab layer. However, we need to cut a hole in the slab for our stairs. To do this, draw a polygon directly on top of the slab to the full size of the bump out (SEE FIGURE 30).

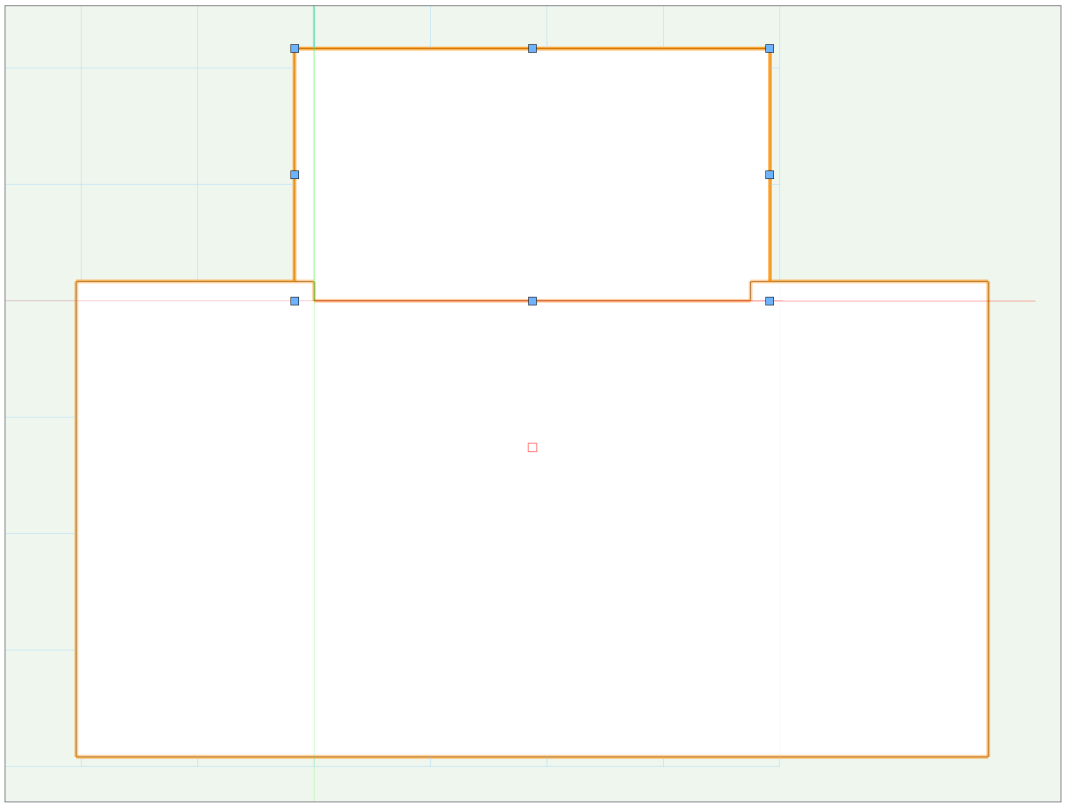


FIGURE 30

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Select the polygon and the slab and right-click and select "Clip Surface." The polygon automatically cuts a hole in the slab and is available for editing by double-clicking the slab and selecting "Edit Modifiers." This Clip Surface command is typically used for 2D objects, but it is important to remember that although the slab looks like a modeled 3D object, it is actually an intelligent object based on a polygon, so it should be edited like a polygon.

As you can see, there is a gap between the first and second floor walls around the staircase, because there is no slab there. You can change the height of the three first floor walls by adding 12 to the offset height. You might also want to change the joins of those three walls on each floor to capped joins to make them look more realistic (see FIGURE 31) To do this, select the Wall Join tool in the Building Shell tool set and select both the L-Join mode and Capped Join modes.  To rejoin the walls in this mode, in Top or Top/Plan view, click first one wall and then the other, making sure that the first wall is the one you want to die into the second.

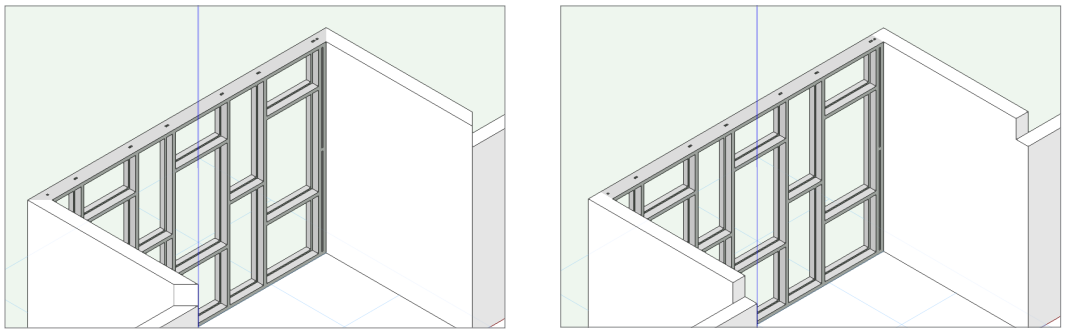


FIGURE 31

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

EXERCISE 4: SURFACE ARRAY AND SUBDIVISION

Tools and menu commands used: Extract, Push/Pull, Create Surface Array, Create Subdivision Primitive, Edit Subdivision, Create Symbol

For the next exercise, we are going to make wall and ceiling features using surface array and subdivision. First, we will create a feature wall using the Create Surface Array command accessed from NURBS > Create Surface Array. To use this command, we will need a solid object that can be arrayed and a NURBS surface. In the InteriorLayout.vwx file, ensure that the model is in a Left Isometric view, the layers 1-Ceiling, 1-Floor, and 1-Slab are visible, and the rest are invisible. Also ensure that 1-Floor is the active layer (FIGURE 32).

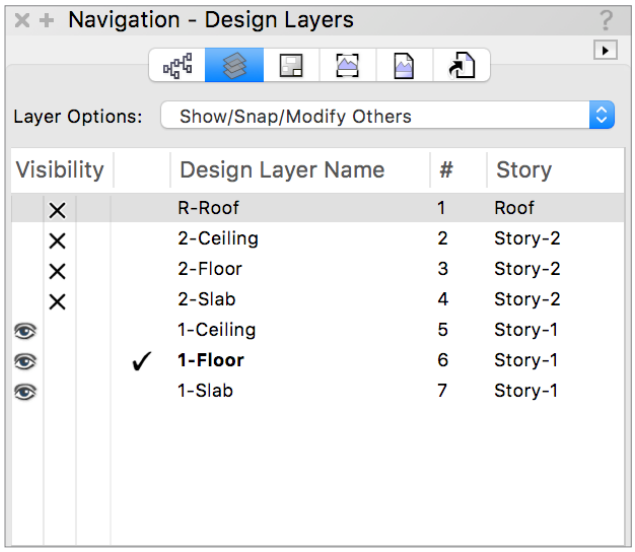


FIGURE 32

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

To create a surface, we can use the Extract tool in the Basic tool palette. Select the fourth mode, Extract Surface mode, and click on the right wall adjacent to the stairwell (FIGURE 33).

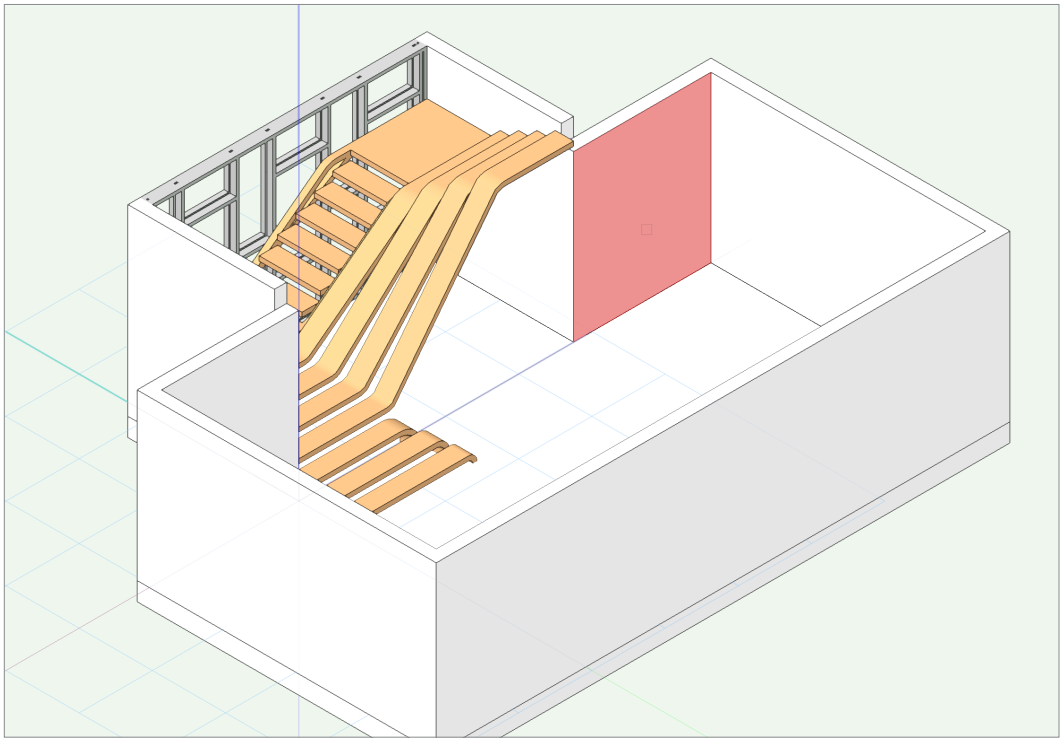


FIGURE 33

After clicking on the wall, either click the green check mark at the left of the Tool bar or press Return/Enter. Now we have a NURBS surface flush with the wall. In order to use the Create Surface Array command, we need a solid object to array.

To create this object, we can start drawing anywhere on the drawing. To start, draw a square 3 feet by 3 feet and using automatic Push/Pull mode, extrude it 3 inches. Continue by drawing a smaller square on top of the extrude, but this time, press and hold the Option key as you invoke the automatic Push/Pull mode. Now, when you extrude either up or down, the created extrude will automatically merge with the original extrude. Do this several times to create a random series of extrudes on top of the original extrude (FIGURE 34). Quick tip: to disable snapping when extruding, press and hold the tilde (~) key **first**, then hold the Option key.

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

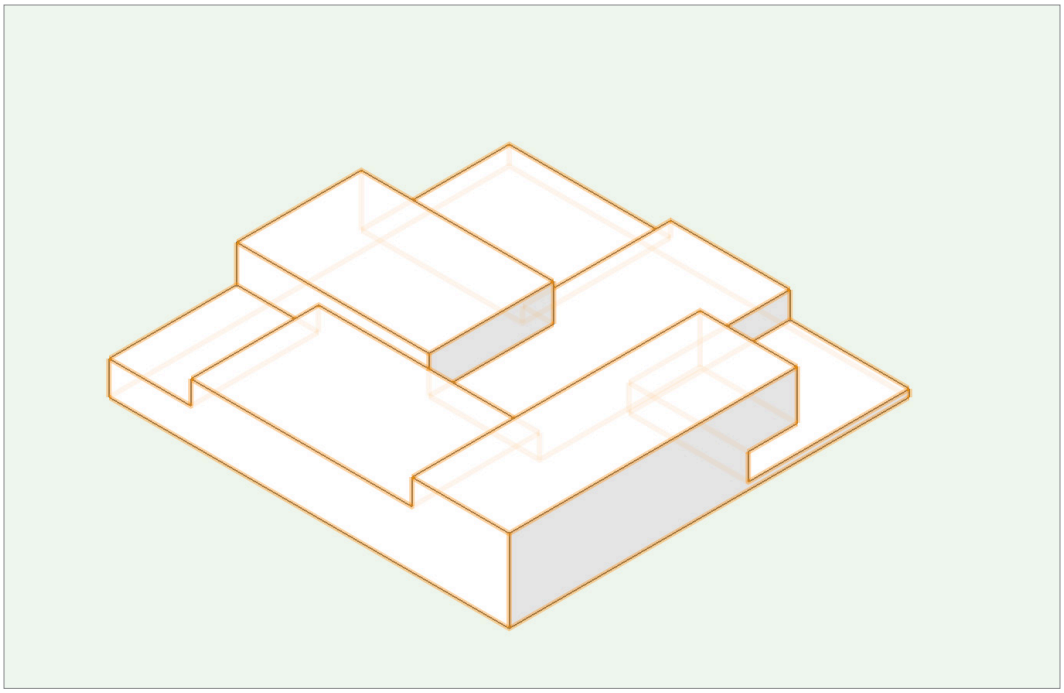


FIGURE 34

Now that we have a solid object and a surface, select them both and select NURBS → Create Surface Array. In the subsequent dialog box, set the "Repetition Mode X'" and the "Repetition Mode Y'" to "No. of Repetitions" and set the number of repetitions for each to 3. Set the "Edge Conditions" to "Trim" and make sure that "Display Base Surface" is unchecked and click "OK." If you want to edit the settings of your surface array, you can change them in the OIP, or if you want to edit either component, you can double-click on the surface array and choose which.

Now we are going to build a ceiling feature using the subdivision tools. Before you start drawing, click on the 1-Ceiling layer under the Layer tab of the Navigation palette to make it the active layer. This is a tool that is similar to the T-Splines plug-in in Rhino and uses Pixar's SubDiv library. To activate the tool, either double-click on the Edit Subdivision tool in the Basic tool palette or select Solids → Create Subdivision Primitive. Choose the cube primitive, set the size to 18", select "Center at Next Click," click "OK" and then click anywhere in the drawing. In the first mode (Transform) of the Edit Subdivision tool, make the cube 15' long and 1.5" thick. You can do this by selecting the different points individually or with a marquee, and using the 3D dragger. Next, add three edge loops to the subdivision at equal intervals using Edge Split mode **(FIGURE 35)**. You can make equal intervals by clicking on an edge then pressing Tab to enter in the split percentage.

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

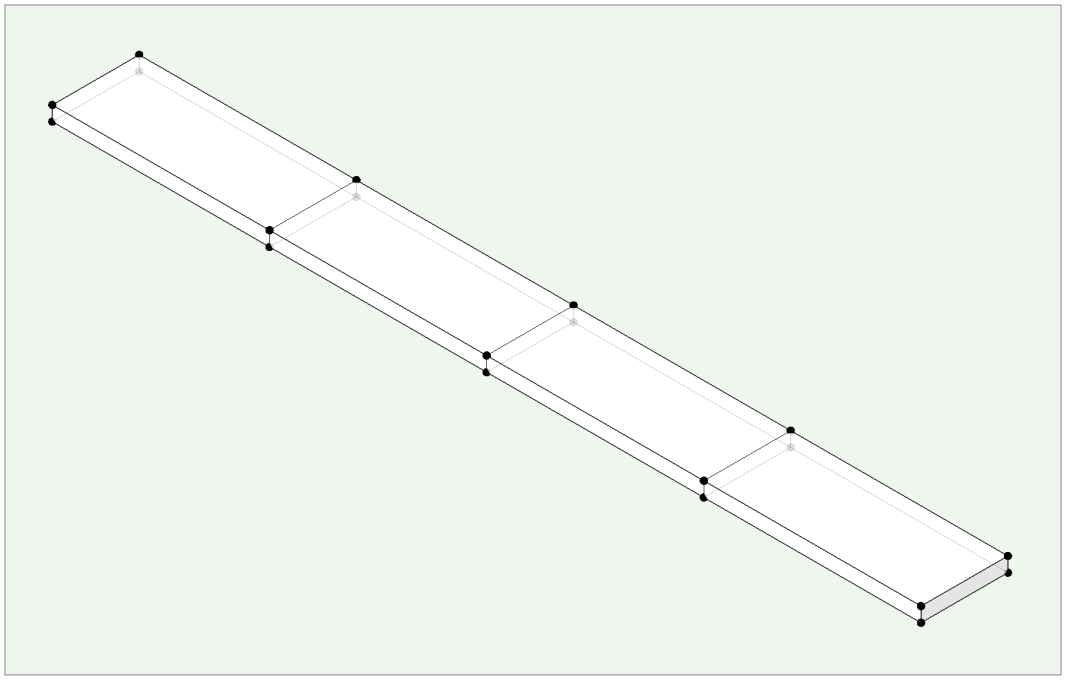


FIGURE 35

Then, select the second and fourth edge loop vertices and drag them up; next, select the center edge loop vertices and drag them down until the vertical distance from the top center to the edges is about the same as the vertical distance of the lower points and the edges **(FIGURE 36)**.

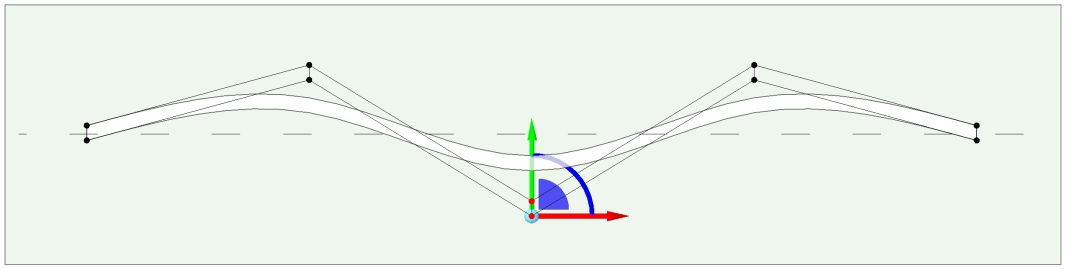


FIGURE 36

TUTORIAL 1 – MODELING AN INTERIOR SPACE (CONT'D)

Now that we have a single strip, type X to exit out of the Edit Subdivision tool and with it selected, select Transform > Create Symbol and copy the settings in FIGURE 37.

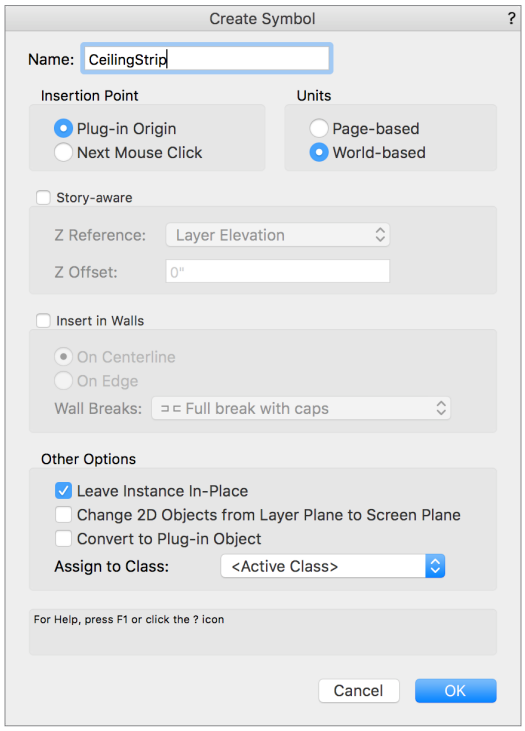


FIGURE 37

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

Once the object is a symbol, mirror it in a right view on a horizontal axis, making sure that Duplicate mode is selected, then move the mirrored symbol adjacent to the original **(FIGURE 38)**.

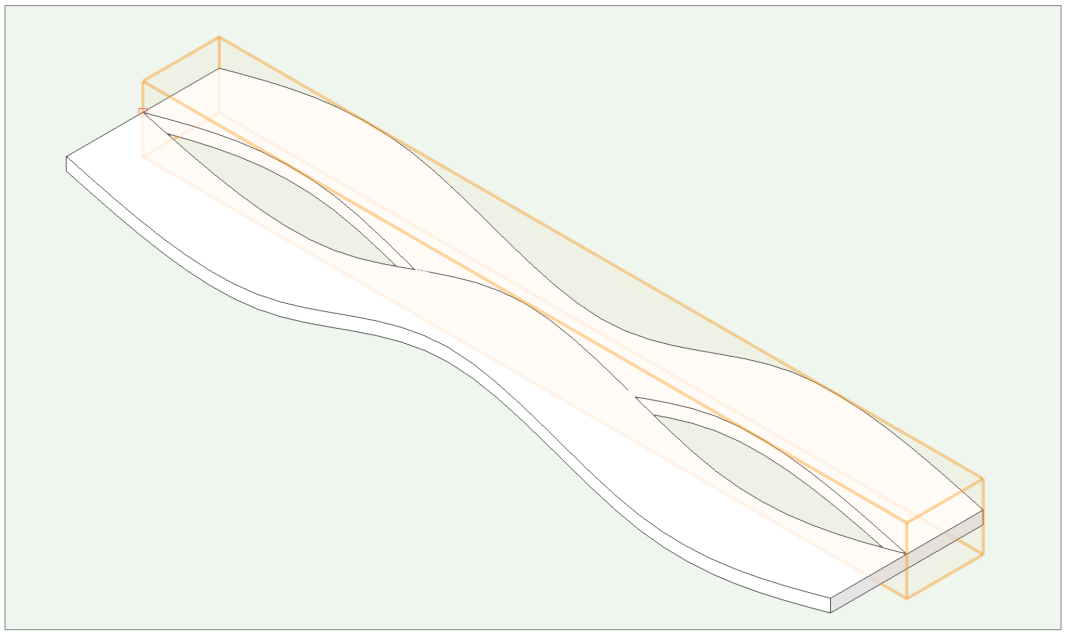


FIGURE 38

Make copies of the symbols and array them alongside each other for five total symbols, alternating between mirrored and unmirrored. Select all five strips and create another symbol with the same settings but a different name. If you want to edit the strips' curves, you can double-click to enter the symbol, and double-click again on any of the strips, choosing "Edit 3D Component" each time, and finally double-click on the subdivision object to invoke the Edit Subdivision tool. Whatever changes you make will be reflected in all of the strips. To exit out of all the containers, click the yellow Exit Symbol button for each symbol **(FIGURE 39)**.

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

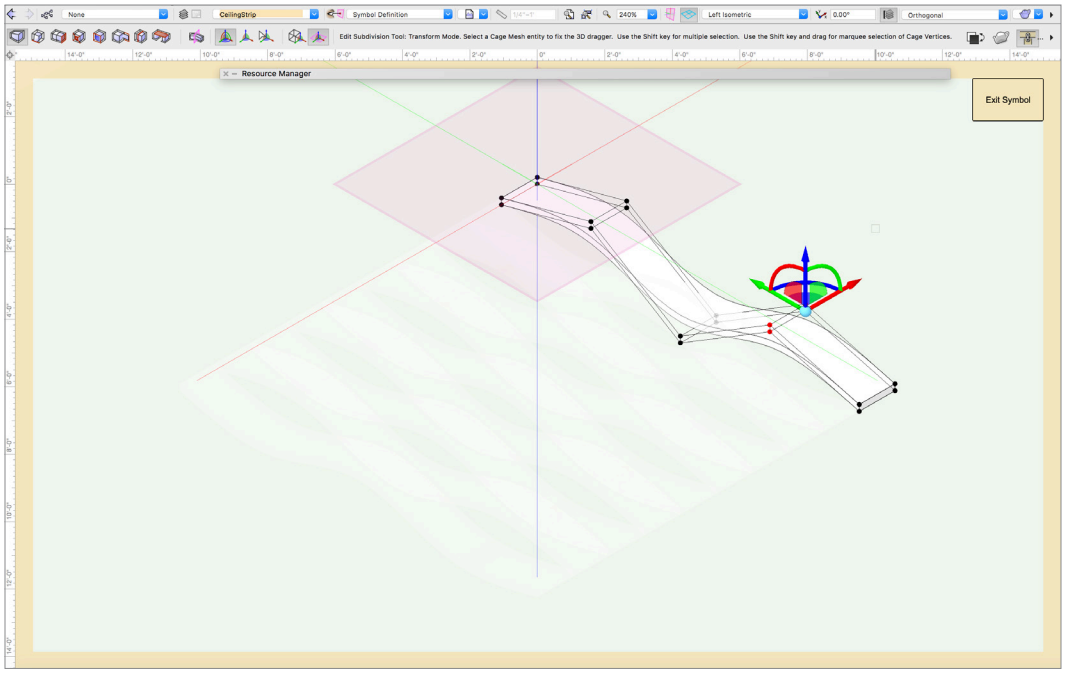


FIGURE 39

Move your symbol so it sits below the second story slab on the left side of the room. Now you should have an interior model that looks like **FIGURE 40**.

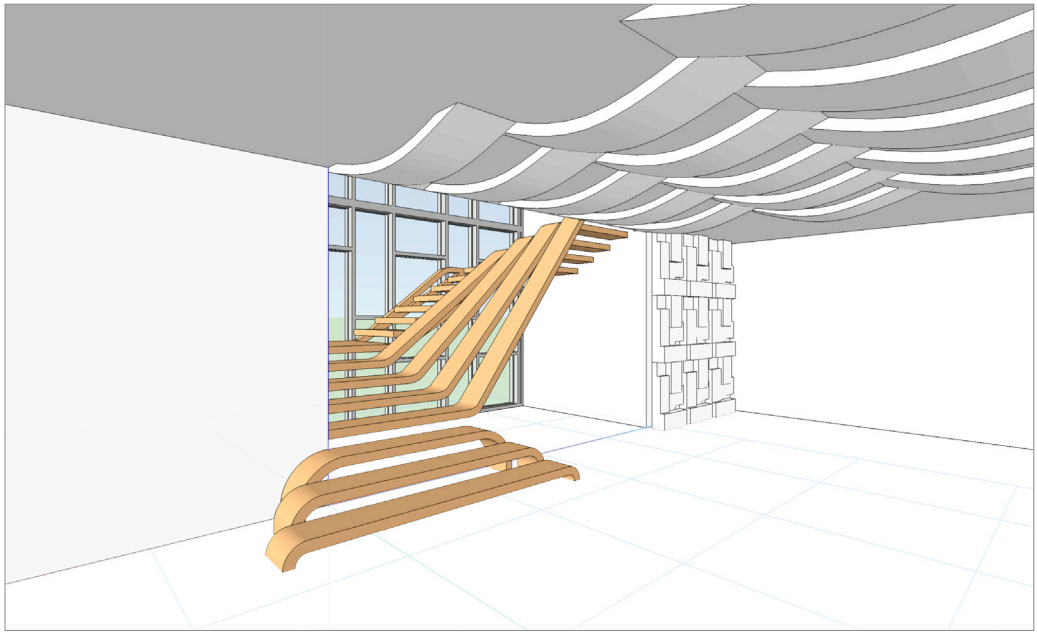


FIGURE 40

TUTORIAL 1 – **MODELING AN INTERIOR SPACE** (CONT'D)

In order to get this view of the model, it is important to set the current projection (on the right side of the View bar) to "Normal Perspective." The projection of this file was set to "Orthogonal." Modeling in a perspective projection vs. an orthogonal projection is up to the user: some value the realism of perspective projection, while others value the precision of orthogonal projection. After you set the projection to "Normal Perspective," press the "1" key on the numeric keypad, and scroll into the interior of the room using the mouse. You can make further adjustments to the view using the Flyover tool and the Pan tool. You can invoke the Flyover tool by selecting the tool in the Basic tool palette or clicking the scroll wheel on your mouse (if you have one) or typing the keyboard shortcut Shift+C. The pan tool looks like a hand and is located in the same palette, but can be invoked by typing "H."

Once you get to a view you like, you can save that view to return to it later. To do this, go to the Saved Views menu in the View bar  and select "Save View." You can choose your settings to reflect whether you want the same layers and classes to be visible when you return to the view. If you only want the camera position, you can deselect "Save Layer Visibilities" and "Save Class Visibilities." After you create the view, it will be available in that same dropdown menu for future use. You can create as many views as you want — it is a very useful tool for organizing your file in Vectorworks.

From here you can continue to develop your model by adding windows and doors, as well as add details. The objects you have created in these exercises can be edited as a whole or by component, and although you have combined objects, none of those combinations have been destructive or reductive.

TUTORIAL 2 – CREATING A MASSING MODEL

For this tutorial, you will need the template file called "3D sketching.sta." Add this file as one of your favorite resources, so you can simply open it to start a new file. To do so, open the Resource Manager (if not visible on the screen) by pressing Cmd+R (Mac) or Ctrl+R (Windows). To add this file to favorites, go to:

File Options menu (gear icon) > Add New Favorites Files and select the template file in your browser and open it. The file is now available in the Resource Manager Favorites folder. To open this template file, right-click on the file and select Open.

EXERCISE 1 – PUSH/PULL TOOL

The first step is to create a basic massing model (as shown in FIGURE 41) using Push/Pull and Push/Pull Add and Subtract commands.

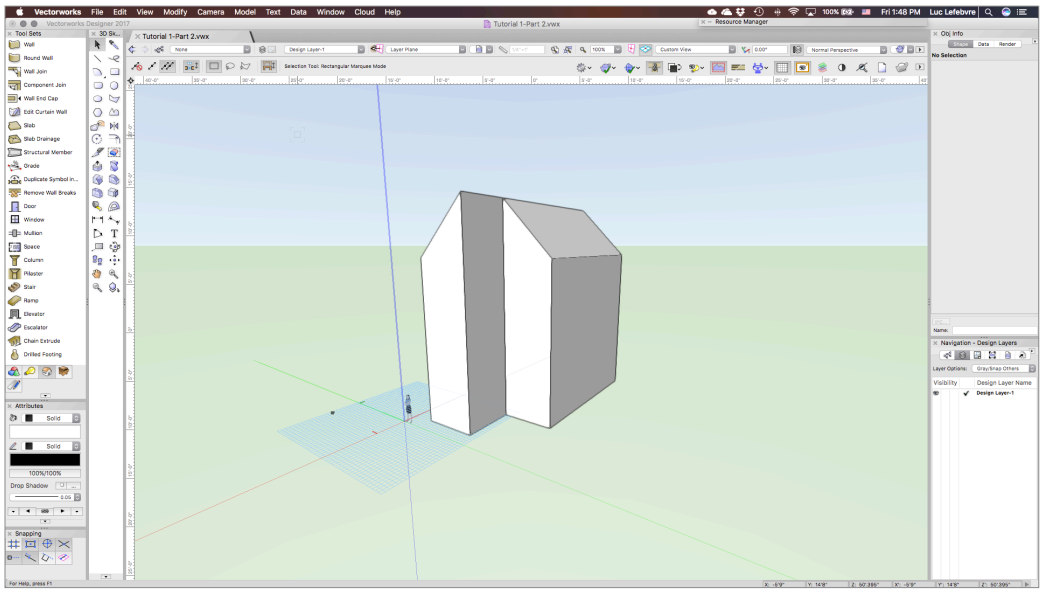


FIGURE 41: USING PUSH/PULL TO CREATE BASIC GEOMETRY

TUTORIAL 2 – **CREATING A MASSING MODEL** (CONT'D)

Using the Rectangle tool, draw a rectangle with the dimensions of 20'x40' (enter the values using the floating Data bar). Engage the automatic push/pull by moving the cursor directly over the rectangle — the face will be highlighted in red; then click-drag the face upwards and enter a height of 30' in the floating Data bar (as shown in **FIGURE 42**).

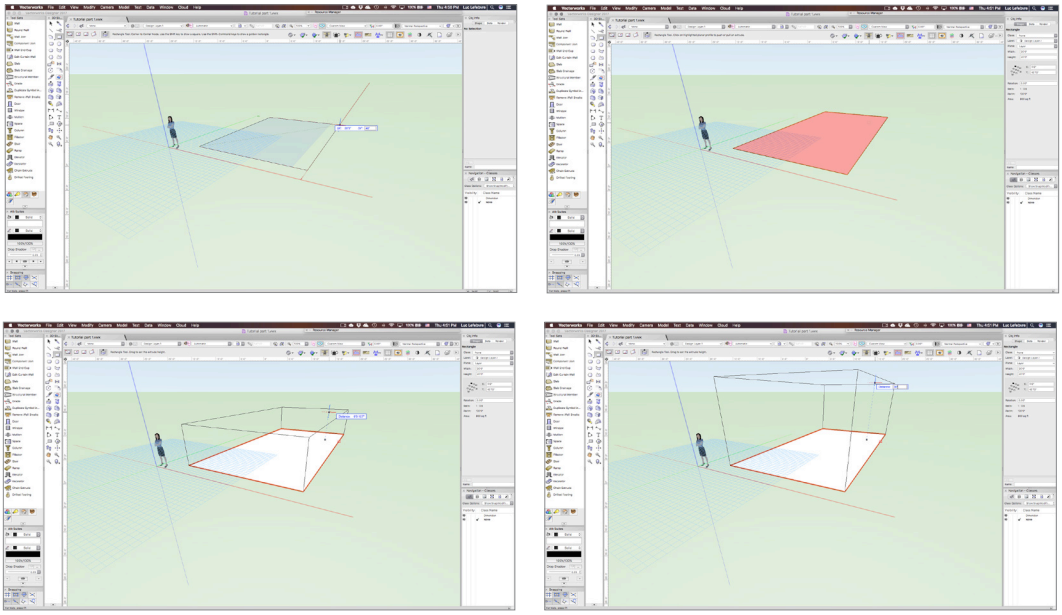


FIGURE 42: PUSH/PULL SEQUENCE

TUTORIAL 2 – **CREATING A MASSING MODEL** (CONT'D)

The Push/Pull mode (and tool) has an automatic add/subtract feature. To activate this function, press and hold the Option (Mac) or Alt (Windows) key while pushing or pulling.

Ensure that the correct face is activated, then create a sloped-roof profile by drawing a triangular polygon with the Polyline tool. Click the polygon and start pulling the surface, while pressing and holding the Option (Mac) or Alt (Windows) key to add the solid extrusion to the main mass. When you reach the back edge, release the mouse; you will now see one object representing the building mass.

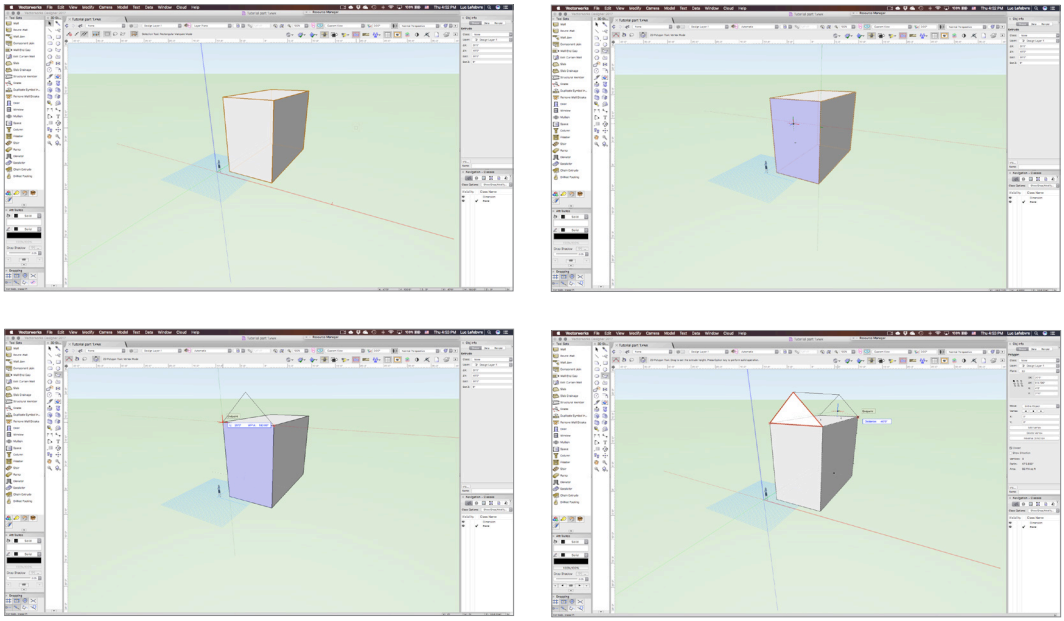


FIGURE 43: PUSH/PULL AND ADD SOLID MODE SEQUENCE

TUTORIAL 2 – **CREATING A MASSING MODEL** (CONT'D)

Now we will use the same functionality, but to subtract an extrusion from the building mass. Select the Polygon tool, move the cursor to the front face of the building, and draw another shape — the outline of the right half of the building face. Push/pull into the mass while pressing and holding the Option (Mac) or Alt (Windows) key. Now you just subtracted from the building mass.

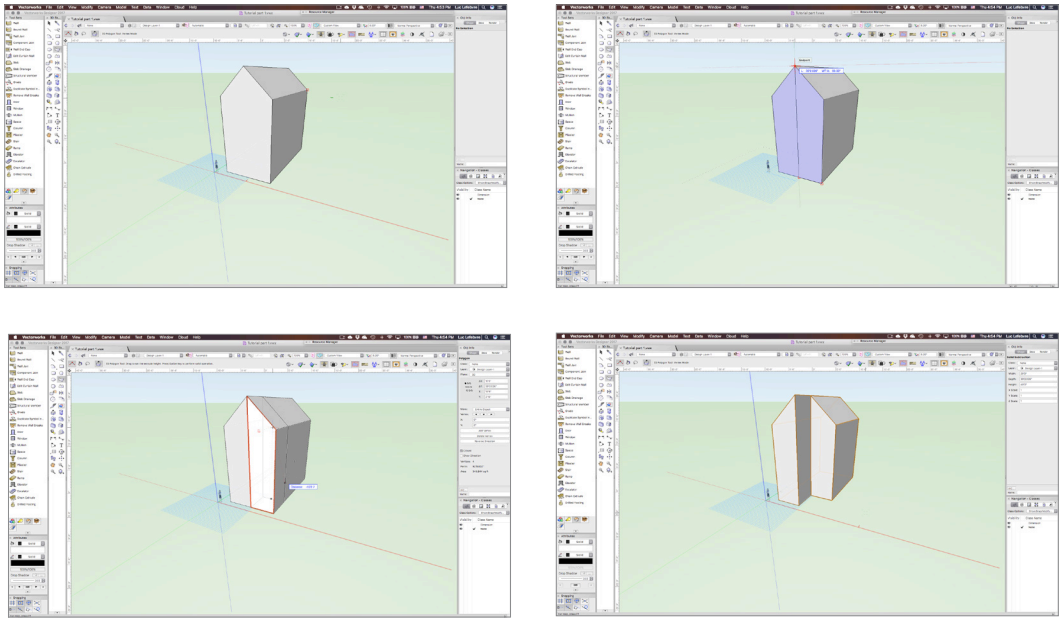


FIGURE 44: PUSH/PULL AND SUBTRACT SOLID MODE SEQUENCE

TUTORIAL 2 – **CREATING A MASSING MODEL** (CONT'D)

With Vectorworks, you must think in terms of adding and subtracting from a solid mass. This technique provides more control and precision while modeling and maintains the history of the various operations. For example, you can double-click on the building mass and edit the 2D shapes used to create the initial extrude.

The second step is to create multiple, recessed openings using solid tools.

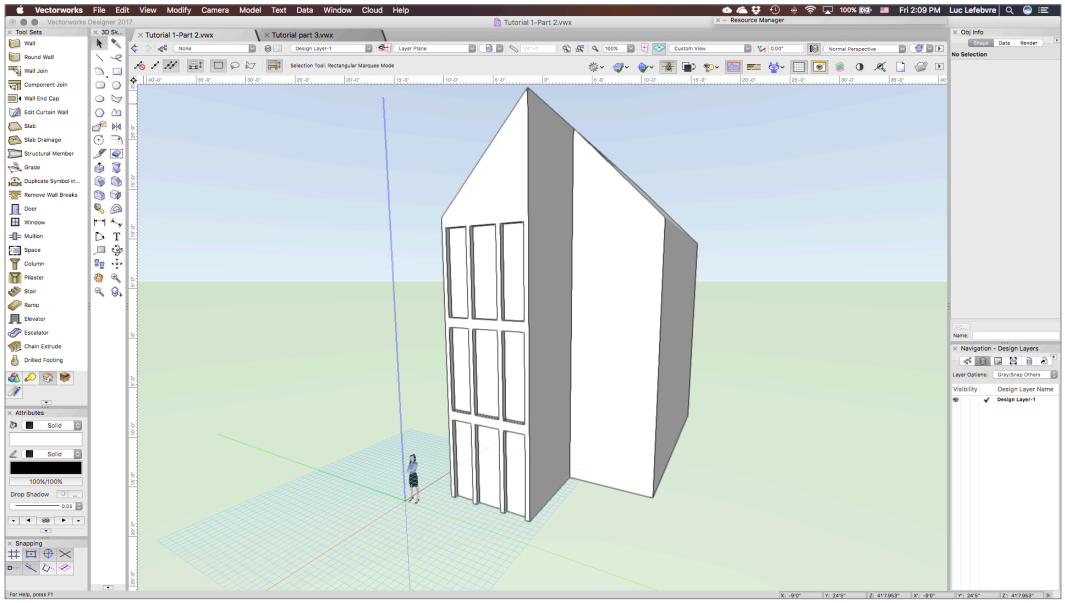


FIGURE 45: USING SUBTRACTIONS TO CREATE RECESSED GEOMETRY OR OPENINGS

TUTORIAL 2 – CREATING A MASSING MODEL (CONT'D)

To arrive at the result shown in FIGURE 45, you can proceed in a similar fashion as earlier, by using the Push/Pull mode of the various 2D shapes directly on the building mass or you can build solid objects and then subtract them from the building mass. In addition to the Push/Pull tool, Vectorworks has a full suite of solid modeling tools, such as, Extrude, Multiple Extrude, etc. They can be found in the Solids menu.

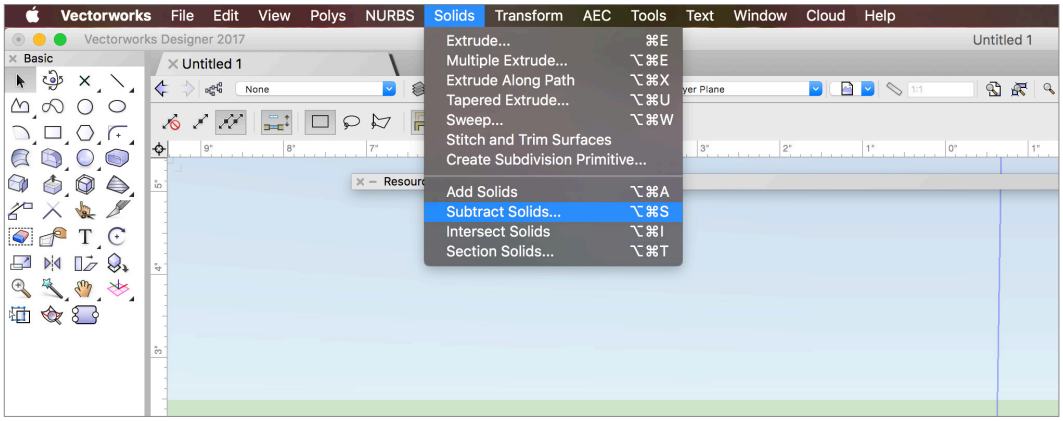


FIGURE 46: SOLID MODELING COMMANDS

On the façade, draw various rectangles. Select the Rectangle tool, move your cursor to the face of the building to highlight (in purple) the working plane, and draw the shapes. To create a precise pattern, as shown in FIGURE 45, you can use the floating Data bar to enter the exact values for each shape. Use the Selection tool to pick the first rectangle, press and hold the Option (Mac) or Alt (Windows) key (to duplicate the object), release the mouse at the desired location for the duplicated rectangle. You can repeat these steps with multiple rectangles selected. Once all six rectangles are drawn, select all of them; from the Menu bar, select Solids > Extrude (or press Cmd/Ctrl + E) and enter a value of minus six inches (-6") for the extrusion. Then, select the building mass (including the extrude of the rectangles), and from the Menu bar select Solids > Subtract Solids. When prompted, select the building mass object as the object being subtracted from, by clicking either of the arrow buttons in the OIP until the correct object is highlighted in red. You will see now several "openings" or recesses on the face of the wall.

TUTORIAL 2 – **CREATING A MASSING MODEL** (CONT'D)

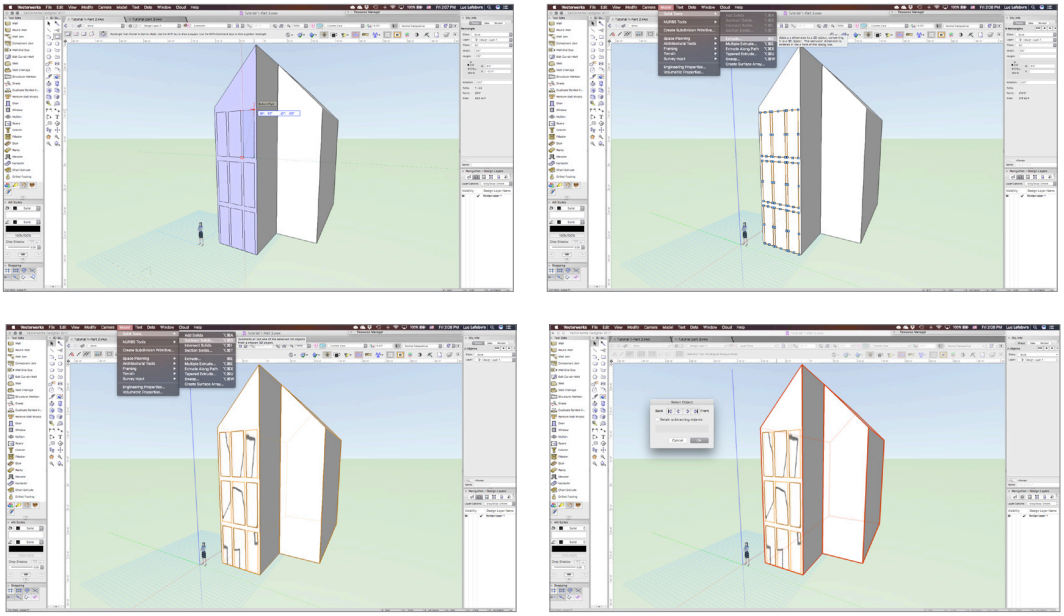


FIGURE 47: EXTRUDE AND SUBTRACT SOLIDS COMMANDS

Practice with the Push/Pull tool and modify the openings to achieve an interesting design similar to the illustration in **FIGURE 48**.

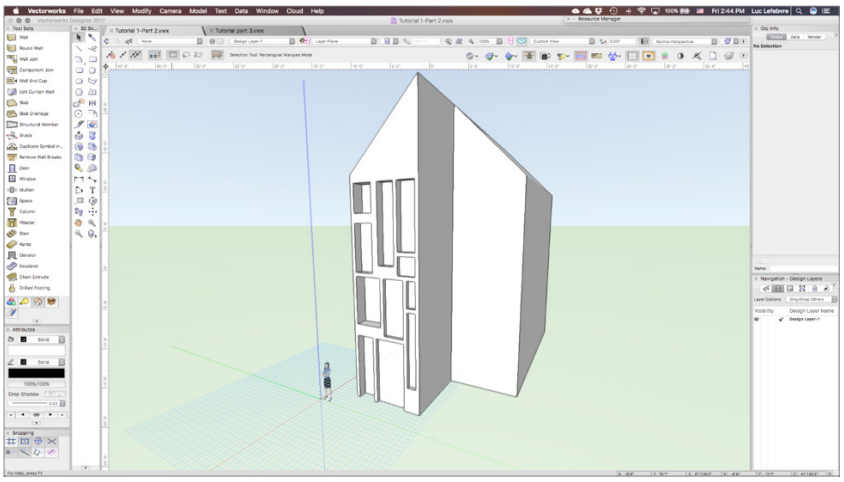


FIGURE 48: END RESULT OF EXERCISE 1

TUTORIAL 2 – CREATING A MASSING MODEL (CONT'D)

EXERCISE 2 – TAPER FACE TOOL

On the main building mass, let's add a protrusion that will cover the main entry.

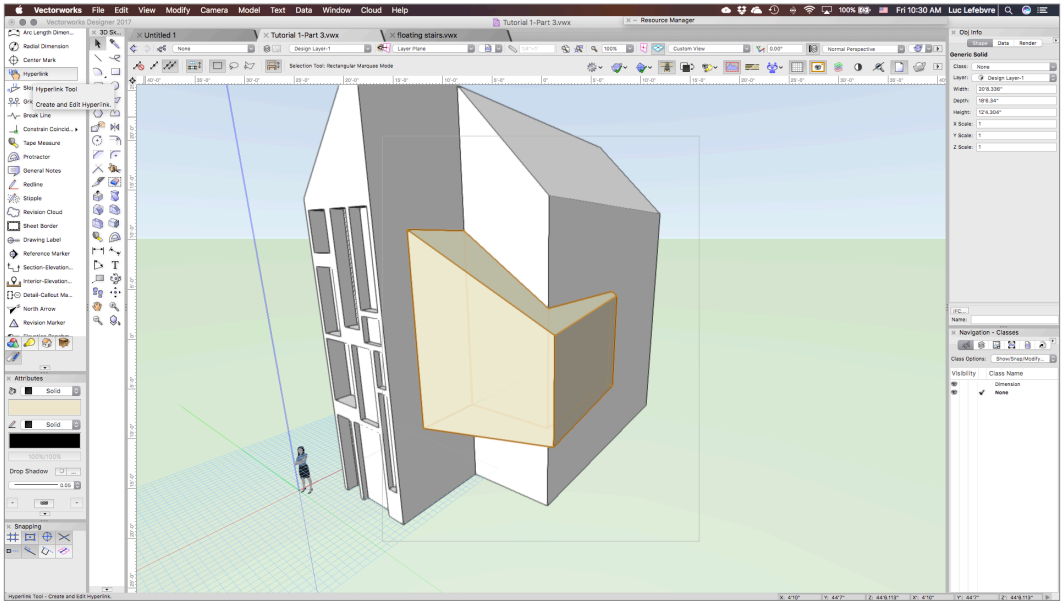


FIGURE 49: USING TAPERED FACE TO MOVE FACES AT VARIOUS ANGLES

TUTORIAL 2 – **CREATING A MASSING MODEL** (CONT'D)

Start by drawing a polyline shape and use the Push/Pull tool to extrude it. The height should be approximately 9'. Now move this object to the correct elevation — about 8' or 9' above the ground plane. Using the Selection tool, pick a corner and move it vertically. Directly next to the cursor, you will see a cue that tells you which direction you are moving the object.

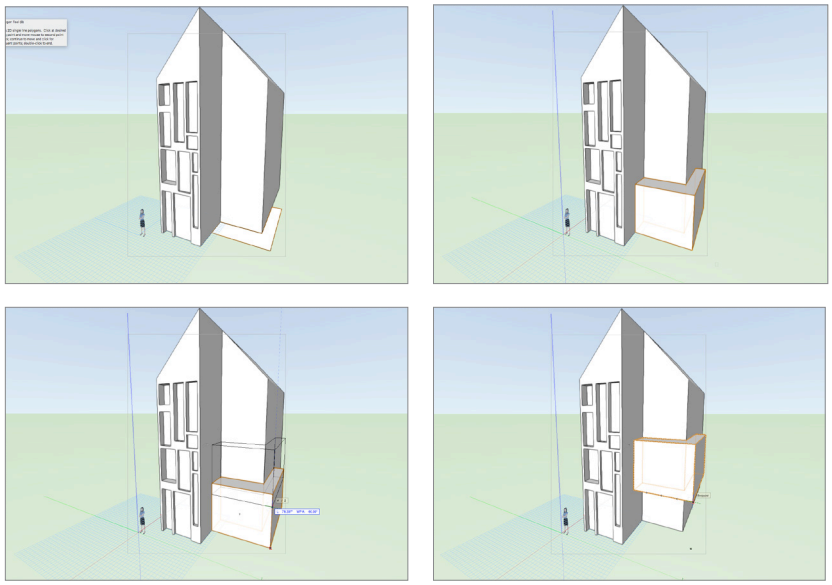


FIGURE 50: PUSH/PULL TOOL AND MOVE OBJECT WITH SELECTION TOOL

TUTORIAL 2 – **CREATING A MASSING MODEL** (CONT'D)

Using the Taper Face tool, let's add some sloping faces and angle to this volume.

Select the Taper Face tool, click first on the face that is the reference face from which the rotation will occur. Click a second time to select the face that will be tapered. Click a third time to indicate the angle of rotation.

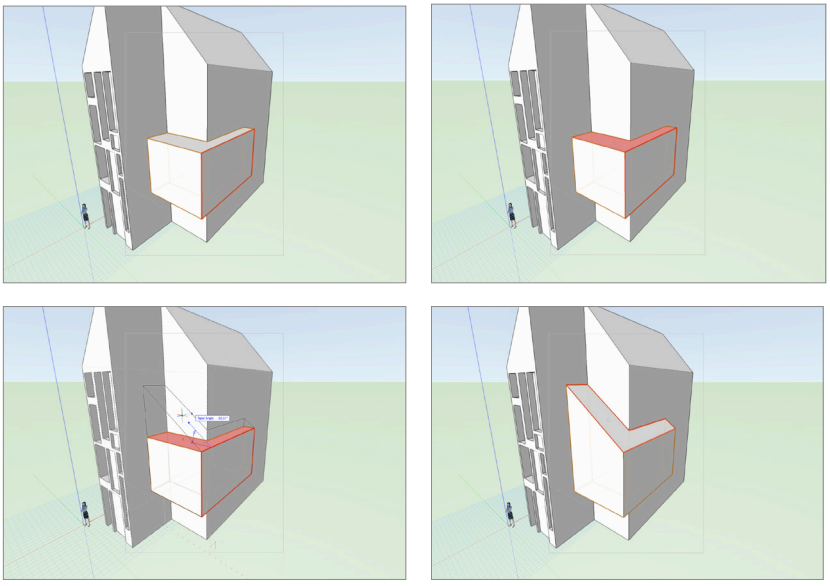


FIGURE 51: TAPERED FACE TOOL SEQUENCE #1

TUTORIAL 2 – CREATING A MASSING MODEL (CONT'D)

Repeat the same sequence of operations on the sides of the volume to arrive at the desired result.

To get used to this tool behavior, apply more tapered faces to the wall recesses you created in Exercise 1 – Push/Pull Tool to achieve similar results as shown in FIGURE 52.

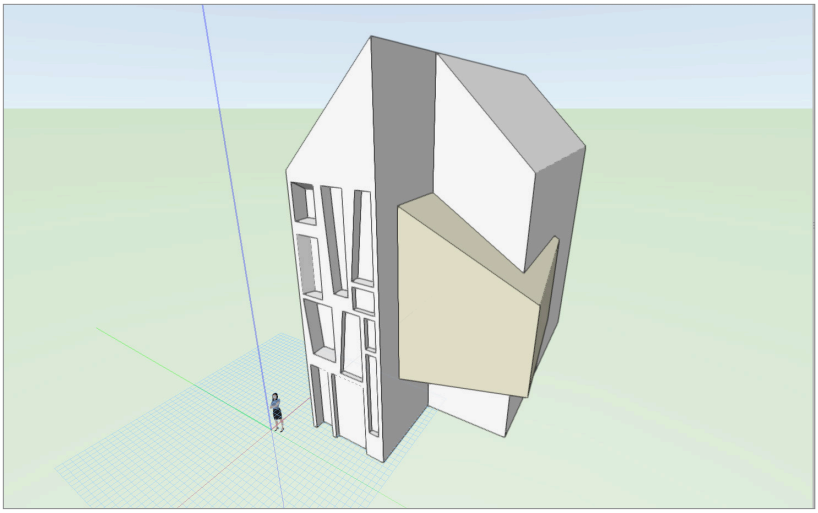


FIGURE 52: USING TAPER FACE TO MOVE FACES OF OPENINGS AT VARIOUS ANGLES

EXERCISE 3 – HOW TO APPLY TEXTURES

Each object must have a solid-fill attribute to render in any render mode such as OpenGL or Renderworks modes. When an object has a color fill, the rendering will automatically inherit that color. For example, select the object with the tapered faces from the previous exercise; from the Attributes palette, click the fill style and pick a color from the various color palettes available.

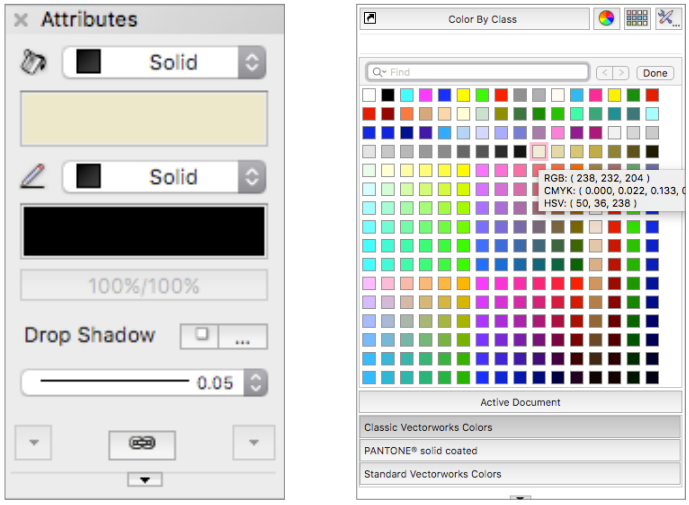


FIGURE 53: ATTRIBUTES PALETTE

TUTORIAL 2 – CREATING A MASSING MODEL (CONT'D)

The color attribute of an object controls only that. If you want to apply a texture to that object you need to apply a Renderworks texture in addition to the solid-fill attribute. If you apply a texture to an object, that texture will override its fill color in a 3D view. To apply a texture, select the object first, then from the Resource Manager double-click the texture you wish to apply (select one of the textures available in your active file). The 3D sketching template has pre-loaded textures. Dragging and dropping the texture resource from the Resource Manager onto the object is another way to apply a texture.

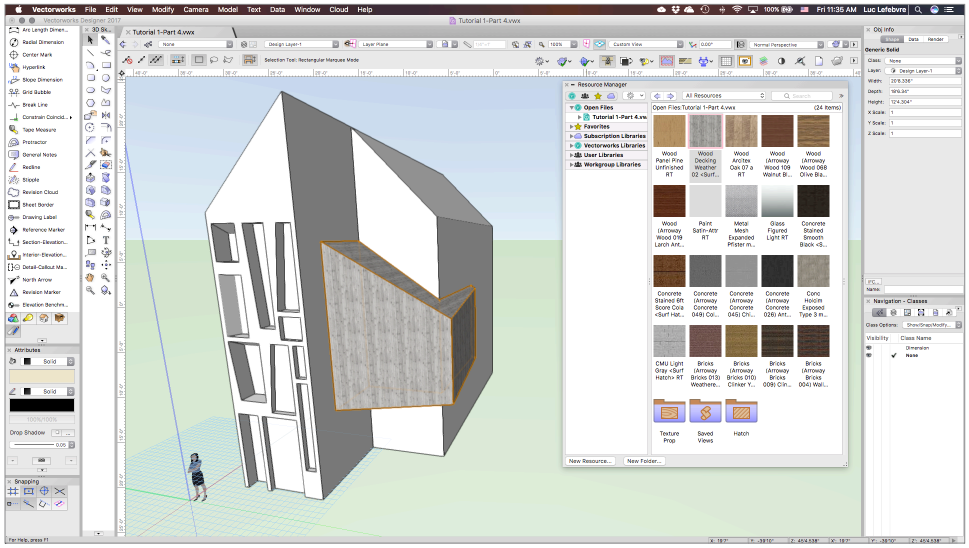


FIGURE 54: APPLY A TEXTURE BY DOUBLE-CLICKING IT IN THE RESOURCE MANAGER

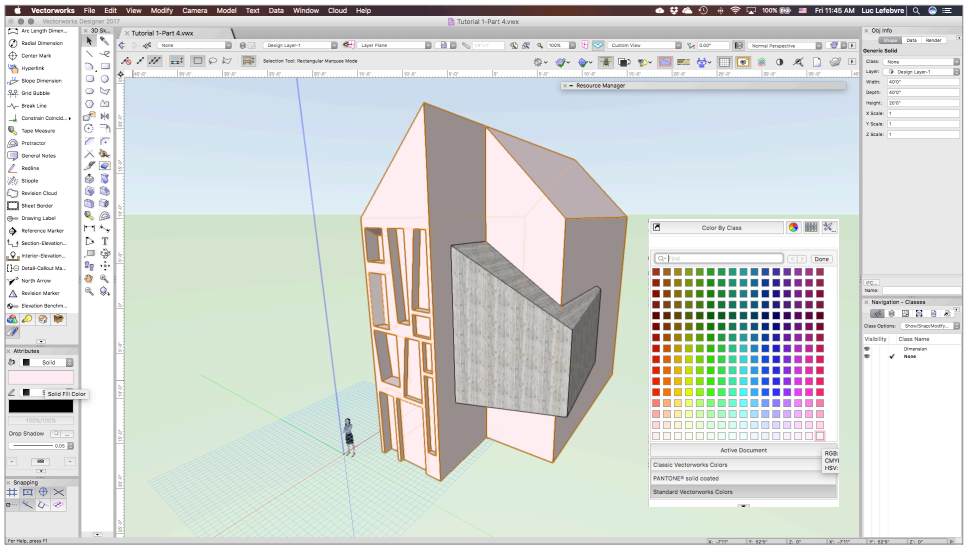


FIGURE 55: APPLY SOLID FILL COLOR ATTRIBUTE

CONCLUSION

Using freeform modeling and combining the full range of 3D modeling tools in Vectorworks gives you endless possibilities for exploring design forms and moving your design exploration to a complete BIM model, 2D documentation drawings, and presentation drawings.

To see more 3D modeling tools in action, click here

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