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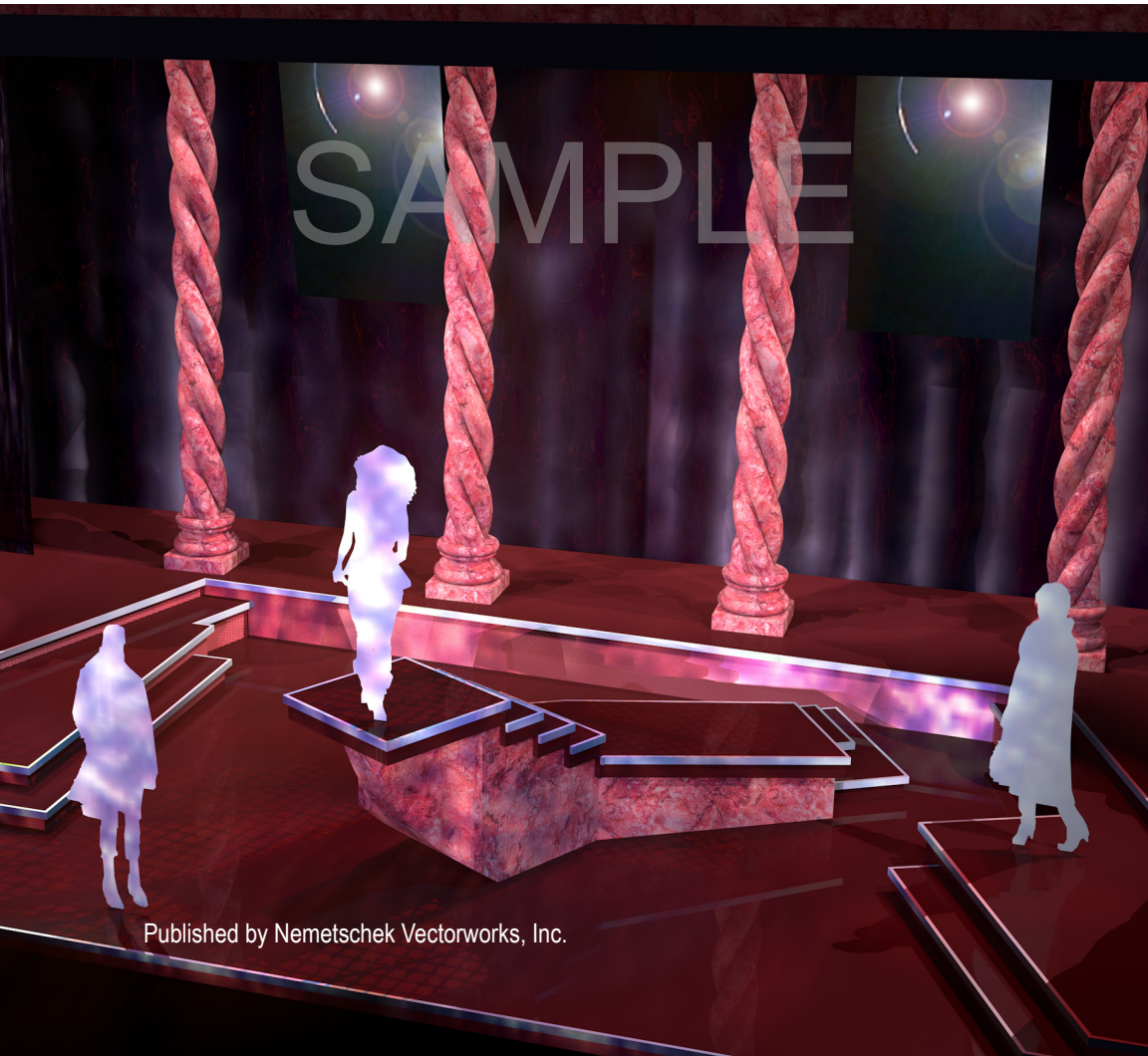
NEMETSCHEK Vectorworks

Entertainment Design:
Scenery, Lighting, and Sound
with Vectorworks Spotlight



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Kevin Lee Allen
Kevin Lee Allen Design (KLAD)
56 Woodlawn Avenue
Clifton, NJ 07013
201.280.3841
klad@klad.com

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Modeling the Booth Theatre

The Booth Theatre is a Broadway theatre located at 222 West 45th Street (George Abbott Way) in the Manhattan Theatre District of New York City.

Designed by architect Henry B. Herts, the Booth and the adjacent Shubert Theatre are a back-to-back pair sharing a Venetian Renaissance-style façade along Shubert Alley.

The Booth was named after 19th-century actor Edwin Booth. The theatre's 783-seat auditorium was intended to provide an intimate setting for dramatic and comedy plays. It opened on October 16, 1913, with Arnold Bennett's play *The Great Adventure*. More recently, *High*, *Next to Normal*, *Thurgood*, *I'm Not Rappaport,* and *Once on this Island* have played the Booth.

Our thanks to the Shubert Organization for permission to work in this space for this project.

Modeling the space is an exercise in tracing, shaping, and creating adjacent 3D objects. Let's review some basic techniques that will you will need.

The Layer Plane and the Screen Plane

These are not drawing modes, but rather planar modes to draw within. 2D objects drawn in the Layer Plane will rotate in 3D space. 2D objects drawn in the Screen Plane will always be seen as facing the screen, no matter the 3D view, and they will not rotate in 3D space.

Planes are useful when preparing to extrude an object from 2D into 3D.

You may choose whether to draw in Layer or Screen Plane from the drop-down menu on the View bar. You may change what plane an object is assigned to by selecting the object and changing its plane in the OIP.

2D Primitive Tools

Open a copy of your template file or a blank new file and work along as described below. This "exercise" in messing around with the tools will help you to achieve familiarity with them.

You can easily find which tool is which by hovering and waiting for the descriptive text to appear or by going to the Help files.

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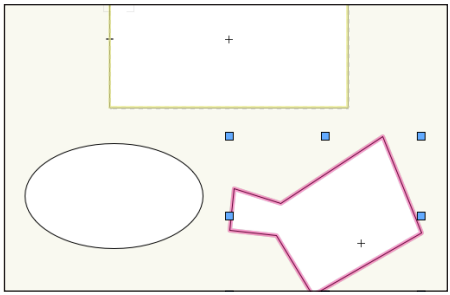
Rectangle

Although we've already used the Rectangle tool, we are going to begin by selecting the **Rectangle tool**. Notice the options in the Tool bar change when a tool is selected. Each mode or option available in the Tool bar offers a different way of drawing. By hovering over the mode icons, you will see descriptive text appearing for each mode. Text in the Tool bar also describes the active option.

Typically when freehand drawing, objects can be constrained when you press a key(s). For example, you can constrain a rectangle to a square by pressing the Shift key. You can constrain a rectangle to the Golden Ratio by pressing the Shift and Command keys simultaneously while dragging. With the Shift key pressed, an oval can be constrained to a circle.

These options will vary with the tool selected. As you explore the application, try every mode available in each case.

You can simply begin to draw by clicking and dragging. As soon as you begin to draw, you will note the appearance of the Floating Data bar (FDB). Hit the **Tab** key to select the first field in the FDB and enter a specific dimension. Then tab to the next field, repeat, and click with the mouse. You have created a specifically sized shape!



Draw a few rectangles, and note the highlight color when you hover over a shape and the change in color when you select a shape. You can select multiple objects by pressing and holding the Shift key or doing a marquee selection (click and drag with the 2D Selection tool). To Marquee select, simply drag around the entire object. You can also Marquee select by pressing the Option key and selecting any object you partially touch.

Select an existing rectangle and note that you can move it or resize it interactively with the mouse. Also note that you can change its size and location in the OIP.

Draw a rectangle in an isometric view with the Push/Pull mode activated in the Tool bar. As soon as you finish drawing, move the mouse over the rectangle and notice that it becomes highlighted. Click and drag to extrude the rectangle. The Push/Pull mode option is available for all of the 2D primitive drawing tools.

Select the **Rectangle tool** and hover the cursor near another rectangle. Note the SmartCursor hints and alignments that are indicated.

Align with a corner, indicated by the red extension line, and hit the T key to lock in that alignment.

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Try this again. When hovering near a snap point, hit the Z key to enable the **Snap Loupe**, which allows you to zoom in close until you click the mouse. You can also use the snap loupe when you want to finish drawing a shape, if aligning to another point.

Circle and Oval
Notice two similar tools, the Circle and the Oval. Select the Oval tool, and notice the different options in the Tool bar. Draw a few ovals using the different options, some freehand, some with absolute positioning, and then with the FDB.

Notice the **Circle by 3 Points** option. This option also appears in Arcs and Curved Walls and is very useful in tracing curves and in designing the right size circle or arc.

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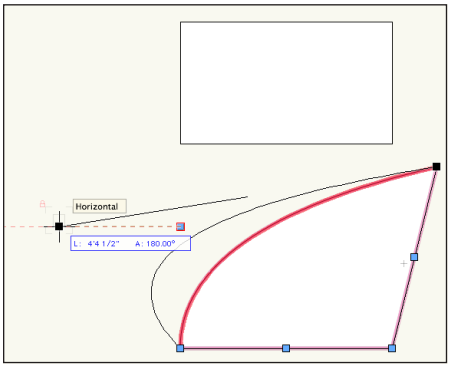
Regular Polygon
Like the Circle and Rectangles, the Regular Polygon allows you to make simple multi-sided objects.

Polygon and Polyline
These tools are for freehand drawing and for intelligent tracing with the SmartCursor. The Polygon has only straight lines, but the Polyline tool allows you to introduce curves. Consider tracing a scanned drawing or placing locus points. You can also use the 2D Line tools and absolute positioning to create a set of guides. Then you can connect the dots with the Polygon tool. Press the U key when drawing with the Polyline tool to switch modes on the fly. This key command generally works with every tool option.

Note that the Polyline tool introduces a preferences option in the Mode bar and six different modes for drawing, including very precise arcs and curves. You can switch modes in the midst of drawing by reaching into the Mode bar or pressing the U key while working.



Triangle
The Triangle tool is located under the 2D Polygon tool. Click on the 2D Polygon tool icon and hold. The Triangle tool will then appear for you to select. Note that this tool has three different modes of operation available in the Mode bar.

2D Modifying Tools

Reshape
The Reshape tool allows for the editing of polygons. If you want to edit a rectangle into a shape other than a rectangle, you must first convert the rectangle into a polygon. Select the rectangle and go to *Modify>Convert>Convert to Polygon.*

The Reshape tool has several modes and options. Reshaping allows users to move points, add points (between existing points), subtract points, or convert points from corners to curves and vice versa.

Let's assume that you have not been able to make the shape that you want. Draw a rectangle. A rectangle is not a polygon, but

you can make a rectangle into a polygon by Adding or Clipping. In this case, we will select the rectangle and go to **Modify>Convert>Convert To Polygon**.

Select the **Reshape tool** from the Basic Tool set and edit. You can also double-click the polygon, and the 2D Reshape tool will self-select. Let's look at the options:

- Move points
- Convert points
- Add a point
- Subtract a point
- Hide or show edges

Note: When you select **Add** or **Convert**, other options become available. Note also the options for selecting points. This is a very robust tool and is very useful for creating sweeping curves.

Your rectangle now shows eight points or, more precisely, four points on the corners and four midpoints. Experiment with the tool: Try these things and then undo so you always return to the basic rectangle. Select the first option on the left, **Move Polygon Handles** mode. Grab a corner and move it around. Undo. Select the **Delete Vertex** mode, and delete one of the corners so that you have a rectangle. Undo. Select **Add Vertex**, and be sure that you have the **Corner Vertex** option selected. Note that you can add and manipulate points only at a midpoint. Select the **Change Vertex** mode and then select **Bezier Curve**. Click on a corner and observe the curve. Manipulate this curve with the Move mode. On another corner, convert the corner point to a Cubic Spine Point. Manipulate the curve and compare how they differ.

Offset

The Offset tool allows you to quickly duplicate a surface inside or outside of an object. Select the tool and go to the tool preferences in the Tool bar. If you have just drawn a complex shape and will use that shape as a platform, you will need to allow for the thickness of the reveal and/or the structure. Simply offset the shape.

Fillet and Chamfer

The Fillet and Chamfer tools are very similar. There are 2D and 3D versions for these tools. The 2D tools are in the Basic Tool set and the 3D are in the 3D Modeling Tool set. You'll recall that we have done some basic work with the 3D tools in our first exercise. These terms are generally used in cabinetry and millwork. In each case, these tools trim the corner off of a polygon. A chamfer is a straight line cut and a fillet makes a rounded corner. In each case, select the tool and trim the edge of a polygon. First select a mode. They each have the same three modes. The first Chamfer or Fillet option adds the detail, the second trims the lines of the polygon to the detail, and the third trims the original shape to the new detail and deletes the lines left when using the second mode.

Select the tools, set your preferences and mode, and then hover over the edge of a polygon. If eligible for Chamfer/Fillet, the edge will be highlighted. Click and drag to an adjacent edge, and it too will be highlighted. Click to execute.

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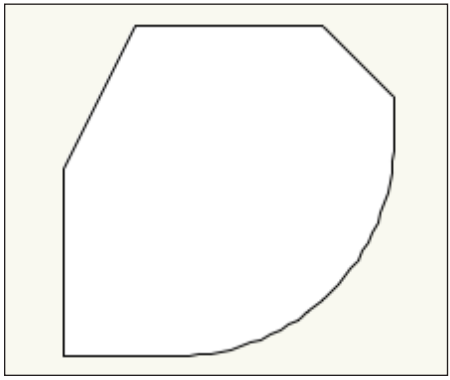
This object has two Chamfers and a Fillet.



Locus Points
Locus Points/Datum provide guides for drawing and reference points as needed. There is a 2D Locus and a 3D Locus tool, located in the respective tool sets.

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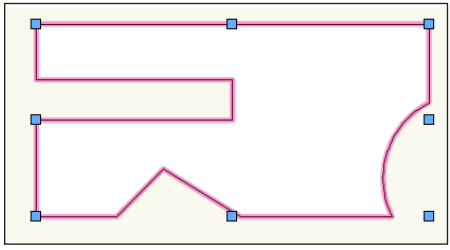
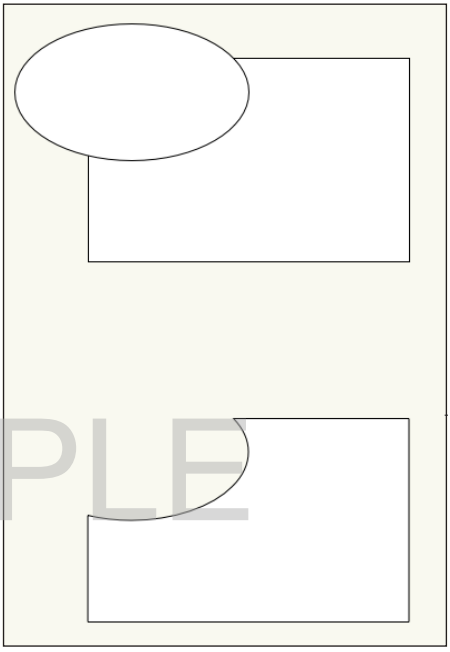
Clip Tool
The Clip tool offers a number of options and modes for removing pieces of 2D forms.

The object below has been clipped using each of the three modes.

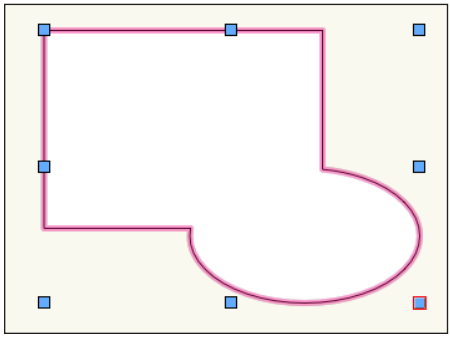


2D Commands

Clip
Modify>Clip Surface is used to subtract one shape from another. First, draw one primitive shape over a larger shape. Select both and go to the command. Only the top object will remain selected. Delete that object, and you will notice a hole in the bottom object.



Add
Modify>Add Surface combines two objects into one. Draw two overlapping objects, select both, and invoke the command. You will be left with one new object.



Combine into Surface
The Combine into Surface command forms a new object from a group of objects. The objects must intersect and form a closed polygon. Depending on objects selected and the location of the mouse click, you can create several different polygons from the same set of objects.

Draw two or more overlapping objects, select them all, and go to **Modify>Combine into Surface**. The cursor will change into a paint bucket. Place the paint bucket inside the area of the polygon you wish to keep and click. A single polygon object is created from the selected objects. The new object uses the current attributes.

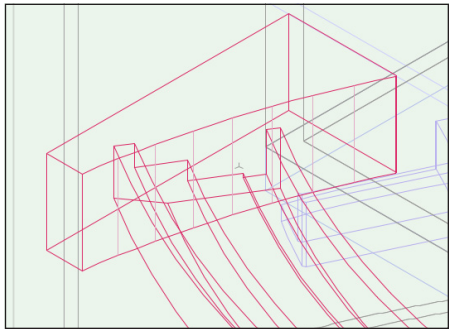
Intersect Surface
Create two overlapping objects and select both. Then, go to **Modify>Intersect Surfaces** and note that the remaining shape is the shape of the area where the two objects once overlapped.

3D Commands

Add Solids
Like the 2D Add Surface command, the 3D Add Solids command (**Model>Add Solids**) combines two or more overlapping and selected 3D objects into one larger object. Once joined, the solids can be edited by double-clicking on the combined object.

Subtract Solids
Again, similar to the 2D Clip Surface command, the **Model>Subtract Solids** command subtracts one or more 3D objects from another. When multiple objects are selected and the command enacted, a dialog will appear that allows you to choose which object will remain and be modified.

Intersect Solids



Model>Intersect Solids creates an object from the overlapping areas of two other solids.

Section Solids
Similar to the Subtract Solids command, *Model>Section Solids* also allows the manipulation of 3D objects using larger NURBS objects.

Extrude
Most of your modeling can be most quickly achieved using the Push/Pull tool and the Floating Data bar. However, there are some occasions where the Extrude command will be more efficient.

Draw and modify any primitive or primitives with the tools we have just discussed. Let's make this shape into a 3D object. With the object selected, go to **Model>Extrude** (Command + E or Ctrl + E), enter a number in the Extrusion field, and click **OK**. Remember, if you're drawing in a file based on your template, you'll need to enter a number in scale. If you're working on a new blank file, the scale will be 1:1, and you will want the size to be smaller.

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