NEMETSCHEK
Vectorworks

Vectorworks® Spotlight

2012 Getting Started Guide

The contents of this guide and accompanying exercises were originally created for Nemetschek Vectorworks, Inc. by Kevin Lee Allen and modified by Nemetschek Vectorworks, Inc.

Table of Contents

Introduction

This guide is designed to teach the basics of working with the Vectorworks Spotlight and Renderworks software tools. The text and illustrations show some of many possible workflows. Your own methods may vary slightly over time. This book only begins to scrape the surface as to what you can do with Vectorworks.

All of the screen shots here show the MacOS. Windows users will find the same information in the same places, although it may look a bit different. From time to time, I have inserted information about keyboard shortcuts. Again, I generally make reference to the Command key. On a PC, that usually means the Control key. There is a complete reference to these shortcuts in the Vectorworks help files, complete with cross referencing the two operating systems.

The approach contained here stresses the modern CAD concept of *Information Modeling*. Simply put, this is working and collaborating on a *model* representing all of the information necessary to visualize and document your project. In other words, with this approach, 2D and 3D sheets as well as lists and quantities, can all be calculated from the model without duplicating the information. On a collaborative level, this allows a set designer to provide a void—and technical directors to fill parts of that void with structure, lighting designers to add instrumentation, sound designers to insert microphones or speakers, and video designers to add screens and gear. *Information Modeling* in the performing arts allows for a truly collaborative workflow for the various partners to work and share information across a series of referenced files.

This guide describes a professional workflow that allows designers and technicians to work and collaborate on a project. All team members have the current state and have great flexability as the project evolves with the design. Working in the model space with dynamic links to presentations (sheet layers) keeps the entire project constantly updated.

Using Metric Units with Exercises
All exercise data set files for this tutorial are set to use imperial units.

How to Use this Guide

Work through the guide and the exercises. Each exercise or process, no matter how simple, leads to the next exercise. It helps to have the hands and the mind work through the simple steps before reaching more complex problems.

This manual covers a lot of ground quickly. Yet, it just skims the surface of a powerful application. Everything is here so that you can get up to speed waith Vectorworks Spotlight quickly. The following are points to keep in mind as you work through the guide:
• Alternate methods are shown for activating/using many tools, commands, and modes.
• Use what works best for you.
• Experiment with different tools and techniques.
• Watch for SmartCursor cues, which appear as you hover your cursor over significant drawing – object geometry.
• The text assumes you are familiar with basic computer terms and basic theatrical concepts.

• Save early, and save often. Save after every operation.
• Establish a back-up ritual. Macintosh users should take advantage of the Time Machine feature within the OS.
• Use the Vectorworks auto back-up in addition to your own back up plan.
• Save–As frequently, so you can always access earlier ideas and solutions.
• Use symbols, and get to know and understand them early on.
• Most tools have options, available for selection in the Tool Bar. See the illustration on page 11.
• Don't be concerned if you do not understand this entire introduction, it will all be explained as you make your way through this guide.

Working through the Guide

This guide is built on a plan of exercises and two projects. Each time a concept or set of concepts is presented, there will be an associated exercise created to practice the base skills presented. The exercises are important for new and experienced users alike, and working through the exercises lays the foundation for more complex tasks.

The Lighthouse. The Cape Hatteras Lighthouse is a complex 3D model briefly illustrated in the text but strongly suggested as a challenge. The lighthouse project brings together all of the exercises. It is a daunting and intimidating task when viewed in total, however, it is actually many simple tasks combined. Users who can complete the lighthouse can generally model and present any other professional challenge that comes their way.

The Theatre Project. In the course of the text users will create a basic theatre space, a set, light plot, design visualizations, and a set of drawings from which these designs could be executed. Tangentially, completing this project will also assist users in configuring the application for future assignments.

Getting Help

Vectorworks Help

With the Vectorworks application installed and up and running, select Vectorworks Help from the Help menu to open the Help application. Alternately, select the "What's This?" command, which will change your cursor to an arrow with a question mark. You may then use this cursor to select an object within Vectorworks, which will send you to the appropriate location within the Vectorworks Help application.

The Vectorworks Help application is a robust depository of information that users can modify and adjust to their needs. The Help application can be automatically updated.

The Help Application Window is divided into two columns. The left column provides navigation, and the right column provides information. Enter search criteria where it says "Enter text to search." Results will be displayed in the right column. Selecting a search result will display the search topic. Search results can be saved as Favorites by clicking on the star icon. You may also add comments and other information.
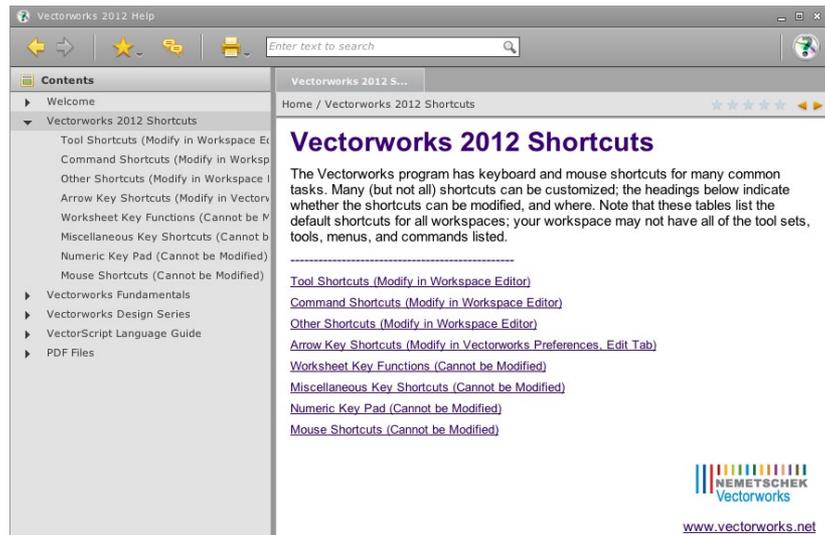
Additional Help

At *http://vectorworks.net* it is possible to access a number of additional learning and information-al tools, including user forums, mailing lists and demonstration videos and other guides (*http://www.vectorworks.net/training/guides. php*). The Vectorworks online community (*http:// www.vectorworks.net/community/index.php*) is dynamic and supportive. Join the user forums and e-mail lists.

There are specific lists and forums for theatre and Spotlight, but do not neglect the general forums and lists. Many issues that arise in Spotlight are familiar to the larger groups of users. Questions posed to the online com-munity are often answered almost immediately. Vectorworks is used widely internationally. Whenever you are working, there are others working around the world.

Links to the online community and RSS feeds are in the favorites tab of the Help Application. User links may also be added.

PDF manuals are shipped on the Getting Started DVD and can also be found under the Vectorworks Help menu for quick reference as you use the software.

Application Resources

On a Mac, the Vectorworks directory should be in the Applications folder on your hard drive. On a PC, this directory should be in the Program Files folder.

The libraries are an important feature that will take time to explore. Critically, the Objects-Entertainment directory contains symbols (pre–drawn objects) for nearly all of the lighting instruments available. There are also lighting accessories, lighting positions, speaker sym-bols, and truss symbols.

There are also libraries for textures (used to "paint" scenic elements and create gobo projections). The file names are generally descriptive of the file contents.

Symbols are 2D, 3D, or combined 2D/3D (Hy-brid) objects, that can be used repetitively and can have critical information attached to them via a data record. Symbols will be discussed throughout this guide.

Section 1:
Organizing Your Workflow

This section provides an overview of the Vectorworks environment and basic definitions. Everything described in this section will be reviewed in greater detail throughout the Guide
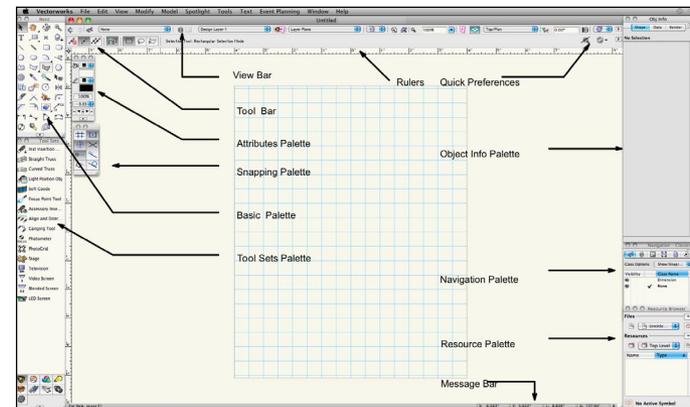
The Screen

When first opening the Vectorworks Spotlight application, your screen should look like this illustration. If it does not, go to the Menu at the top of the screen and select **Tools> Workspaces>Spotlight.**

On the left side of your screen you should see the Basic palette and the Tool Sets palette, which allow you to access additional tools for particular jobs. The Attributes pal-

ette and the Snapping palette are also to the left. On the right you should see the Object Information palette (OIP), Navigation palette and Resource Browser.

At the top of the active window, you will see the View bar and the Tool Bar. The Message bar is located at the bottom of the window.

Palettes

Basic

The Basic palette provides ready access to a collection of 2D drawing tools, 2D and 3D drawing modifiers, and basic dimensioning tools.

Tool Sets

Tool sets are collections of tools grouped for specific tasks. Note, for example that there is a Dimensioning tool set in addition to the Dimensioning tools provided in the Basic palette. In the Dimensioning tool set the basic tools are joined by additional tools.

Attributes

The Attributes palette sets various graphic attributes of 2D and 3D objects. When an object is selected, the line, fill, line style, and opacity of an object may be changed.

Constraints

The Constraints palette sets options for drawing with precise alignment. Constraints can be temporarily turned off by pressing and holding the apostrophe (') key. Users may set Preferences for the constraints and the displayed grid by double–clicking on any of the constraint icons. Constraints help with precise drawing and provide cues to the Smart Cursor.

SmartCursor. The Smart Cursor provides a series of cues displayed as text at the cursor's current location. The Smart Cursor can create snaps to specific points relative to other objects.

Smart Points. Smart Points allow the use of existing geometry as drawing guides. When Smart Points snapping is on, a Smart Point can be defined by pausing the cursor over an object point and pressing the "T" key. Drawing can then be aligned with that point. The alignment is visually shown with a dotted red line.

Working Planes.The Working Planes palette is not opened by default. In this version the functionality of this palette has been integrated throughout the interface, including the View bar, the Object Info palette, the contextual tools, and even the Planar tools. For the purposes of working through this book,however, go to **Window>Palettes>Working Plane** to open the palette. Locate the palette so it is accessible, but not in the way of drawing. Simply explained, working planes allow you to change the base plane on which you are drawing. Typically, the base plane is a flat horizontal plane. This palette will allow you to access multiple saved base planes.

Object Information Palette (OIP). The Object Information palette (OIP) is a critical design control point; every object selected in Vectorworks can be manipulated via the OIP. When you can't figure out how to modify something, look here first.

The OIP has three tabs: Shape, Data, and Render. Shape affects size, location, and specific parameters associated with different types of objects. Data references information associated with the object for use in worksheets, and Render affects the look of 3D objects in presentations.

Resource Browser. The Resource Browser allows access to symbols, textures, and other data within your file and other files that may or may not be open. Select the disclosure arrow at the top right of the Resource Browser and select **Add New Favorite Files**. Navigate to the Vectorworks directory and add the following files to your favorites:
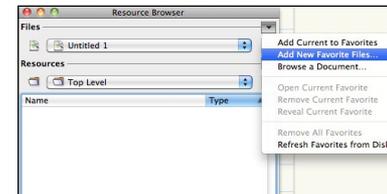
- **Libraries>Defaults>Renderworks-Textures>***Textures_Default.vwx*
- **Libraries>Objects-Entertainment>***Lighting-ETC.vwx*
- **Libraries>Textures-Gobo>Rosco-Gobos>***Rosco Abstract.vwx*
- **Libraries>Objects-Entertainment>** *Lighting Positions Imp.vwx*
- **Libraries>Objects-Entertainment>** *Lighting-Accessories.vwx*
- **Libraries>Objects-Building Architecture & Interior>***Detail-Molding Profiles Copper Beech Millwork.vwx*
- **Libraries>Objects-Building Architecture & Interior>***Furniture-Furnishings and Scenic Elements.vwx*
- **Libraries>Objects-Building Services>***Electrical-Accurate Lamps-Imp.vwx*

Libraries>Default Content is available from within the Vectorworks application. For example, the Default Textures can be accessed from the OIP and when editing class definitions.

Navigation

The Navigation palette will be covered thoroughly in Organizing the Drawing, but for the moment notice that this palette allows you to quickly access Classes, Design Layers, Sheet Layers, Viewports, Saved Views and References. Each of these items will be covered and defined. From the Navigation palette you can activate, navigate, and control visibilities.

Visualization

The Visualization palette will be covered in depth in Drawing a Light Plot. Note that this palette allows control of Light Objects and Camera Objects.

Document Window

View Bar

The View bar allows ready access to a number of important functions. View bar functions can be hidden and displayed from the drop-down list accessed via the Disclosure Arrow on the right of the View bar. We will cover most of the View bar elsewhere, but from the left you will see forward and backward arrows; clicking on these will take you back and forth between recent document views. Skip to the center right and you will see two magnifying glass icons that take you to a view of either a selected item or to a view of all items in the visible drawing (if nothing is selected). Cmd+6 on a Mac and Ctrl+6 on a PC have the same functionality.

There is a drop–down menu for your view of the drawing. Typically, set to Top/Plan (Cmd+5/Ctrl+5), which is the 2D view from overhead.

Top is a 3D overhead view, and the others should all make logical sense. You may also access each of these views from your numeric keypad with 5 being Plan, 2 being Front, etc.

Tool Bar

The Tool bar displays different options available for each tool selected from the Basic Palette or one of the task–specific Tool Sets. On the right of the Tool bar you have

Quick Preferences; selections available from the Vectorworks Preferences allowing the user to make rapid interface changes, as desired. Select available options via the Disclosure Arrow on the right of the Tool bar.

Message Bar

The Message Bar displays precise information about the location of the cursor in the drawing space. This display can be affected by selecting preferences accessed by clicking the Disclosure Arrow in the far right hand corner of the screen. Additionally, the Message Bar displays important alerts, back-up information and rendering progress.

Moving the View

To pan across the drawing at any time (even if a tool or command is active) hold down the Space bar and drag the cursor. This action is referred to as Boomerang mode since you will be returned to the active tool as soon as the space bar is released. Boomerang Mode does not work when editing text.

You may also directly select the Pan tool from the Basic palette.

Zooming

By default, the applications preferences set the scroll wheel of the mouse to zoom in

and out. Similarly, two fingers on a multi-touch track pad will zoom in and out of a drawing.

From the View bar, click Fit to Objects (Cmd+6/Ctrl+6). The view is adjusted to fit the selected object to the screen. When nothing is selected, the same action will fit all objects to the screen. Cmd+1/Ctrl+1 will zoom in, Cmd+2/Ctrl+2 will zoom out, Cmd+3/Ctrl+3 returns to the last view, and Cmd+4/Ctrl+4 shows the full–page view.

Preferences

Vectorworks Preferences

The Vectorworks Preferences can be accessed by navigating to **Tools>Options>Vectorworks Preferences.**

Select the **Session tab**, and then enter 100 in the maximum number of undos field. Verify or adjust other settings as desired. These are application–wide settings.

Document Preferences

File>Document Settings>Document Preferences allows you to set parameters specific to the active file. In the United States, select the **Dimensions tab** and set the Dimension Standard to "Arch."
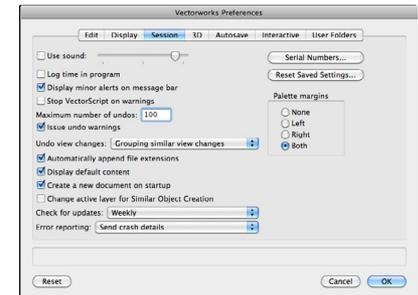
Unit Preferences

File>Document Settings>Units sets the options for dimensioning and specific units/measurement systems.

Spotlight Preferences

File>Document Settings>Spotlight Preferences allows you to establish specific settings for configuring the plot and communicating with Lightwright. (*http://www.mckernon.com*)

Quick Preferences

Some preferences can be toggled from the Tool bar. Available Preferences may be added or deleted by selecting the drop–down menu via the Disclosure Arrow on the right side of the Tool bar.

files and modifying your workspace(s).

From the workspace editor, we will make a copy of the Spotlight Workspace just to see how this is done. You will now have a window with three tabs that allow you to edit the Menus, Tools and Keys. Grab the New Menu from the left column and drag over to the right column. Name it. Note that you can readily rename the other menus just as you can rename a file. You can also delete a menu by selecting and hitting the delete key. Once you have a new menu, you can drag other items from the left column into your new menu, and arrange them as you like.

You can also edit the contextual menus to readily access an often–used tool from the right mouse button.

From the Tools tab, you can modify your palettes in much the same way. You can totally reorganize the tool sets to meet your work flow and needs.

In both cases, you can alter the keystrokes required to bring up a specific tool.

Workspaces

The Spotlight Workspace

Vectorworks is completely customizable. Adjusting the menu and palette layout is the most readily apparent way that the average user can make Vectorworks their own.

Editing/Creating Workspaces

Go to **Tools>Workspaces> Workspace Editor** and you will have several choices:
- Edit the current workspace
- Edit a copy of the current workspace
- Create a new workspace.

Avoid creating a new workspace and avoid editing one of the workspaces that are pro-vided in the installation process. Creating a new workspace gives you a blank slate. Making a copy of the Spotlight Workspace

gives you an excellent foundation on which to build, and you always have the original to go back to for reference. You can name the copy whatever you like to differentiate your workspace from the original.

Most users have several of their own workspaces. Typically at least one for use on a laptop and one for use with a larger screen. Over time you may find additional tools or plug-ins that you would like to add to Vectorworks. Some come with their own workspace. Other add-ons or plug-ins need to be added to any workspace where you might want to use them.

For example, lighting designers, may be interested in utilizing the visualization capa-bilities of ESP Vision (*http://espvision.com*) and would want to modify a workspace. If you work in television or corporate theatre, you will notice the Video Screen capabilities available in the Spotlight tool set. Devel-oper Andrew Dunning also offers a more powerful commercial version. Use of the commercial version requires adding plug-In

Organization

Vectorworks documents use several conventions for organization:

- Classes
- Design Layers
- Sheet Layers
- Viewports
- Saved Views
- References

When working in a team or just to keep files smaller, develop different elements in different files, and then use the File Referencing features to bring all of the elements together.

Let's look at the Organization dialogue box. Select **Tools>Organization**. Note the differences and similarities between this dialogue and the Navigation palette. Also be aware that this dialogue can be accessed from the Edit Classes and Edit Layers buttons in the View bar.

Classes

Classes are used to assign graphic attributes and to control visibility in drawing and when creating Viewports for presentation. Classes can be used for objects on different layers. Like Design Layers, they can be used to control what is visible. Vectorworks starts by giving you two classes: Dimension and None. Begin by editing the Dimension class. Click on **Dimension** in the **Organization** dialog box, and then click the **Edit** button. Check **Use at Creation** and set the fill color to none so that your Dimension text does not conceal other details. Click **OK**.
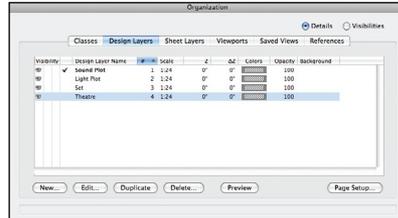
From the **Classes** tab in the **Organization** dialog, click on **New.** Name your class, and click the check box for **Edit Properties After Creation.** Create a Normal Weight class that has **Use at Creation** checked and set the line weight to a medium width, about twice the width of the Dimension Class line weight. Also create a class called Section Style with a thick line weight and cross hatch pattern fill. You will need this Class later.

Classes truly allow full use of Vectorworks, and, as a best practice, no object should be drawn without having a class assigned. Going further, consider that your theatre walls may have one color and your set wall to have another color. By using classes to assign these attributes, when the color of the set changes, you can change all of the walls at once. Similarly, you would want different classes to distinguish the Grand Drape from the masking.

Design Layers

The design layer is the basic level of organization. Think of layers as sheets of vellum on a table; architects use layers to distinguish floors of a building. Many theatrical designers create layers for the theatre, the set, the light plot, and the sound plot. Each design layer can have a different scale and can be set to different Z elevations.

This is a basic layer structure:

- Sound Plot
- Light Plot
- Scenery
- Audience
- Theatre Architecture
- Audience Seating
- Trace Layer

A PDF or a JPEG of a theatre, ballroom, or television studio architecture can be imported to a bottom tracing layer. On top of that you may have an architecture layer and a master layer for the set and other information. Design layers can be used to create specific physical elements that may be saved as symbols and placed in the layer with the architecture or the set.

Layer visibility is controlled in the Organization dialogue or via the Navigation palette.

Sheet Layers

Sheet Layers are used for presenting drawings. Sheet Layers are always in a 1:1/Full Size or Actual Scale. We'll discuss Viewports and Sheet Layers for presentations in the Presenting your Drawings section on page 91.

Saved Views

Saved Views (in the View bar) allow you to revert to previously saved views quickly at any time. There may be an area of detail that you continually need to return to in plan; a Saved View will allow that. Views can have different layers and classes visible. Saved Views are also very useful for looking at scenes rendered with lights focused, lighting levels set, and gobos inserted as you adjust the light levels.

Section 2:
Stationery Documents

When creating a new document (**File>New**), Vectorworks will ask if you want to create a blank document or use a stationery file. Vectorworks comes with a selection of stationery files, most geared for architecture. It is a useful time saver to create and evolve your own stationery files.

When you go to **File>Save As Template** and save a file as **Default.sta** Vectorworks will automatically file your template in the proper place. You will be able to access your saved settings whenever you create a new file.
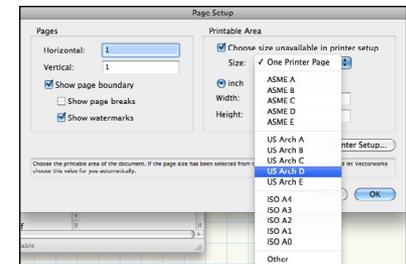
Go to **File>New** to create a new document; you will have a choice between selecting a blank document or using a template. A template file has various predetermined characteristics. Select **Create Blank Document** and we will determine our own parameters.

Go to **File>Page Setup**. Here you establish the size of the page and select a printer. The printer does not need to be selected now if you will be printing from a PDF, which is the rec-ommended practice. "Draw" on a sheet size that is the same as the size on which you plan to print. Let's establish an Architectural size D sheet (24" x 36"). If you are not connected to a plotter, you will have to check "Choose size unavailable in printer setup" on the top right and then US Arch D from the drop–down menu. On the left select "Show page boundary" and de-select "Show page breaks." Showing breaks will clutter your drawing area with divi-sion markers, likely dividing the 24 x 36 inch pages into 8 ½ x 11 inch chunks.

Click **OK** and now we will begin to make some specific settings.

Go to **File>Document Settings> Document Preferences;** you will see three tabs. We will leave the left and right tabs set to the default; select the Dimensions tab. Make sure the three check boxes are checked and that the drop–down menu is set to Arch. Click **OK**.

Go to **File>Document Settings>Units** and be sure that your document is set to feet and inches – or metric units – as appropriate. Of course, if you design the show in one system, you can go back later and convert the document from imperial to metric, or vice versa. Click **OK**.

You can add a Layer Scale button to your View bar by clicking on the arrow on the far right of the View bar and selecting Layer scale from the View bar menu. Click on the Ruler icon that has been added to the View bar and set the scale to 1/2"=1'-0" and click **OK**.

Select **Tools>Options>Line Thickness** and review the default settings.

Select and set a default font. With nothing selected on the page, go to **Text>Font** and select your preferred font. It should be something generally readable and if you will be sharing files, the font should be one that works across platforms and is installed on your colleagues' systems. You can make adjustments to text later in the OIP or Text menu.

Create these layers by going to

Tools>Orginization and selecting the Layers tab:

- Trace Layer
- Theatre Architecture
- Audience
- Soft Goods
- Scenery
- Sound Plot
- Light Plot

Set the layer scale for each layer to 1/2"=1'

Now, save the file settings as a template file. Go to **File>Save as Template** and the Save as Vectorworks Drawing Template dialog box will open and suggest that the file **Default.sta** be saved in the Templates folder of your User folder or the Vectorworks Directory. Click **Save**. Also save a copy of your default file as **DefaultLetter.sta**. In this file, change the document size to a standard letter–size page. All new documents, unless you select another template, will have the attributes you have specified set by default.

Drawing & Modeling

Vectorworks provides many ways to draw. For the user, it is a matter of choice to determine what works best for him or her and/or specific scenarios. Flexibility in drawing is one of the many great reasons to use Vectorworks.

Layer Plane and Working Plane

These are not drawing modes, but planar projections to draw within. Planar objects drawn in the Layer Plane will rotate in 3D space. Planar objects, formerly drawn in the Screen Plane were always projected to the screen, no matter the view whether top/plan or not and they had to be specifically converted to 3D to become 'unstuck. In the more recent versions of Vectorworks, objects, whether planar or not, may be selected and manipulated in any projection with all the functions of the combined drafting and modeling feature set.

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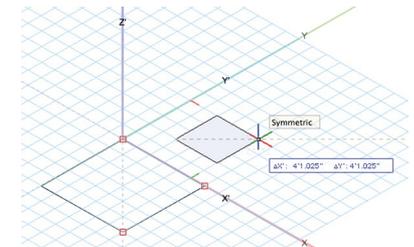
change what plane an object is assigned to by selecting the object and changing the plane in the OIP.

The Layer Plane is indicated by a pink box, unless you have changed the color in your preferences.

Creating Planar Objects

Open a copy of your **DefaultLetter.sta** file and use this file to work along as described below. Switch the plane from Layer Plane to Screen Plane in the View Bar.

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.

Rectangle

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 to describe the mode. There will also be text in the Mode bar that describes the active option.

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


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
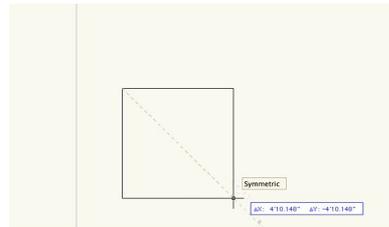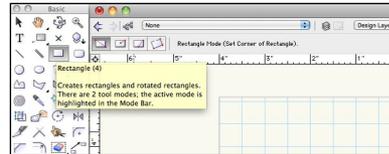
Data bar (FDB). Hit the Tab key to select the first field in the FDB and enter a specific dimension, tab to the next field, repeat, and click the mouse button. You have created a specifically sized shape!

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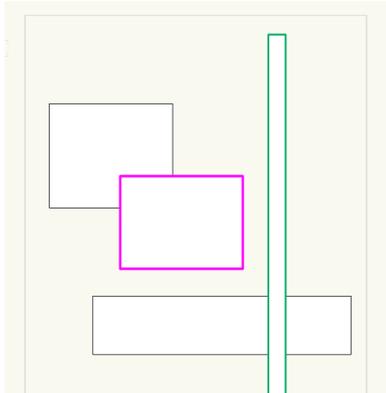
Select an existing rectangle and note that you can move it or resize it interactively with the mouse. Also note that you can change its size and location in the OIP.

Select the **Rectangle** tool and hover the cursor near another rectangle. Note the SmartCursor hints and alignments indicated. Align with a corner, indicated by the red extension line and hit the "T" key to lock in that alignment.

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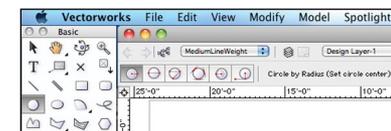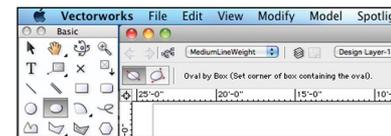
Notice the **Circle by 3 Points** option. This options also appears in Arcs and Curved Walls and is very useful in tracing curves and in designing the right size circle or arc.

Regular Polygon

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

Polygon and Polyline

These tools allow for freehand drawing. The Polygon only has 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.

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 Modebar
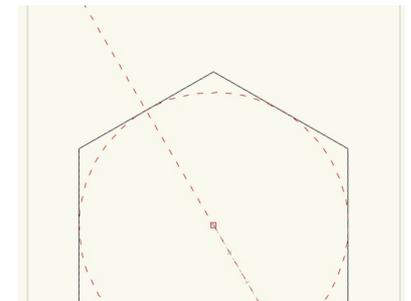
Triangle

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

Modifying Planar Objects

Reshape

The Reshape tool allows for the editing of any object created with the multi-step behavior.

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 visa 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 Polygons.** Select the **Reshape** tool from the Basic Palette and edit. You can also double–click the polygon and the 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 (access to the different Reshape modes can be found in the Tool bar,): try these things and then undo so you always return to the basic rectangle. First 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
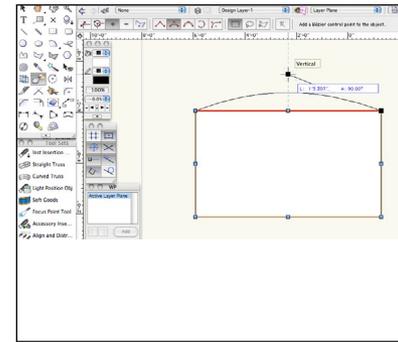
delete one of the corners so that you have a rectangle. Undo. Select **Add Vertex,** and be sure that you have the Corner Vertex option selected. Note that you can add and manipulate points only at a mid-point. Select the **Change Vertex** mode and then select **Bezier Control Point** mode.

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. Consider that if you have just drawn a complex shape and you will use that shape as a platform and you will need to allow for the thickness of the reveal and/or the structure. Simply offset the shape.
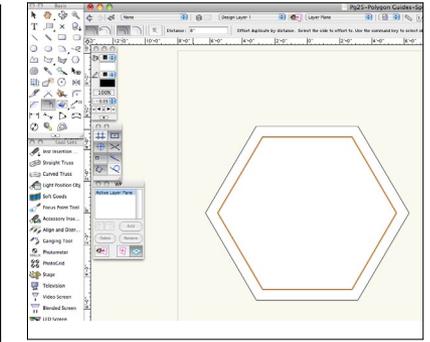
Fillet and Chamfer

The Fillet and Chamfer tools are very similar. 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, the third 'trims' the original shape to the new detail and deletes the lines left when using the second mode.
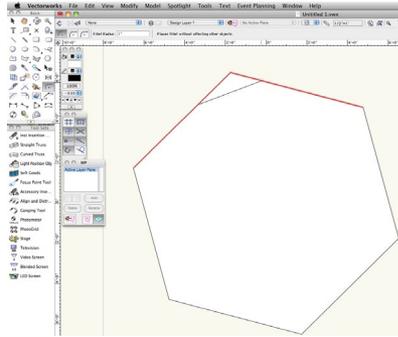
Select the tools, set your preferences and mode and then hover over the edge of a polygon. If eligible for Chamfer/Fillet, the edge will be highlighted.

Click and drag to an adjacent edge ,and it too will be highlighted. Click to execute.

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 object

into one. Draw two over lapping 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.

Exercise

Open a copy of your **DefaultLetter.sta** file and create 11 Design Layers with 1:1 scale. On 10 layers draw a 2D object using all the techniques described. Assign Graphic Attributes to each object using a class. Open the file **DesignLayerTitleBlock.vwx** and paste the Title Block and border into the 11th layer of your file. Place the Title Block at the bottom of the layer hierarchy. Layers can be moved in the Organization dialogue or Navigation palette. Edit the text as appropriate. Add sheet numbers and titles on the layers with your work. Example files are included .

3D Modeling Tools

Create a new letter size document in 1:1 scale. Go to the **Right Isometric View** using either the numeric keypad or the drop–down menu in the View bar. Choose the **Selection** tool from the Basic palette and select the **XYZ Axis** on the page. Note the series of colored dots that appear around the intersection of the axes. Note the convention of using RGB lines to indicate XYZ.

Working Planes

Hover the mouse over the dots and note how the cursor changes. Select a dot and rotate the axes. Note the pink rectangle that now indicates the new working plane that you have created.

In the Working Plane palette, select the now active **Add** button, and save this working plane.
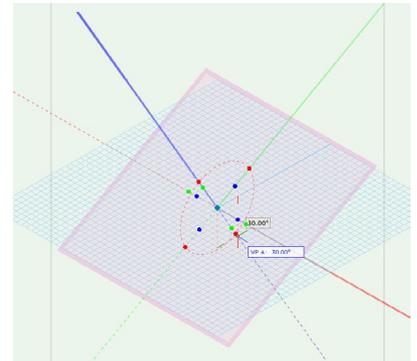
Select the Rectangle tool from the Basic palette and hover near the intersection of the axis. Note that you can click and draw on this new plane and that the cursor will "stick" to the 0-0 point at the intersection.

Draw a rectangle 5" x 2" and note that you can tab into the Floating Data Bar to draw precisely on the new working plane.

Push-Pull

After creating the rectangle the **Push Pull mode** is automatically activated. Move the cursor over rectangle, and when the red highlight appears click to start the push pull operation. Move the cursor up then press the tab key and **enter 2**" into the data bar. **Press the tab key and press enter twice** to end the operation. You can perform the same operation by selecting the Push Pull tool from the **3D Modeling Tool Set.**
Note that you can select and manipulate other faces of your extruded rectangle with the **Push-Pull tool**, but if there are other primitives in your document, drawn on other planes, those objects cannot be selected and manipulated without changing the working plane.

Fillet or Chamfer Edge

Like the 2D tools, the **3D Fillet Edge** and **Chamfer Edge tool**s modify 3D objects. Select the **Fillet Edge tool** from the **3D Modeling Tool Set.** Enter a radius of 1" by either clicking on the Preferences icon or entering directly in the Constant Radius box in the Tool bar. Select the top right edge of the rectangle highlighting it in red. Click the check mark in the tool bar to create the fillet. Select the **Push Pull tool** from the **3D Modeling Tool Set**, select the face below the newly created filleted edge, move the cursor to the right to start extruding this surface.
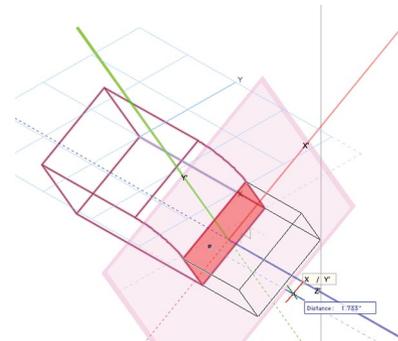
Press the tab key to invoke the Floating Data Bar, enter 2", press tab, and enter twice to finish the operation.

Set Working Plane Tool

Select the **Set Working Plane** tool from the **3D Modeling Tool Set**. Move the cursor around the object and note how different planes are highlighted. Select the top plane of the object. This will automatically set the

working plane. Activate the **Circle tool** from the Basic palette. Click in the center of the top of the object to start your circle. Then press the tab key to invoke the floating data bar. Enter ¾", press tab, and enter twice to complete the operation.

Protrusion Cutout

Select the **Push/Pull** tool from the **3D Modeling Tools Set**. Activate the third mode, **Sub-Face Mode** of the tool. As directed in the Tool bar, first select the curve and then the solid. Move the cursor towards the circle until it turns red and click and drag to add or subtract from the solid. Move the cursor down and snap the circle to the bottom of the solid. Click once to complete the solid subtraction. Go to **View>Rendering>OpenGL** to view the solid object.

3D Primitives

Hover around the 3D Modeling tool set and see what tools are installed. Experiment with the Sphere, Hemisphere, and Cone tools.

In a new document with 1:1 scale, draw a free form shape with the 3D Polygon tool. In the OIP, enter a Z value, and notice that you have a planar object floating in space. By carefully placing 3D Locus Points in space and connecting with the 3D Polygon tool,

you can create forms that would be difficult or impossible with other techniques. Experiment with the other 3D modeling tools and make a variety of forms.

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Editing 3D Shapes

Most 3D shapes can be edited by double–clicking on the form.

Exercise

Open a copy of your **DefaultLetter.sta** file and create 11 Design Layers with 1:1 scale. On 10 layers draw a 3D object using all the techniques described. Assign Graphic Attributes to each object using a class. Use the file DesignLayerTitleBlock.vwx as you did with the 2D exercise. Be sure that you have a different class for each object.

3D Commands

Extrude

In the View Bar switch the active plane to Screen Plane. Double–click on the Rectangle tool and enter the following data: width=3" [76.2mm], height=3" [76.2mm]. Deselect **Position At Next Click**, and select the middle circle in the object position locator. Then in the data fields next to the object position locator, enter **x=0** and **y=0**. Click **OK**. You will have a square in the middle of the page.

Double–click on the Circle tool. Enter the following data: radius=.5" [12.7mm], deselect **Center At Next Click**, and enter **Ctr x=0** and **Ctr y=0**. Click **OK**. You will have a circle in the middle of the page, on top of the square.

Select All (Cmd+A/Ctrl+A) and go to **Modify>Clip Surface**. You will now only see the circle selected. Delete the circle. The square has been clipped by the circle.

Double–click on the Circle tool. Enter the following data: radius=1/2" [12.7mm]. De-select **Center At Next Click**, and enter **Ctr x=1.5"** [38.1mm] and **Ctr y=1.5"** [38.1mm]. Click **OK**. You will have a circle over the top right corner of the square.

Select All and go to **Modify>Add Surface**.
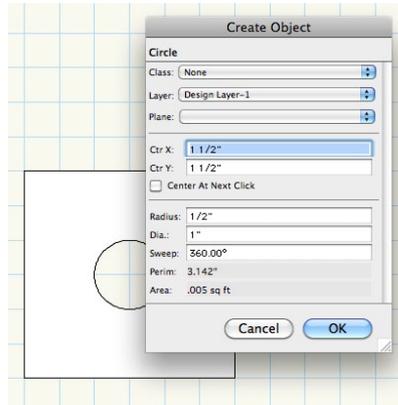
The circle has been added to the square. Let's make this a 3D object. Go to **Model>Extrude** (Cmd+E/Ctrl+E) and enter 3" [76.2mm] in the Extrusion field and click **OK**.

Select the **Flyover** tool and look at the object in different views. Do the same with the Custom View drop–down menu in the View bar and/or your numeric keypad. You will see the following options:

- Interactive Origin Mode
- Object Center Mode
- Active Layer Plane Origin Mode
- Working Plane Origin Mode

For our purposes, select Object Center Mode and click and drag to rotate the view. Experiment with the other options.

Now take a look at the object in different views. Do the same with the View drop–down menu in the View bar and/or your numeric keypad.

Sweep

Sweep (**Model>Sweep**) is a simple way to quickly create modeled or sculpted round 3D objects like balusters, finials, or martini glasses. We will start with a simple 2D primitive form. Consider sketching a rough draft of your final object and/or using a tracing layer with a placed JPEG or PDF image. PDF images created as vector files are especially useful for tracing in Vectorworks, as you can snap to points in the PDF.

Please refer to the file **Martini.vwx** included on this guide. The file shows each step broken down on different layers, and all of the objects are classed. Attributes and textures are assigned using the class definitions.. For illustration purposes, draw a few 2D lines to use as guidelines and use the intersections of these guides to create a martini glass and some liquid in the glass. Next, use the Polyline tool to draw the basic shape. Begin with all corner points and use the Reshape tool to add or convert points to curves and adjust the shape. Once you have the basic glass shape
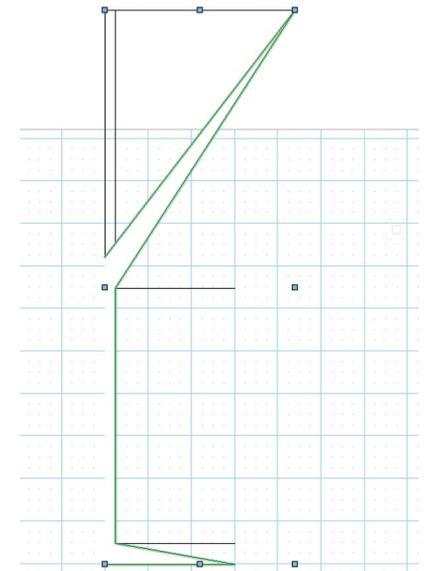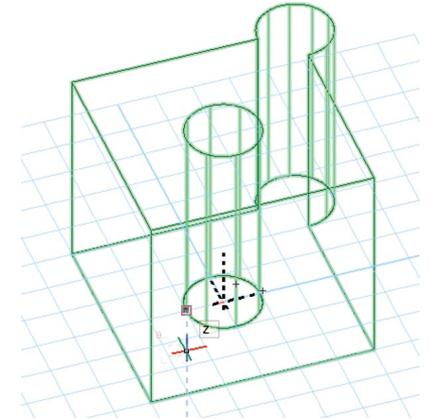
duplicate its layer, and edit the glass to become the form needed for the liquid. Use the Reshape tool to remove points and use the Clip tool (Basic palette) to delete enough of the form from the simplified shape so that the liquid will not "spill." This ensures that the inner profile of the glass and the outer profile of the liquid match.

Once the shapes are finished, duplicate the original layer with the glass profile and then copy the liquid profile from its layer to the new one using **Edit>Paste in Place**. Paste in Place will keep objects in their exact absolute position as long as you paste between layers of the same scale.

With the shapes drawn and positioned, go to **Model>Sweep,** enter 360°, and accept the other defaults.

Extrude Along Path

Extrude Along Path can be used to create many objects such as picture frames or ornate proscenium arches. Draw a rectangle, select a solid crown molding profile, and **Model>Extrude Along Path.**

Extrude Along Path extrudes around the center of the profile objects. This small bit of information is important in determining the size of your path. If you want the outer perimeter a certain size, your path needs to subtract the width of your profile.
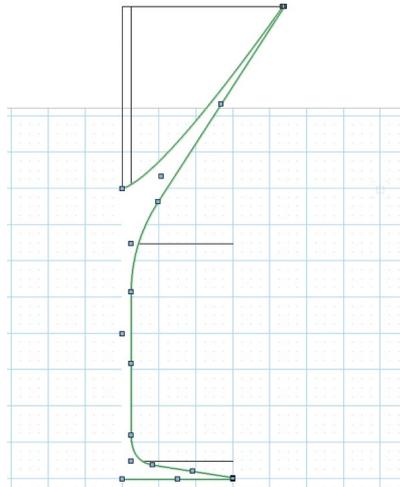
You can differently manipulate your extrusions, working with forms created in different Layer Planes. Check the Fix Profile box in the Extrude Along Path dialogue box to extrude a form on one Layer Plane perpendicular to a path on
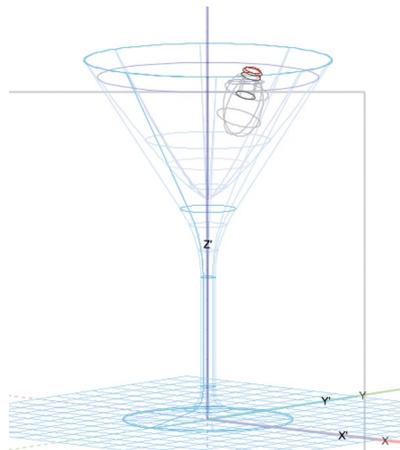
another Layer Plane.

Working in the Screen Plane, select a molding profile from the Beech Millwork file you added to your Resource Browser favorites. You can insert one of these symbols and **Modify>Convert> Convert to Group**, in order to be able to modify the form. Add a rectangle to represent a small piece of wood to hide the edge of the artwork, and place a rectangle. Select the two objects and then the **Model>Extrude Along Path** Command.

Note: Extrude Along Path will extrude from the top to the right and down, so consider the orientation of your profile. The illustration shows the finished product and the profile and path. An enlarged version of
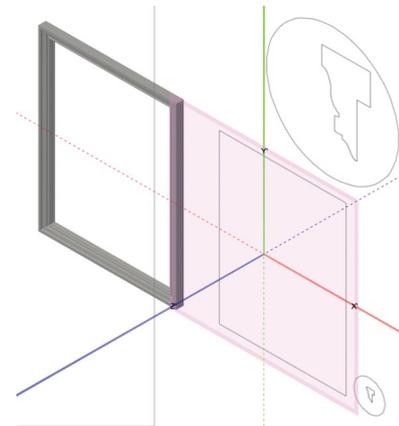
the profile is included for illustration of the orientation. Double–clicking on the finished piece allows you to edit (or flip) the profile or the path.

Multiple Extrude

Multiple Extrude allows for the creation of truncated and tapered objects. Draw a simple 2D primitive–a rectangle or a circle. Offset inside of that object. Select both profiles and go to **Model>Multiple Extrude.** Set a height and use the Flyover tool to examine what you have made. Double–click on the object to edit, or edit in the OIP.
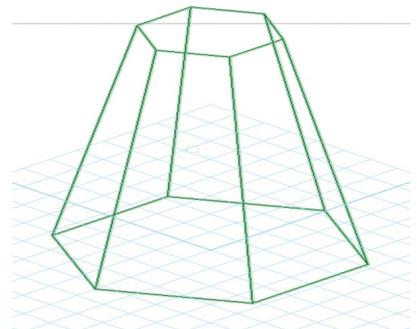
Note that these objects do not have to be centered over one another. Experiment.

Similarly, see the type of results that you can achieve with a single primitive and using the **Model>Tapered Extrude** command.

Chain Extrude
The Chain Extrude tool is located in the Building Shell tool set.

You can create a cornice with Extrude Along Path. You can create a cornice with repeating corbels using Chain Extrude.

Create the profiles as you would normally. If you want a continuous object and a repeating object, create the continuous object first. Select the object(s), select the **Chain Extrude tool**, follow the prompts, and draw the line required in the Plan View.

Revolve with Rail
This command is complex, but very useful for many architectural shapes and tents.

The Revolve with Rail command creates complex surfaces by revolving a planar NURBS curve about an axis. The revolution is guided by a rail curve on a plane perpendicular to the plane that contains the profile curve and axis.

To create a surface with profile and rail:
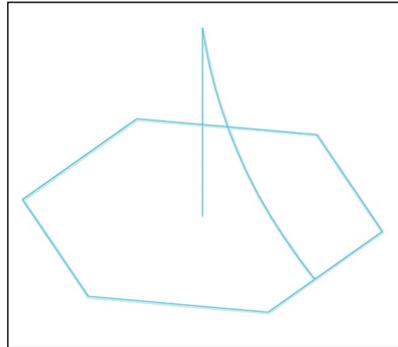
• Create an axis, a rail, and a profile. Then convert to NURBS curves. Begin by drawing in the Layer Plane.
• In the Front View draw a line from 0" to 2" [50.8mm] tall at 0-0. This is the axis.
• In the Top/Plan View draw a 2" [50.8mm] square centered around the axis. This is the rail. The rail must be perpendicular to the axis and the profile.
• In the Front View draw a curve between the axis and the rail. This is the profile. The profile cannot intersect the axis, it can touch it.
• Switch to an Isometric View, Select All (Cmd+A/Ctrl+A) and go to **Modify>Convert>Convert to NURBS**. Go to **Modify> Ungroup**. Deselect the NURBS.

• Select **Model > 3D Power Pack > Revolve with Rail.** Select, in order, the axis, profile and rail.
• The surface is created.

Solid Addition/Loft tool
Solid Additions are an extension of the idea behind Multiple Extrude.
• Create three rectangles of different sizes.
• Create a 4" [101.6mm] square at 0-0 in Top/Plan.
• Go to **Modify> Convert> Convert to NURBS**.
• Go to the Front View.
• Duplicate one copy 4" [101.6mm] on the Z axis.
• Go Back to the Top/Plan and create a 2" [50.8mm] square at 0-0.
• Convert to NURBS.
• Change the Z elevation to 2" [50.8mm] in the OIP.
• Go to the right isometric view.
• Select the **Loft tool** from the 3D Modeling tool set.
• Select the **Loft with no Rail mode** and click on three corners (see illustration).
• Check and review your options in the dialogue.
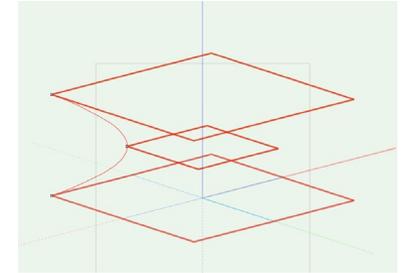
Manipulating Solids
Model>Add Solids and **Model>Subtract Solids** are the 3D equivalents of Add & Clip Surfaces. Create two intersecting 3D objects, select them both and try Adding and Subtracting. Note the red outline provided by the application that allows you to visualize how you are combining the objects. As in the 2D world, you can also work with more than two objects at once for some operations.

After you have created objects by adding or subtracting, you can double–click on those objects to edit or move the base forms.

Manipulating Hybrid Objects

Align/Distribute
You will need a number of objects on a page to experiment with this tool. Select the objects and go to **Modify>Align>Align** (Cmd+=/Ctrl+=).

You can align objects horizontally or vertically, and you can also distribute the space between objects. To align/distribute in 3D space, go to **Modify>Align>Align 3D**.

Grouping
Multiple objects can be grouped together for simpler handling with the Group command **Modify>Group** (Cmd+G/Ctrl+G). Groups can be edited by double–clicking on the Group to enter the Edit Group mode and can be ungrouped by selecting the group and going to **Modify>Ungroup** (Cmd+U/Ctrl+U)
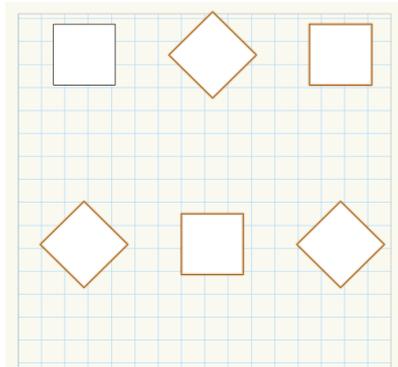
Move
The Move Command (Cmd+M/Ctrl+M) or Move 3D **Modify>Move>Move** or **Modify>Move>Move 3D** allows the movement of objects along the X-Y or XYZ axis of the drawing.
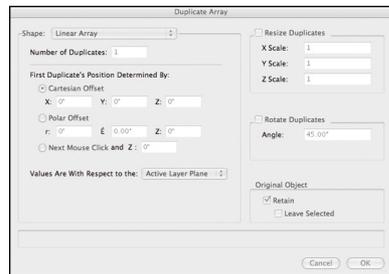
Duplicate Array
Often there will be a need to reproduce several of any 2D shapes or 3D forms. Go to **Edit>Duplicate Array** and note that at the top left drop–down menu you have three modes:
- Linear Array
- Rectangular Array
- Circular Array

Note: Options for each mode are different, but they do allow you to offset in different ways and to rotate the object(s) that you are duplicating.

The Duplicate Array command allows lighting designers to populate electrics and for scenic designers to create patterns.

Move by Points
The Move by Points tool is located in the Basic Palette and has three modes, Move Mode, Distribute Mode and Reference Point Mode.

Mirror
The Mirror tool is located in the Basic Palette. and has two modes in the Tool bar: Mirror Object and Mirror and Duplicate. Select your objects, select the Mirror tool, preferred mode, and click and drag. Hold the Shift key down as you drag if you want to constrain the angle of the mirroring.

Rotate
Not every object should retain its original rotation. Double–click on the Rotate tool in the Basic Palette and any/all of your selected objects can be rotated to a specific angle, up to 1/100 of a degree. You can also freehand rotate by clicking on an object, dragging to another point on the object, and clicking and dragging. Note that Vectorworks tells you when you are horizontal or vertical. Note also that you can rotate and duplicate in the Tool bar. Press the Shift key while freely rotating to constrain the rotation angle.

Rotate 3D
Rotate 3D is a Command, not a tool. **Modify>Rotate>Roate 3D** invokes the command. There are some objects that cannot be rotated in space with the Rotate tool.

Exercise
As you have before, create an 11–layer document and use these new techniques.

Project — The Lighthouse
This complex model uses the techniques explained in this chapter. Work on modeling the Cape Hattaras Lighthouse as you continue through the exercises that follow.
The JPEG of the lighthouse included on this guide is a half section/half elevation. Import the JPEG and use the **Modify>Scale Object command** and the **Symmetric By Distance** option to scale the drawing and to set a layer scale. This is why a scale bar must always be included on every drawing. The only point of reference available will be
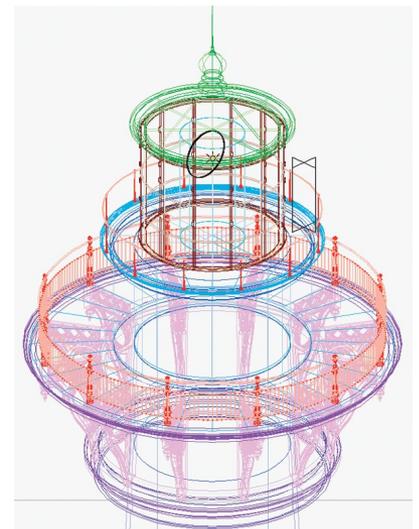
the scale bar on the JPEG. On a new layer, trace and model the lighthouse. Consider using different layers for different elements and either stacking the layers or assembling on one master layer.

As you plan your project, consider the number of finishes and object types that you will wish to class. Plan your drawing modeling before you begin work, making the classes first.

You can also challenge yourself with other great architectural landmarks. The United States Government HABS (Housing and Building Survey) Drawings from the Depression Era WPA is a great resource: http://memory.loc.gov/ammem/collections/habs_haer

The Cape Hattaras Lighthouse and the Windmill, modeled by student scenic designer Carla Ramos (her file is included on this guide) can both be found as part of the HABS archive.

Lighting Designer Lucas Benjaminh Krech rendered the Lighthouse seen at right after reading the *Getting Started Guide to Spotlight 2010.* He then blogged about his experience at http://lucaskrech.com/blog/index.php/2010/04/26/product-review-vectorworks-2010-part-2/

Once you are able to tackle complex challenges like these, you are prepared to model virtually any piece of scenery or complex venue you are likely to ever encounter.

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These challenges hone skills and enhance personal confidence.

Section 4: Hybrid Tools

In this section we will create a basic theatre space and a simple set using the Hybrid Wall, Window and Door tools located in the Building Shell tool set. Hybrid tools have both a 2D and a 3D component created in one drawing operation. Open a copy of your **Default.sta** document. Create the following classes:

- Theatre-Walls
- Theatre-Proscenium
- Theatre-Stage Floor
- Scenery-Deck
- Scenery-Walls
- Scenery-Ramp
- Scenery-Ramp Face
- Scenery-Columns
- Datum

- Lights-Instruments
- Lights-Positions
- Focus Point Objects
- Drapery-Legs
- Drapery-Borders
- Drapery-Full Stage
- Entourage-3D
- Entourage-2D

For the moment, create the classes, check **Use at Creation**, and give everything a solid fill. As you progress through the work, you may want to assign some objects colored lines in order to more clearly see your work and differentiate objects.

We are first going to create a theatre space. As you have noticed, Vectorworks creates a zero-zero point on the page. We are going to assume that zero-zero is the intersection of the Plaster Line and the Center Line in a traditional Broadway-size proscenium theatre. We are not going to be concerned that our theatre may go off the page in the Design Layer.

Locus Points

There is a 2D Locus and a 3D Locus tool, located in the Basic Palette and 3D Modeling Tool set respectively. Locus Points/Datum provide guides for drawing and reference points as needed.

In the View bar, set the Class drop-down to your **Datum** class and the Layer drop-down to **Theatre Architecture**. From the Basic palette, and in the Top/Plan View, double-click the 2D Locus tool and place a locus **X = -35', Y= 0'**. With the locus point selected, in the **Attributes** Palette set the **Pen Style** to a bright color. This will make it easier to find later.

Wall Tools

Click on the play icon below to watch a video of the following steps.

There are two Wall tools: the Wall and the Round Wall in the **Building Shell** tool set. Each have similar drawing options available in the Tool bar. The Round Wall also has options similar to those associated with the Circle, Arc and Oval tools.

Select the **Wall** tool and the **Right Control Line Mode** in the Tool bar. Click and drag to the right in your drawing and notice that the control line works as expected. Double-click to end that wall section and click and drag up, and the control line also works as expected. Now try starting a wall with the Right Control Line Mode, and as you click and drag to the left, notice that the wall is not drawn as desired. Similarly, dragging down (to start) will not provide the correct result. Try the same practice walls with the **Left Control Mode** selected. Notice that

for the Wall to draw as expected, you must start drawing to the right or up. Delete your practice walls.

Using the drop-down menu in the View bar, set the class to Theatre-Walls. Select the **Wall** tool. Select the **Right Control Line Mode** and via the tool Preferences, set the wall's Overall Thickness to 9" [228.6mm]. Click on the locus, drag up, tab into the FDB and enter 30' [9.144m] in the length; tab to the wall angle and set to 90°. Hit **Return,** and click on your page. Drag to the right. Tab into the FDB and enter 70' [21.336m] at 0°, hit return, and click and drag down the page. Tab into the FDB and enter 30' [9.144m] with -90°, click **Return** and double-click.

With the Wall tool selected, go back to the wall preferences and change the wall thickness to 24" [.610m]. Switch to the **Theatre-Proscenium** class. Click on the left wall's outside edge and drag to the right.
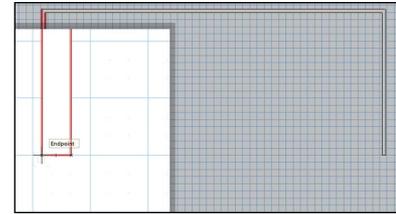
Double-click on the outside edge of the right wall. Use the **Zoom Loupe** (Z key) as needed.

Select all the walls and change the wall height (+Z) to 50' [15.240m] in the OIP. Select **Both** from the Caps drop-down in the OIP and edit the Theatre-Walls class to have a thick line (same as your Section Style) and a Pattern Fill of diagonal lines.

Floor

Click on the play icon below to watch a video of the following steps.

Make the **Theatre-Stage Floor** class active in the View bar. Select the Rectangle tool from the Basic palette. Click on the Up Stage Right outside corner of the wall structure and drag to the outside corner point of the Down Stage Left. Double-click on the Rectangle tool to create a rectangle with the top center at the **X = 0', Y = 0'** point 40' [12.192m] wide by 3' [0.914m] deep. Select both rectangles and then go to **Modify> Add Surface** to combine them.
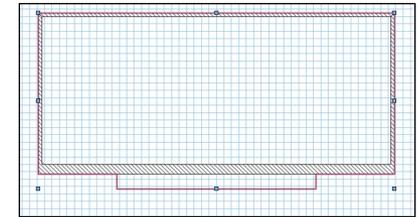
Go to **Spotlight>Architectural>Floor** and set the bottom Z to -36" -[.914m] and the thickness to 36" [.914m] and click **OK**. Go to **Modify>Send>Send to Back**. Go to **Modify>Lock** to lock the Floor in place.

Note: Extruding objects with a positive value extrudes them up from the zero Z, and extruding with a negative value extrudes down from zero.

Door and Window Tools

Click on the play icon below to watch a video of the following steps.

Now, add a proscenium opening. In the **View** bar, set the Class drop-down to your **Theatre-Proscenium** class. From the **Building Shell** tool set, select the **Door** tool and hover over the middle of the down stage wall. The SmartCursor will indicate: "mid-point" when you are in the right place. Double-click to insert the door. In the **OIP** click the Settings button. Under **General,** set the width to 40' [12.192m] wide and the height to 18' [5.4864m] tall and

change the configuration to Cased Opening. Click **OK**. At any time, use the Flyover tool, the numeric keypad, or the Current View drop-down in the View bar to check your work.

Work with the Door tool to add a standard size door upstage left.

Note: The Window tool works in the same basic manner as the Door tool.

Soft Goods Tool

Click on the play icon below to watch a video of the following steps.

Go to the Soft Goods Layer and set the drawing class to **Drapery-Full Stage**. Activate the Selection tool in the Basic Palette. Select the 2D Locus point we used when drawing the walls. You may need to draw a marquee around the bottom left corner of the theatre walls. Go to **Modify>Move>Move, X Offset = 5'** and **Y Offset = 6'**. Select the **Spotlight** tool set and select the **Soft Goods** tool. Select the **Preferences** in the Tool bar and set the **Function** to **Curtain**. Change the **height** to **6'**. Click on the 2D Locus to start the curtain and hit **Tab** to activate the FDB. Set the

Length to **60' [18.288m]**, press the **Tab** key, set the **Angle** to **0°**, and then press the **Tab** key again to set the angle. Double click at the intersection of the constrained length
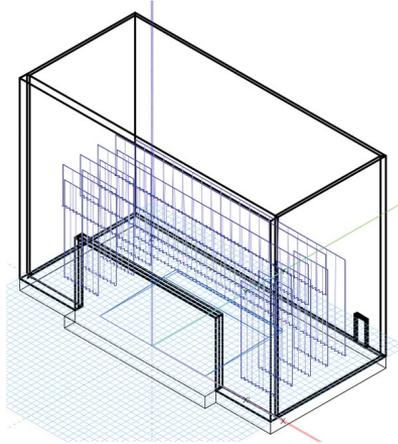
and angle indicated by the dotted red lines to place the Soft Goods object. With the Soft Goods object selected set the **Z** to **18'** in the **OIP**. With the object still selected, activate the **Move by Points** tool in the **Basic** Palette, click on the **Preferences** in the Tool bar, set the **Number of Duplicates** to **4**, and check **Retain**. Click **OK.** Click once on the 2D locus point, move the cursor up, press **Tab** to activate the **FDB**, set the **Length** to **4'6"** and the **Angle** to **90°**. Press **Enter** twice to move the duplicate and distribute the Soft Goods object. Press the **X** key twice to deselect everything and activate the **Selection** tool. Select the Soft Goods object closest to the rear wall. In the **OIP**, set the **Z** to **0'** and the **Height** to **24'**.

Switch the class to **Drapery-Boarders**. Select the first Soft Goods object we created. Activate the Move by Points tool, select the Preferences and set the Number of Duplicates to 1 and check Retain. Click once on the 2D locus point, move the cursor up, press

Tab to activate the **FDB**, set the **Length** to **7"** and the **Angle** to **90°**. Press **Enter** twice to move the duplicate the Soft Goods object. In the **OIP** set the **Z** to **0'**, **Adjustable Length** to **10'**, and the **Height** to **24'**. Make 3 duplicates using the **Move by Points** tool. The offset should be **4'6"**. Select all the legs and then the **Mirror** tool from the Basic Palette. Click and release on the mid-point of the stage and drag down; hold the Shift key to constrain the downward movement to vertical. Click again to mirror the objects.

Note: To see multiple layers using the same view, select **Unified View** in the View bar.
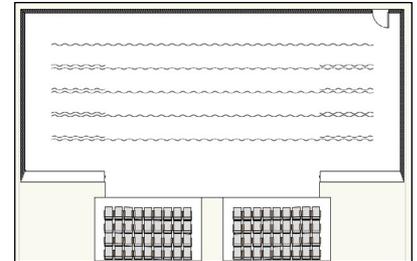
Create Seating Layout

You now have a fairly complete and well-masked stage house. Let's add seats. Set the class to **None** and the layer to **Audience**. Select the Rectangle tool from the Basic Palette and set it to **Rectangle** mode in the Tool bar. Start the rectangle from the midpoint of the DS edge of the stage and

draw down and to the left. The rectangle should be 20' [6.096m] wide by 12' long [3.658m]. With this rectangle selected, go to **Spotlight>Architectural>Create Seating Layout.** Select the Padded Theatre Seat and click **OK**. When prompted, select the focus straight ahead, and seats are automatically created. With the seats still selected go to **Modify>Move>Move 3D** and move -2' [-.610m] on the X axis and -3' on the Y axis. Use the Mirror tool from the Basic palette to duplicate the layout to the right.

Round Wall Tool

Switch to the **Scenery Layer** and set the class to **Scenery-Ramp**. Select the **Round Wall** tool from the Building Shell tool set. Click on the Preferences and set the width of the wall to 4' [1.219m], select the **Left Control Line** mode, and the **Wall By Radius** mode are selected. Draw from the center of the stage, click and drag straight down. Tab into the FDB and enter 4' and 90 degrees. Move your cursor in a counter-clockwise direction to draw an arc that is 270° so that the arc ends facing your audience. With the wall selected go to **Modify>Move>Move** and move the wall -2' on the Y axis. Set the height to 42" in the **OIP**. Edit the wall with the Reshape tool from the Basic Palette. Switch to the Left Isometric View and grab the top blue control point on the DS edge of the wall; drag it to the ground, changing the wall to a ramp. In a **Top/Plan** view activate the **Rectangle**

tool, set it to **Rectangle** mode. From the left point of the wall face that is parallel to the
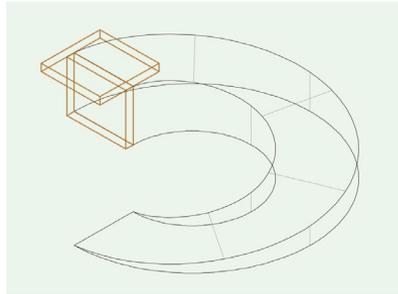
audience seating, start drawing a rectangle to the right. Press the **Tab** key to invoke the **FDB**. Enter x = 4' and y = -6" **Extrude** (Cmd+E/Ctrl+E) to 3'6" Switch to **Rectangle by Center** mode and create a 4' by 4' rectangle from the center of the extruded rectangle you just created. If you use the **FDB** enter 2' by 2'. **Extrude** this rectangle to 6". Set the **Bot Z** to 3'6" in the **OIP**.

Wall Sculpting

Switch to **Scenery-Walls class.** Select the Wall tool from the Building Shell tool set. Draw a 2' [.610m] thick by 24' [7.315m] long by 20' [6.096m] tall, 21' [6.401m] Upstage of the Plaster Line. This is a bit boring, so we'll add a few niches. On the midpoint, center a rectangle 1' [.305m] deep by 2' [.610m] wide. Go to Model> Extrude and set the Extrusion to 7' [2.134m] and set the bottom Z to 4' [1.219m] in the OIP. Make 2 duplicates of this object to the right and 2 to the left with a 2' seperation between each. Use the Edit> Duplicate and the
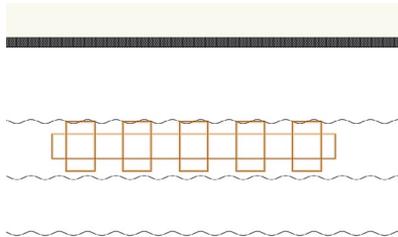
Modify>Move commands to accomplish this. Select all of the elements and the wall. Go to **Spotlight>Architectural>Create Wall Recess** and accept the defaults.

Note: You can also add wall projections if you like. The process is very much the same. We have mainly used the default settings. It is critical that you go back and experiment with other settings to see how they affect your choices and possibilities. Experimentation and observation is the only way that a new user can master the program.

Rotated Plan

Note the Rotate Plan icon in the View bar. This tool allows users to change the angle of the view of the plan such that if, for example, the set was not parallel and perpendicular to the Plaster Line/Center Line, the set could be viewed at right angles.

Select the **Unified View** button in the View bar for all layers to align to the new view. Rotated Plans can be saved as Saved Views.
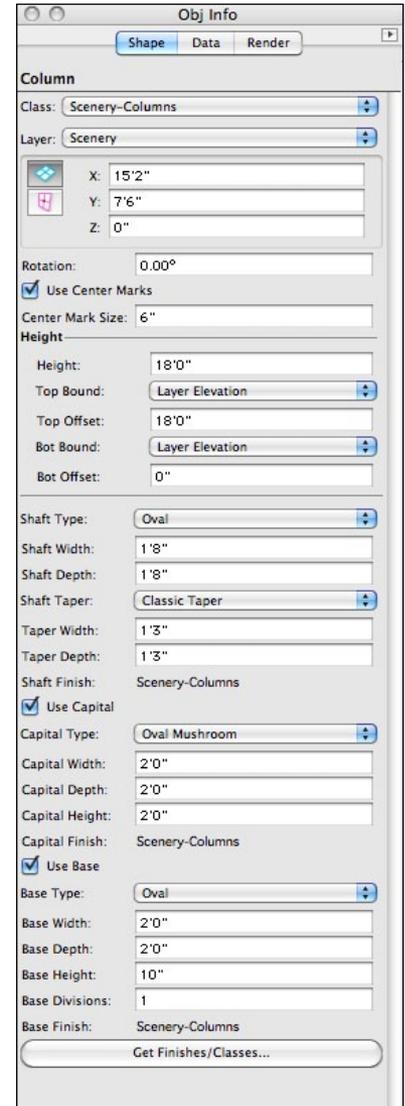
Column Tools

First set the class to **Scenery- Columns** Now let's go back to the Building Shell tool set and select the **Column** tool. Insert a column stage left in wing two. Select the column and go to the OIP. Enter the data as shown in the screen capture, on page 47. Select **Get Finishes/Classes** in the OIP and seat all to the class Scenery-Column.

Save this Theatre Project file for future reference. When manipulated with the Flyover tool, your work should look like the illustration below..
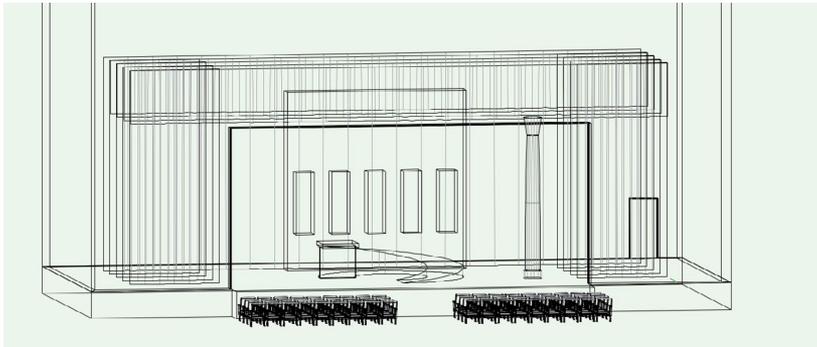
Section 5:
Understanding Symbols

Symbols are specifically intended for items that repeat, but can also be used for one-off objects. Symbols help keep a file or a project organized.

Symbols help control the size of your file. A symbol definition is stored only once in your file. If you edit a symbol, all instances of that symbol will be updated. Data can be attached to a symbol.

Any object can be saved as a symbol and will be stored for your access via the Resource Browser. You can then readily edit the symbol by right-clicking on the symbol in the Resource Browser.

Elements within symbols can be given classes for rendering and line weight. The symbol itself can also be classed. In this case DO NOT CHECK the "Use at Creation" box and assign no attributes when creating the Class for the symbol(s).

If a project has moving scenery, multiple instances of the same symbol with different classes can represent the unit on stage and in storage.

Symbol Geometry

2D Symbols
A 2D symbol has only 2D geometry.

3D Symbols
A 3D symbol has 3D geometry and will display properly in all views, rendered as the user dictates.

Hybrid Symbols
A Hybrid symbol has both 2D and 3D geometry and displays the 3D geometry in all views EXCEPT Top/Plan. In the Top/Plain View a Hybrid symbol displays simple 2D shapes. Lighting Instrument symbols are Hybrid symbols.

Available Resources

Go to your Vectorworks application directory and look at the many libraries provided. You can add more as Favorites so their contents can be accessible via the Resource Browser or you can open some of these files and then access them via the Resource Browser. In the latter case, you can right-click on a symbol and either "Import" or "Reference" the symbol. Note the section about 'File Referencing' below.

Take some time to look through the valuable content that Nemetschek Vectorworks has assembled. In addition to the audio gear and lighting equipment you will find furniture, hardware, and fixtures that will prove useful.

Inserting Symbols

Symbols are inserted using the 2D or 3D Symbol Insertion tools after a symbol is selected from the Resource Browser and activated. Some special types of symbols have specific insertion tools. Those other insertion tools will be covered later.

Note: To insert symbols click once. The you can rotate the symbol. Click a second time to lock down the rotation. Double-click on insertion if you do not want to rotate.

Creating Symbols

To create a symbol, select a 2D or 3D object or group and go to **Modify>Create Symbol.** The Create Symbol dialogue offers several options: it allows you to select where the symbol will be inserted and whether the symbol is scaled to the World Base or Page Base. It also allows you to class the inserted symbols.

World Based symbols are inserted 'in scale' while Page Based symbols will always appear in the size drawn on the page, no matter what the scale of the layer.

If you have a 3D symbol and want it to be a Hybrid, see Editing Symbols.

Symbol Types

Plug-in objects (PIO or PIO's) are like standard symbols, but customizable. You will see that doors and windows are PIO's and can be varied within a single drawing. PIO's are modified in the OIP or other dialogues.

Red
A "red" symbol is a symbol converted to a PIO. Individual insertions of these symbols can be extensively modified in the OIP.

Blue
A "blue" symbol is made when, Convert to Group is selected when the symbol is created. When placed, this type of symbol is converted to an editable group. Changes made to the symbol later have no effect on the group.

Black
The most common type of symbol is the "black" symbol. Changes made to the symbol affect all instances of the symbol.

Modifying Symbols

Symbols can be modified or replaced via the OIP. Symbols can be scaled by percentage symmetrically or asymmetrically.

Editing Symbols

Symbols can be edited from within either the document or the Resource Browser. When editing in the document, the objects around the symbol are grayed out. When editing from the Resource Browser, the symbol appears isolated. Right-clicking on a symbol in a document shows a contextual menu that offers the choice of editing the 2D or the 3D component of the symbol. Right-clicking on the symbol in the Resource Browser brings up a dialogue that allows you to edit the 2D, the 3D, and options. In order to edit a symbol in the Resource Browser, you need to be viewing symbols within the active document. Click on the House icon in the Resource Browser to switch to the active document.

Editing works like any other drawing modification. Note the heavy yellow-orange border around the drawing area that indicates you are in the Edit Symbol Mode. Also note the **Exit** button in the top right of the window.
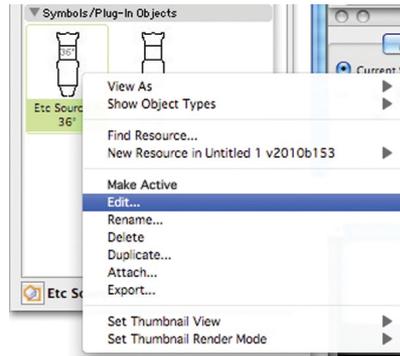
To Create a Hybrid symbol, edit the 3D component and copy the entire object. Exit the 3D and edit the 2D component and **Paste in Place** (Cmd+Opt+V/Ctrl+Alt+V) the 3D element. With the 3D element still selected, go to **Modify>Convert>Convert to Polygons**, select the Hidden Line option. In the OIP set the Plane to Screen. Exit the Symbol.

File Referencing

Go to **Tools>Organization** and open the Organization dialogue. Select the **References** tab on the far right.

References are the key to collaboration. If one member of the team draws the studio, theatre, or ballroom space and saves it as a symbol, other members of the team can "reference" that symbol. If it is modified, all drawings associated with that reference will be updated. Similarly, the set designer can save the scenic elements as symbols, and as the design is developed, all members of the team have updated information. A scenic studio or technical director can add structure to the set by inserting other symbols.

Exercise

Open the **TheatreProject.vwx** file with your set and theatre model. Save the Back Wall and the Column as symbols.

Section 6:
Drawing a Light Plot

In preparation for creating a light plot we will go through several steps that add information to our document. Users will want to add these settings to their **Default.sta** document.

Open your **TheatreProject.vwx** file with the theatre and set model. Work on the **Light Plot layer**.

Label Legends

A label legend provides information around your units. Go to **Spotlight>Label Legend Manager** and select **Add**. Call the first one LL-1 for brevity. Once created, click in the left column to make the legend active.

Select **Edit Fields**. For simplicity select only three of the many possibilities: Unit Number, Color, and (down near the bottom) Focus. To select a data field, just check in the left column.

Note: In the right column you can choose to enclose information in a container.

Containers are symbols, and to change the container, you must edit the symbol in the Resource Browser. The container symbols do not appear in your document until you choose to use them.
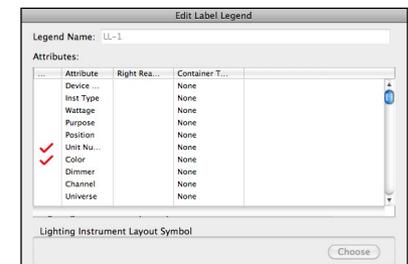
Click **OK**. Select **Edit Layout,** which will open the Edit Symbol window, defined by the colored border. From here you can select and drag the labels from the left column around the instrument. The Smart Cursor will help you align the data. You can also use the Align command. Text can be formatted from the Text menu. Click **Exit Symbol** when finished.
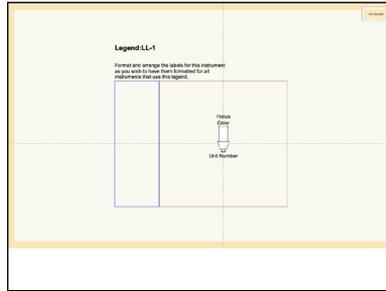
You will also want to create additional label legends to use on vertical lighting positions; one with the information on the right and the other with the information on the left. Remember once you have created your label legends, add them to your **Default.sta** document.

Label Legends will automatically size themselves appropriately for the instruments to which they are assigned.

Lighting Positions

Click on the play icon below to watch a video of the following steps.

Next, you will need some electrics. Go to the **Resource Browser**, use the drop–down menu to access the Lighting Positions file we already added as a favorite. To more easily view resources in the **Resource Browser** click on the disclosure arrow underneath the **House** icon and select **View As>Thumbnails.** Select the 50' pipe symbol. Right+Click (Ctrl+Click on a Mac) and select **Import** from the contextual menu. Revert back to the active document in the Resource Browser by clicking the **Home** icon. Switch to the Lights-Positions Class and set the layer to **Light Plot**. Double–click on the 50' pipe to select it. Go to the **Spotlight** tool set and choose the **Light Position Obj** tool. Align the insertion point with the midpoint of the DS edge of the stage, press the **"T"** key, and position between the Proscenium wall and the first Soft Goods Curtain. Set the **Z** height to **24'** in the **OIP**. Name the position **1st Electric** in the **OIP**. Repeat for the onstage electrics. Use the Vectorworks duplication options to add more **Lighting Postions** on stage.

Off–stage add one 20' Vertical Lighting positions on the left side. Line the insertion point of the lighting postion to the left of the corner of the seating layout, click once then move you cursor down and then click to place the position vertically. Use the center of stage to place the next off-stage 20' position behind the seats.
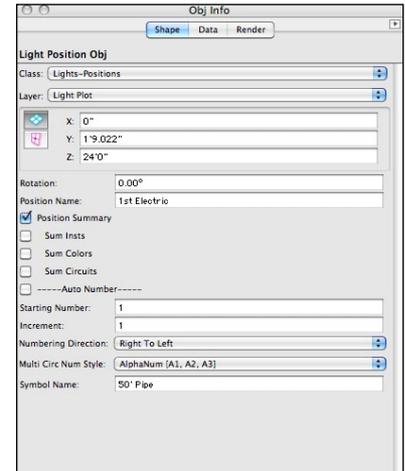
Creating Lighting Positions

The Vectorworks libraries are great resources, but they cannot anticipate everything any designer will ever need. The application allows you to create for your particular situation. Any hybrid symbol inserted with the Lighting Position tool (or you can select a hybrid symbol and go to **Spotlight>Object Conversion>Convert to Lighting Position**) can be a lighting position.

You can easily create a lighting position with the Truss tools or with simple primitives. The Truss tools are pretty self explanatory at this point: they create hybrid objects. A library of commercially available truss included with the package.

While a lighting pipe is typically round, you can choose to make it a square (simpler

geometry, smaller file size) extrusion 2" [50.80mm] by 2" [50.80mm] by your choice of length. You will likely want to assign a class to the 3D element. Make sure that your 3D component is centered at 0-0 and **Modify>Create Symbol,** with the insertion point at center. Name the symbol, click **OK** and then right–click on the symbol in the Resource Browser to edit the 2D component, which currently does not exist. There

are two schools of thought on the 2D component–line or rectangle. The decision is up to you. In either event, double–click on the 2D tool you need and place the object–the same size as the 3D (in the case of the line, the same length)–at the 0-0 point. Class the new object, and exit the symbol. You now have a hybrid symbol that can be used as a lighting position.

Trusses

The Truss tools in the **Spotlight** tool set can be used as Lighting Positions. There are **Straight** and **Curved** Truss tools They insert hybrid objects. You can specify sizes to create either custom trusses or objects that match trusses you know you will be using. There are truss symbols for many manufacturers in the Entertainment Library.

If you are using trusses, draw the elements you need, select them and choose **Spotlight>Object Conversion>Convert to Lighting Position**.

Inserting/Modifying Instruments

Click on the play icon below to watch a video of the following steps.

Switch to the **Lights-Instruments** class and activate the **Selection** tool. In the Resource Browser, select **Lighting-ETC** from **Files** drop down menu. Double–click on a 26° instrument symbol. Notice that the Instrument Insertion tool has been activated. Place the first instrument on the 1st Electric position at center. Look at the **OIP** and notice the number of options available. **Right+Click/Ctrl+Click** on the lighting
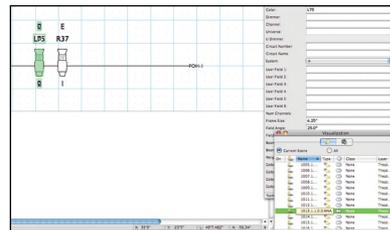
instrument, select **Focus Instruments**, select **Next Click**, give the Focus point a name and set the **Height to 0'**. You can also create a focus point using the **Focus Point** tool in the **Spotlight** tool set. Create a few

focus points on around the stage. Use the **OIP** to change their **Class** to **Focus Point Objects**. Double–click on the Lighting Device or click the Edit button on the **OIP**. Select another focus for the unit. On the Light Information tab, select **Draw Beam**. Click **OK**. Notice that Vectorworks Spotlight calculates the angle and coverage of the instrument. You can use this feature to verify your instrument choice. Don't forget to deselect **Draw Beam** from the OIP, or your drawing will become very cluttered.

Coloring Lights

From either the Lighting Device dialog box or the OIP, you can assign Rosco, Lee, or GAM color in the color field. A Rosco color is noted as R36 and a Lee as L36. Hexidecimal or RGB values can also be entered.

You can add additional information to your schedule. When you add color and focus in the OIP, that information will appear in the LL-1 label legend in Top/Plan view on the plot. Also note that the instrument added now appears in the Visualization palette. Double-clicking on the instrument in the Visualization palette selects that unit on the plot.

Editing Lights

Lights can be edited and focused in a variety of ways. We've already looked at the powerful OIP and have seen how that design control point interfaces between your lights, focus objects, positions, and label legends. Let's look at other options. Right–clicking on the instrument in the
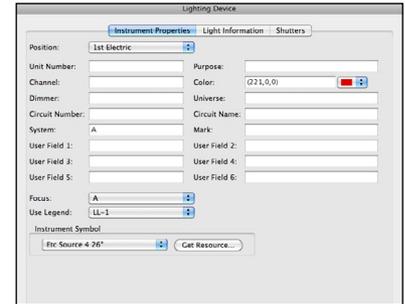
Visualization palette allows editing of the lighting properties.

Double–clicking on the instrument in the plot allows editing of various properties, including shutter cuts for visualization. Right-clicking on a unit offers several choices: Assign Label Legend to Insts, Focus Instruments, Referesh Instruments, Edit, Edit Light and Properties in the contextual menu. Edit opens the Lighting Device dialogue. Edit Light accesses the dialogue at right, reaching into the symbol to access the Vectorworks light source (more on those a little later). Properties is another route into the OIP data.

Use the Instrument Insertion tool and Duplicate Array command to add additional instruments. Add information as you need in the OIP. Once you have populated an electric, select the position and check "Auto Number" in the OIP; the instruments will be numbered and that information will be added to the plot. If you move units around, deselect and reselect Auto

Number, and the information will be updated on the plot.

Before we can present and visualize this light plot, go to **Spotlight>Reports> Generate Paperwork.** Select the schedules you need, for example, select **Instrument Schedule** and click **Setup** to specify what to include in the schedule. Schedules will be stored in the Resource Browser.

Adding Accessories

Instruments often need accessories like color scrollers, or barn doors. There is a selection of accessories in the Vectorworks Entertainment Library. You can also make accessories symbols by creating a hybrid symbol, selecting it, and going to **Spotlight> Object Conversion> Convert to Accessory**. Selecting an accessory symbol activates the Accessory Insertion tool.
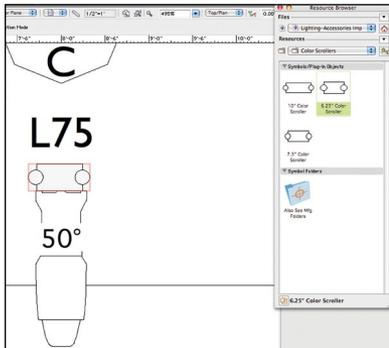
Inserting accessories is a three-click operation. The first click inserts the accessory, the second click sets the angle. The cursor provides highlighting for the third click. Clicking on an instrument in place associates the accessory with an instrument.

Adding Gobos

Vectorworks comes with a large library of gobos by many manufacturers. You can easily import a gobo texture into your document or create a custom black–and–white or full–color gobo.

Any square graphic image can be imported into Vectorworks as a gobo texture. Go to **Spotlight>Visualization>Create Gobo Texture** and follow the steps through the creation of the texture. Name the gobo. We'll look at creating textures in more depth shortly, simply accept the defaults. Remember that the gobo projection is only going to the image within a circle within your square image.

Alternately, via your Resource Browser, you can open or add as a favorite one or more of the stock gobo libraries and import a gobo texture. Once you have your texture(s) in place, you can add one or two gobos to any instrument in the OIP. You can see in the OIP that you can also rotate the gobo images as needed for visualization.
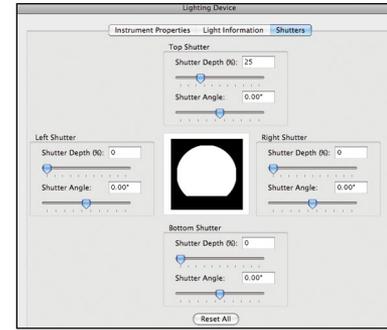
Shutter Cuts for Visualization

Double–click on an instrument in your plot and open the Lighting Device dialogue. The right–hand tab will be for shutters. This dialogue simple and easy to understand. It is very interactive. You will need to check your work as you go by rendering with the single light activated.

Aligning Instruments

Although it is possible to Align/Distribute lighting instruments with the **Modify>Align** commands, the Spotlight Align tool provides additional entertainment industry–specific options. Select multiple instruments and select the **Align tool** from the Spotlight tool set. As indicated in the Tool bar, draw a line to align the insertion points of the instruments. Once the line is drawn, you will see the associated dialogue that allows alignment or alignment plus distribution–including distributing on instrument centers.

Ganging Instruments

Instruments can be ganged by channel, dimmer, or circuit as specified in the tool Preferences. Once the ganging method is selected and the tool is active, click on two or more instruments and then once in space to gang the units. Clicking above the units places the ganging graphic above, clicking below places the gang indication under the instruments.

If you gang three instruments and need to revise the ganging to two units ganged adjacently, simply select and delete the ganging graphic that attaches any two of the units.

Vertical Lighting Positions

We are not drawing this plot for production, but rather to illustrate how all these tools work, individually and together. In production other and/or different fields would be required, but the principles remain the same.

On the 20' [6.096m] verticle pipe your placed outside of the theatre architecture. Populate the position with a few lights. Begin with one unit to the right of the position. Assign the unit to the position and give it a color and Label Legend. Duplicate the light down the pipe and Mirror the units. Now Mirror the entire position to the opposite side of the stage. Reassign and adjust the Label Legend information. Name the position and assign the lights to the position. You can then select the postion and all the lights and use the mirror tool to duplicate the entire postion on the right side of the theatre.
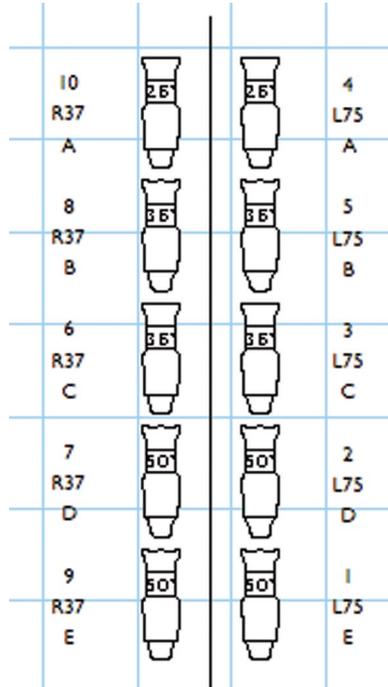
Projection/Monitor Tools

Vectorworks includes a number of very useful tools if you will be working with projections onstage, in television, trade shows, or corporate theatre. In the Spotlight tool set,

take note of the Television tool and the three Projection Screen tools–Video, Blended and LED.

These tools work very much like many others covered. Take some time and explore them in a new file. Note that once inserted, you can change the size of the monitors/screens in the OIP. Note that the screens show you projector placement. The projection cones appear in 3D so that you can analyze any obstruction issues on the computer and not in the field.

Photometrics/PhotoGrid

The Photometrics and Photogrid tools provide you with two ways of ensuring that you have an even wash and that your focus areas are not spread too thin. If you are working on a television production, Vectorworks uses these two tools for measuring the light from your instruments.
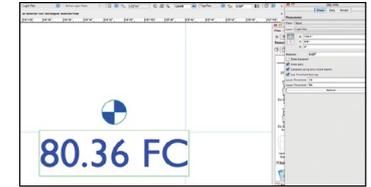
The Photometer tool in the Spotlight tool set measures the elevation and light at any given point on the stage. Draw Beam must be turned on for this tool to work. Simply select the tool and insert on the plot. As you turn Draw Beam on and off for different units or systems, you will have to refresh the Photometer Object.

The Photometer Grid tool allows you to create an array of photometers across the stage–perhaps one at the center of each area and one where each area overlaps with the next.

Custom Lighting Symbols

Any Hybrid symbol can be made into a Lighting symbol by selecting the symbol in the document and going to **Spotlight> Object Conversion>Convert To Instrument.** In this way, you can assign a symbol to represent a practical or prop lamp and be accounted for in your paperwork.

The next section details Vectorworks lights. Once you review that section, you can come back, edit your 3D symbol, and insert a light.

If you are looking to represent a specific lamp type, Vectorworks has a file of lamps in the library, which you should have already added to your Resource Browser favorites. You can also import Illumination Engineering Society (IES) data from manufacturers specifications.

Be sure that your symbol either uses the default instrument texture or a texture with cast shadows unchecked for the light to pass out of the instrument.

Create Plot and Model View

The Create Plot and Model View command will create a Definition Layer for the boom(s) selected. From that Definition Layer it places a Design Layer Viewport (DLVP) of the boom(s) in plan on the Plot Layer–this is your 2D Light Plot View. It will also place a DLVP of the Definition Layer on a new or existing Model Layer. The Model Layer (after you have rotated the booms) is used for stage sections and rendering.

Critical issues:
  • *You must have a layer structure as I have previously described.*
  • *Your lights and positions must be on one layer.*
  • *If your focus objects are on the layer with your lights and positions, they should be classed together and invisible.*
  • *Be sure that you do not have any Sheet Layer Viewports created that reference the Plot Layer.*

Select one of the vertical positions and associated units.
Go to **Spotlight>Visualization>Create Plot and Model View**.

The Create Plot and Model View command moves the selected lights and lighting positions to a new design layer and references them back to your Plot Layer as a Design Layer Viewport (DLVP). Create Plot and Model also places a DLVP on an existing model layer, or it will create a new model layer.

The first dialogue in the process names the new Definition Layer. Since we have two vertical positions, we will run this command twice. Name each Definition Layer so you can identify your positions. Check the box next to Vertical.

If you have multiple boom positions, you must run Plot and Model View for each boom, or create the booms on layers separate from your horizontal hanging positions.

If you include your horizontal positions or have nothing selected when you run the Create Plot and Model Command, all or none of your positions will become vertical positions.

Definition layers are created at the same scale as the original layer. Objects are placed at the same position as they were originally drawn. When viewing the Model or the Plot Layer, be sure to turn off all the visibility of the Definition Layers.

On the Model Layer you can rotate and position the booms so that they will appear correctly in sections and elevations using the Selection tool in the Basic palette or use **Modify>Rotate>Rotate 3D**.

In your Model Layer, in the Top/Plan View, select a boom and rotate so it faces the stage. Repeat, as required for each vertical position.

If you create each position manually Create Plot & Model will create another Definition Layer and DLVP that contains all the other geometry–It just won't rotate that way all you
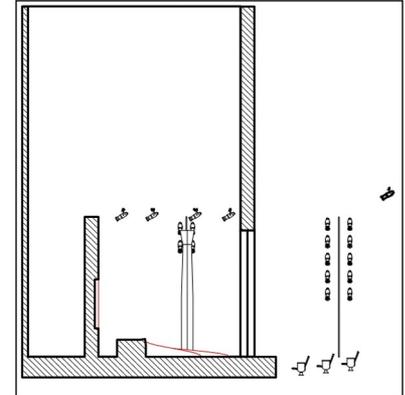
have on your plot and model layer are DLVPs.

If you view your Plot Layer and Model Layer, you are going to see the DLVP on the Plot Layer and the DLVP on the Model Layer. Use the visibilities options in the Navigation palette to make your choices.

When we create Viewports to present the drawings, you will:
  • Make a Top/Plan Viewport of the Plot Layer, with other appropriate layers visible.
  • Cut Section Viewports of the Model Layer using **View>Unified View** and with other layers visible as required/desired.
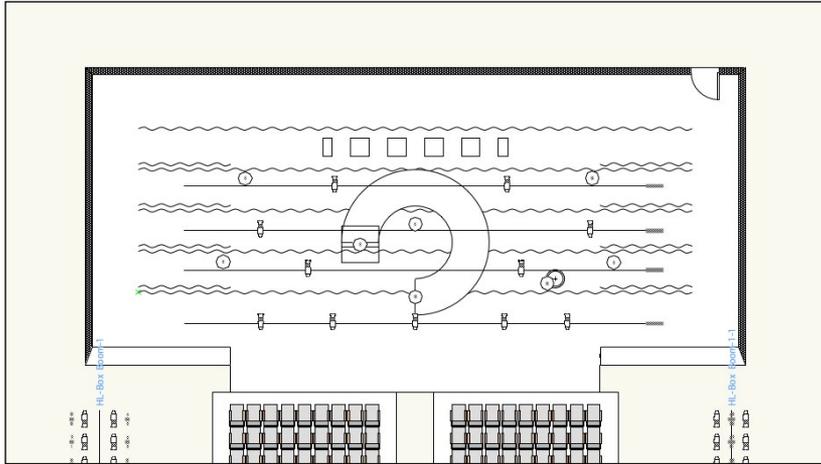
• Use the Model View, Camera tool, Unified View, and other layers to render and visualize the design and/or specific cues.

In the annotations space of your Plot Viewport, you will want to add a 2D symbol indicating boom placement. The 3D View of the instruments shows the 3D and you will want the 2D symbol for graphic clarity. I have also rendered this simple design that you see above, set some light levels, turned some instruments off, added some lights as I felt necessary in the visualization phase, and added gobos. We have reviewed all of

those steps or we will review them as we move forward, but you should make your own design choices. All of these files, like this plot, are relatively simple, but your work will likely be much more complicated.

Paperwork

Transferring Data to and from Lightwright

At the beginning of this guide, we looked at **File>Document Settings>Spotlight Preferences** and the Lightwright Tab. This Preference tab allows users to determine what information about lighting units they would like to be able to export to Lightwright in order to create paperwork for executing the lighting design. The exchange of information between Lightwright and Vectorworks is *automatic.Check* the box for "Use automatic Lightwright Data Exchange" to enable this function.

Vectorworks Reports

Vectorworks can also generate instrument schedules, hook-ups and other paperwork. Go to **Spotlight>Reports>Create Report** to create a custom report. You can also use a default Spotlight report, in the Resource Browser go to Vectorworks Libraries and select **Defaults>Reports~Schedules> Spotlight Schedules.vwx**.

Exercise

Working in your Theatre Project file:
• Add classes for your lights, lighting positions and focus objects.
• Create on stage and Front of House electrics and populate them with lights
• Create a minimum of four boom positions with lights.
• Focus and color the lights.
• Create a Plot and Model View of your work.

Section 7:
Visualizing Your Design

The image below has some classes added, additional lights, and gobos inserted, and textures created. It could illustrate one moment of one cue. Many such views can be created by set and lighting designers to convey their ideas to directors, producers, colleagues, and craftspeople.

The rendering and visualization capabilities of the Vectorworks Renderworks module are key to the creation of an efficient workflow. In a proper workflow, the ability to update a model and have all of the mechanical drawings and renderings updated is critical to a smooth operation. Having all of these functions within one suite that communicates internally has proven to be the only path.

Vectorworks and Renderworks provide a number of ways to visualize your drawings. Some of these are pertinent to presenting your mechanical or designer drawings; others are relevant to visualization. Combining these methods also allows designers to include illustrations within the mechanical drawings.
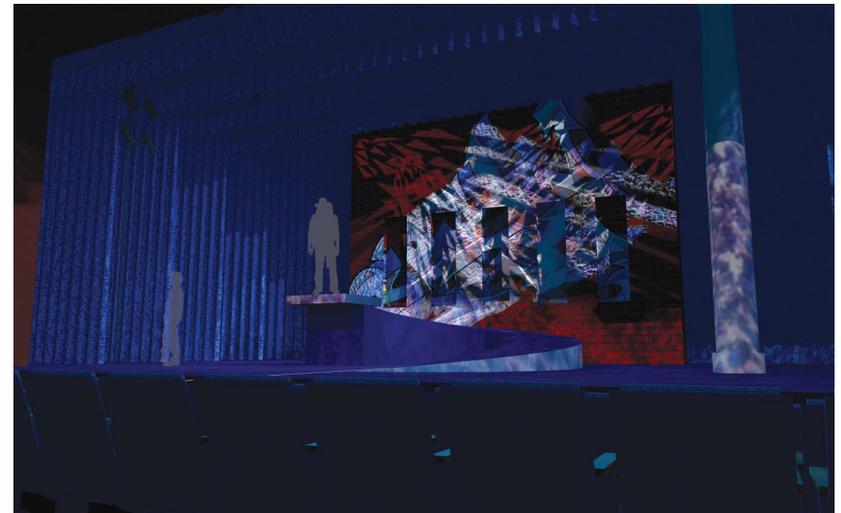
Note: *For additional instruction on Rendering techniques, we recommend reading the Renderworks Getting Started Guide by Daniel Jansenson.*

Renderworks and Spotlight allow lighting designers to visualize moments and cues and present them to colleagues before working in the theatre. Using the lighting controls and renderings, designers can write cues well before tech. Time invested in the design studio can save producers valuable crew time.

For film or television the Renderworks Camera tool can show specific lens choices and camera placement views of sets. While we will not deal with the animation tools, or third-party animation plug-ins, Vectorworks makes it easy to illustrate camera moves or walk through animations of exhibit spaces or themed environments.

It is very important that renderings and models clearly show clients and colleagues the design intent. Clients do not like surprises. Renderworks allows designers to be very specific about what the deliverables will look like, well before fabrication. Changes made in the 3D space and renderings are much more easily changed than built pieces.

Textures (sometimes also referred to as Materials) are some of the real magic within Renderworks. Learning to use them well will help create effective presentations. You cannot get to the point of building your ideas if you cannot effectively show your vision to others.

This book is all about the application, but I would be remiss not to say this text ignores the paper-and-pencil process that should take place as you think and plan.

Rendering Modes

From the drop-down menu in the View bar or by going to **View>Rendering** you will see a list of available rendering modes. The View menu list is longer, so let's look at it;
- Dashed Hidden Line
- Line Render Options
- Unshaded Polygons
- Shaded Polygons
- Shaded Polygons No Lines
- Final Shaded Polygons
- Create Batch Render Job
- Start Batch Render
- Wireframe
- Wireframe Options
- Sketch
- Sketch Options
- Open GL
- Open GL Options
- Fast Renderworks
- Final Quality Renderworks
- Custom Renderworks
- Custom Renderworks Options
- Artistic Renderworks
- Artistic Renderworks Options
- Hidden Line

This book will not delve into every option. First, let's consider at a few things related to line drawings.

We have been working in the Wireframe mode, which shows every line we've drawn. However, if you want to show an elevation without clutter, this is not the appropriate mode to use. Consider thinking back to hand–drafting conventions, and that Hidden Line or Dashed Hidden Line might help to clarify our intent. Use and experiment with the Line Render Options dialogue to adjust the look of the rendering mode.

When rendering, you will want to move from an orthogonal or isometric view into a less mechanical perspective view. Go to **View> Projection> Perspective**.

Open GL renderings are useful for fast preview images to see if your textures are in place and properly oriented. Open GL is not a presentation format. Open GL can be useful for your own visualization. Open GL does not render backgrounds.

We will focus on Final Quality Renderworks, which offers a great look for presentations. To save time as you develop ideas, consider rendering in Fast Renderworks to preview your ideas.

Open GL and Renderworks each place an unseen light source in your renderings if you have not already 'lit' the scene. Since we will deal with lighting specifics next, just work with that invisible light source for the moment.

Layer Backgrounds

In our theatre space, we do not need a background, as we have the architecture. However, if illustrating an isolated element, like the martini glass or a trade show space, you might not want to model an entire world before you render a simple object. In these cases, Renderworks defaults to a white background that you can easily change.

Work in the file you created when you made the ten–3D objects.

Choose to edit your design layer via either the Navigation palette or the Organization dialogue. Using your existing file, you now have the opportunity to create ten different backgrounds. First, note that in the Edit Design Layer dialogue you can assign a background from the default backgrounds file. Once we create a few backgrounds, you can also assign a background to a layer by double–clicking on the background icon in the Resource Browser.

Let's make a few backgrounds. Exit out of any dialogues and go to the Resource Browser, Right+Click and select **New Resource>New Renderworks Background**.

After taking a look at your options, name your background something that will readily remind you of the content. You also have weather options, which we will avoid right now, as they add considerably to the rendering time. For the moment, be aware of the options and plan to go back and test them. Your test file is a good place for this kind of experimentation, as you currently have minimal geometry to slow the process.

The top drop–down will be our focus:
- Clouds
- One Color
- Two Color
- Image
- Image (HDRI)

One Color should be self–explanatory and having at least a black background is always useful. When roughing out ideas, use a black background rather than worrying about the surrounding architecture. Two colors will give you a traditional gradient background.

The Clouds option is very versatile, certainly useful if you are doing an outdoor project or if you want to see a simple outdoor scene behind a set. Clouds also make terrific backdrops for free–standing kiosks. The default options make for a lovely day sky. Switching the default white to black, gives you a good night sky. As always, you need to experiment with the options and render the options in Final Quality Renderworks to see your results.

Select **Image>Options** brings you to a standard OS File Open dialogue–select an image that you would like to use as a background–say a park or beach scene. That selection takes you to the Edit Image Background dialogue. The size of the image will be based on the size of your output, so there should be no surprises. But what are Flip H and Flip V? Instead of the X and Y indicators we have used elsewhere, Vectorworks has changed the designation in this dialogue to horizontal and vertical. Images can be inverted– made to look like a film negative image–consider that for some types of presentations you might want to make a Vectorworks drawing or a hand–drafting into an old–style blueprint with white lines on blue or black.

Simply defined, High Dynamic Range Images (HDRI) contain lighting data and are a composite of different exposures that Vectorworks can use to "light" a scene. So, if you're working on an outdoor project and have (or can create) an HDRI image of the area at a certain time of day, the light data contained in the image and interpreted by Vectorworks will cause your model to be lit with the same colors and angles as the background. There are many resources on the Web from which you can download HDRI images. Be sure to verify the licensing and ownership of those images.

Exercise
Make at least ten backgrounds for use later. Understand that you should allow time to edit and modify those backgrounds as you work with them to take your document to the next stage.

Create a Black Background for your Theatre Project and assign the background to the Theatre Architecture Layer.

Textures

Vectorworks provides a large number of predefined textures. As always, you'll find them, if you haven't already, in the Libraries. While you can use the library textures, it is also useful to review them to see how they have been created. Use this study as the basis for the creation of your own textures.

Creating Textures
You can create a new texture the same way you create a new Renderworks Background. Right+Click in the Resource Browser and select **New Resource>New Renderworks Texture**. Note that in both cases, once you have a background or texture created, you can right–click under the sub head to access the "new" choice.

In the Edit Texture Dialogue–accessible by Right+Clicking in the Resource Browser there are several overall options:

- The size field in the lower left defines the size of your texture.
- The Indirect Lighting Options button in the lower right allows you to create glowing or back lit objects by overriding document lighting.

Textures can generally be described as either a Procedural texture or an Image Based texture.

Procedural

A procedural texture is computer generated using an algorithm designed to produce a realistic representation of natural elements such as wood, metal, stone, and others.

Image Based

An image based texture has as its primary source an image file, such as a JPEG or PSD file. A logical use for an image based texture would be to illustrate a painted back drop on stage. Image based textures can also represent commercially available products like carpets or patterned plastic laminates.
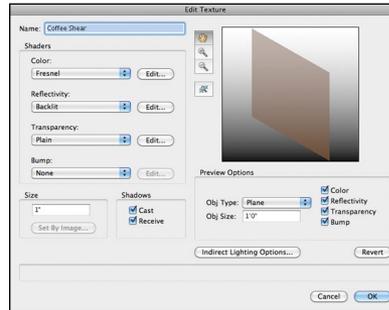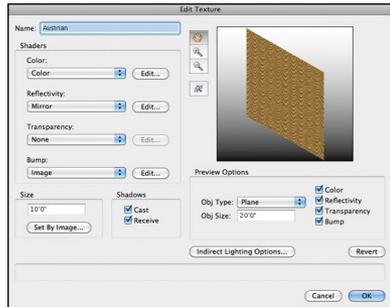
Images created for use as image based textures can be designed in one of two ways:
- To be a seamlessly repeating pattern.
- To be defined in actual size.

Images as textures should be kept to a moderate size. As a very general rule, no larger than a 1Mb file. The image files should be created with the output method in mind. This concept is discussed in further detail in the section on Image Props.

Shaders

Textures are defined in Renderworks by adjusting and modifying a series of definitions called Shaders

Color

The Color Shader defines the surface color; this can be a plain, uniform color, or a complex pattern like wood or stone.

Object Attribute. Object Attribute assigns the object's fill color attribute to apply as a color texture.

Image. Allows importing of image files.

Color. Basic, simple color defined through the available Vectorworks Libraries or the system color picker. This Shader also allows for the brightness of the color to be modified.

Fresnel. Creates a simple texture that has an overall glowing or gradient like appearance.

Bricks. Creates a basic brick pattern based on percentages/proportions of the texture size as defined in the lower left of the dialogue. Color and size/proportional variants are also assigned to further refine the texture.

Noise. The Noise shader allows access to a huge array of options for creating different painting or natural stone, marble, or granite looks.

Pavement. The Pavement shader creates colored stone patterns and textures. The settings defined in the shader Options help to create realistic and random repeats.

Tiles. The Tiles shader allows for the creation of a number of different geometric patterns. The settings in the Options allow for a very regular pattern or a repeat that appears much more random.

Reflectivity

The Reflectivity Shader defines the amount of light reflected by a surface Reflectivity is dependent on surface texture properties and light sources

Note: Increasing the blur of the reflectivity shaders increases realism and, in turn, increases render times.

Image. Image reflectivity allows a designer to choose what exactly will be seen as the reflection in a texture. The reflection will be an imported image file.

Backlit. Backlit reflectivity will help to properly render things like televisions screens. Deselect Cast Shadows in the Edit Texture dialog box when using the backlit shader.

Glass. Glass reflectivity would be appropriate for rendering windows, and adjusting the color options of the shader further defines environmental reflections.

Glow. Glow reflectivity can create objects that do not have shadows cast across, similar to a back-lit object that also emits light (if the Emit option is invoked). Glow shaders can be an alternative to creating line or area lights.

Metallic. Metallic reflectivity options can be used to create realistic metal textures that reflect the colors in the surrounding environment. Mirror can also be used to create polished metal looks.

Mirror. Mirror reflectivity options can create fully reflective surfaces or be used at low settings to add a sheen to surfaces.

Plastic. Plastic reflectivity options provide designers with a subtler set of options than the Metallic or Mirror options.
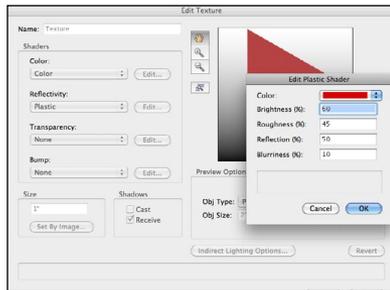
Bricks, Noise, Pavement, and Tile. These options work with the Color Shader or be used to overlay a reflectivity onto a Shader.

Transparency

The Transparency Shader defines surface transparency or opacity.

Image Mask. The Image Mask defines an imported image or alpha channel as pattern or mask.

Image. Selects an imported image to apply as a transparency texture, for colored transparency and projected colored lights like gobo projections.

Color. Allows the designer the option of isolating a color from an image based shader to drop out of the texture.

Glass. Transparency with the options required to properly illustrate how glass interacts with the world around. Generally, for glass, set the color to white, and the Index of Refraction to 1.

Plain. A simple slider to create different degrees of uniform transparency.

Rectangular Mask. Uses the texture size as a rectangular, transparent mask (usually combined with another shader for a specific effect). Used for decals.

Bricks, Noise, Pavement and Tiles. These options combined with the Color Shader overlay a transparency effect onto a color shader.

Bump

Bump maps define surface irregularities that bring dimension to textures without the complexity of additional modeling. This is an instance where vector data would create a larger file than a raster adjustment. Proper use of Bump maps will produce files that render faster than fully–modeled images.

Image. An image based bump map specifies an imported image to be used as the source of the displacement. The image can be either a full–size image or a seamlessly tiling image gray scale image.

In a gray scale image, the darker areas will appear to recess and the lighter or white areas of the image will seem to actually bump out.
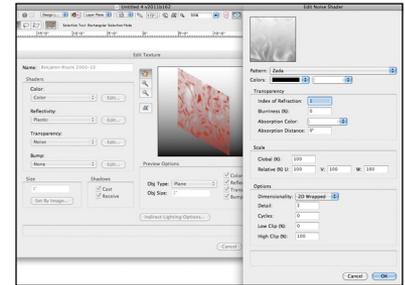
Bricks, Noise, Pavement and Tiles. These options can work with the Color Shader or be layered onto a Color Shader for effect. For example, the Brick bump used with the Brick Color can create a very realistic 3D brick, without modeling each object. Alternately, for example, a noise bump added to a plain color can add a stucco effect to a simple color.
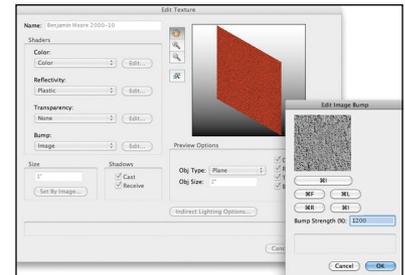
Textures for the Theatre Project

We will examine some the of the effects shaders can make by creating or modifying textures to be used in our Theatre Project. Open the Theatre Project file.

Edit the class Scenery-Wall. Select the texture Brick Runbond Red 02 from the Default Texture file as the texture for all sides of the wall. By clicking to the right of the texture preview you can visually access all of the textures in your document and the Default Textures.

Click **OK**.

Right–Click on the Brick Runbond Red 02 Texture in the Resource Browser to edit the texture. Add a Brick Bump Map to the textures. Set the strength of the bump to 500 and otherwise, accept the defaults. Note in the preview that the texture is not aligned with the image of the bricks. Edit the Color Shader and flip the Image vertically to align the color and bump shaders.

Create a new texture named Red Paint. Select **Edit**. Click on the color swatch. Select "Pick a Color" on the top middle right. Select the Benjamin Moore Color Preview palette and select BM 2000-10 Red as your color. Click **OK** back to the edit texture dialogue. Assign a plastic reflectivity to simulate a semi-gloss finish.
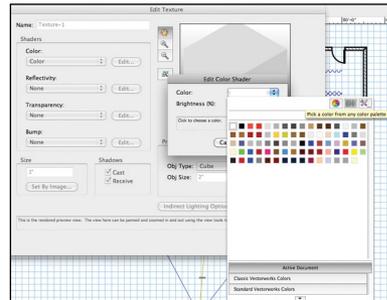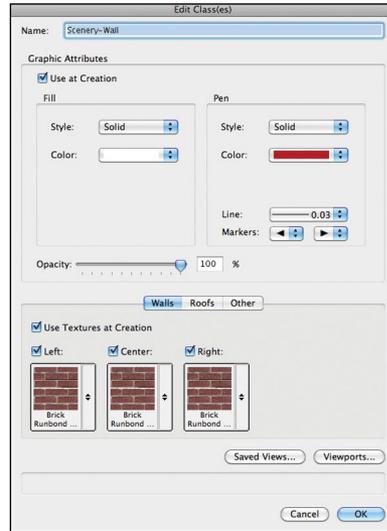
Create a black-matte texture in the same way, with Reflectivity set to none.
Create a black-gloss texture by selecting the Fresnel Color Shader and setting the options with two shades of color (dark on the edges), and Glass Reflectivity with edge

color around 50% gray, center very dark but not black.

Lastly, create a brushed–metal texture with a simple color and Metallic Reflectivity. Set the Metallic Option to Brushed.
Use Class Definitions to make the theatre walls and the drapery Matte Black, the Stage Floor—Gloss Black, and the ramp Gloss Black with metallic facing. The column should be the Brushed Metal. The vertical form at the front of the ramp should be metallic and the top level platform should be Gloss Black.

Assigning Textures

Textures can be assigned to objects in a variety of ways: by Class definition, by selecting an object in the OIP, going to the Render tab and assigning a texture from the drop–down menu (which accesses the default textures as well as textures in the document), and by selecting an object and then double–clicking on a texture in the Resource Browser or dragging the texture icon from the Resource Browser on top of the selected object.

It is extremely important to develop the habit of using Classes to define the graphic attributes within your documents. By extension, this means you must plan your documents ahead of developing designs. Notice in your Class definitions, textures are assigned differently to walls, roofs and other objects.

Textures and Walls

Now that you have some textures, let's add them to some Classes. Open the Class tab in the Organization dialogue. You must have **Use at Creation** and **Use Textures** at Creation checked. You will see that you can have different textures for different sides of walls and roof objects. All other modeled objects are textured as Other.

Textures in the OIP

Once you have textured an object by class, select the object and look in the Render tab of the OIP. You now have many options, including over ruling the class assignment.

The OIP allows for many options with scale and placement of textures. You can also select different texture options for different faces of objects, just as you can texture different wall surfaces differently.

Select the Stage Floor and change the sides to the Red Paint Texture in the Render tab of the OIP.

Mapping

Sphere, Cylinder, Plane, Perimeter or Roof mapping types are used to control how a texture is projected onto different types of objects. The Attribute Mapping tool does not modify Perimeter or auto-aligned Planar mapping types.

Attribute Mapping Tool
Find the Attribute Mapping tool in the Visualization tool set. The Attribute Mapping tool allows you to edit texture mapping parameters of wrapped color shaders or mask transparency shaders visually. We'll use this tool with a Decal.

Exercise
Open your file where you created the 3D objects. Create textures for each object and assign by class.

Creating Image Props

Image Props are largely a task for image-editing software. They serve multiple purposes, but are key to adding people/figures to renderings. You can use the same technique for trees and small objects that would be too complex to model or consume too much memory, like a toaster on a counter. Vectorworks ships with a number of great Image Props in the Library for you to use. If you have the Designer package or Landmark module, you will find a number of additional tree Image Props in your Library and I also suggest investigating VBvisual Plant tool in the Visualization tool set available in the Landmark module. The VBvisual Plant tool requires Renderworks. To create an Image Prop in Vectorworks, go to **Model>Create Image Prop.**

Keep your image file small, as larger graphics files can cause Renderworks to work slowly.
In print graphics, files are usually created at the size they need to be printed by 300 DPI.

You will more likely be using a desktop ink jet printer which works well with 100-150 DPI.

We'll actually be working with pixels, not
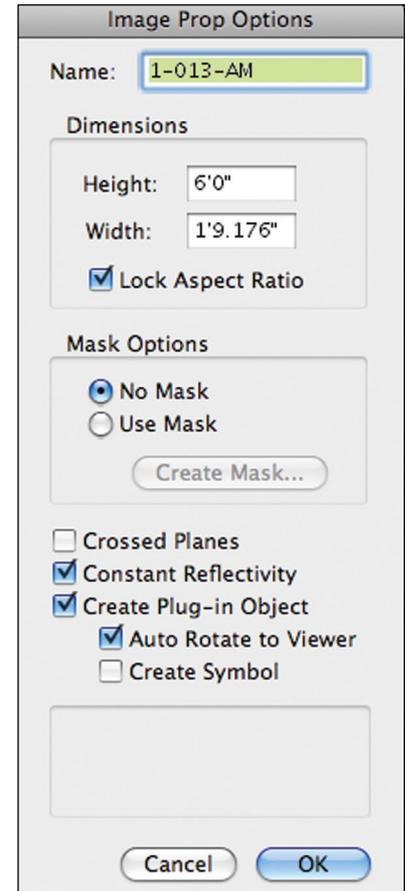
DPI; 300 DPI x 3" tall is 900 pixels. How big is your person going to be when printed? If you will only be outputting to a letter–size page, your person may end up as only an inch or two tall.

Create figures as "actual size" in the photo editor. A 6' tall man can still be a 6' tall image file but, set the DPI very low, usually 5-20 DPI, to keep the file size as small as possible. Determine the DPI by estimating how large the figure will be in the presentation. If it will be 2" tall, you need a file that is 300 DPI or 300 pixels tall. Set the pixel height/DPI appropriately.

Although, as you will see, you can make some of these specifications within Vectorworks, I find this method cuts down on the a possibility of error. Generally speaking, I try to keep most image files under 1Mb.

When making an Image Prop, Vectorworks allows you to mask out the background in a couple of ways. Again, this is often a chore best tackled in an image editor.

In Photoshop and Corel Painter you can create an image mask or alpha channel that Vectorworks can find and use as a mask. Alternately, you can add a solid color around the figure and mask that color. In both cases be aware that there are two caveats:
   • Be sure that masking color is also not on the figure or you will have holes in your people.
   • Consider the color against which you are going to place the figure.

If you have a dark brown set and you mask out your figure using white, most image editors will "anti-alias" the edge. That is they don't just paint white, but they blend the white into the adjacent color–your figure. So if you mask with white and place in a dark environment, your figure may have a white or light gray outline. Mask your figure in a color close to the background.

Create an Image Prop from the file (Image-Peop.psd) included and place the figure on stage. Class the figure as Entourage-3D

Decals

Decals allow multiple textures to be applied to a single object. Decals are created in the same manner as Image Props or Textures with a mask. Adding a decal allows you to either create a new decal or use one that you have created and is residing as a Texture in the Resource Browser. Decals are great for adding graffiti to a wall, a logo to a set, or a carpet on a wood floor.

Import the Graffiti texture from the file provided. Edit the Stage Wall symbol in 3D. View your wall, full screen in an isometric view, render in Final Quality Renderworks. Select the wall and go to the OIP. Select **Add Decal** and select your graffiti image. Adjust the size. The decal should appear in the lower left corner. Select the **Attribute Mapping tool** from the Visualization tool set and move it around. Notice the options in the Tool bar and the FDB. Also notice that you can move the graffiti numerically in the OIP. While working with the decal also change the scale or size of the bricks as they are mapped to the wall.

Unified View

The Unified View command in the View bar has been mentioned before, but since it is critical to the information that follows, let's spend a little more time discussing this functionality.

In a document with several layers, like the set and lighting design we are working with right now, it is likely that you will need to look at multiple layers at once and you will want to switch between views. Simply switching views only affects the active layer unless Unified View is activated.

In order to invoke Unified View, simply click the button in the View bar. To disable Unified View, click again. This is the same as using the **View>Unified View** command.

Not all primitive drawing functions will work when Unified View is in use.

Renderworks Camera Tool

The Renderworks Camera tool in the Visualization tool set is your friend. It can help with the simplest of chores like checking your masking from the end seats to clearly illustrating or animating your designs for presentations.

Let's go back to our theatre and light plot.

To place a camera on the Set Layer near house center select the Renderworks Camera tool, click on the location where you want the camera, and drag in the direction you want to view. Double–click on the object to see the camera view in Wireframe.

To see all of the layers properly, go to **View> Unified View** or click the **Unified View** button. Now click **Fit to Objects** in the View bar, and you have a proper full screen image. Use the settings in the OIP to adjust the view.

Note: Cameras are automatically added to the

Visualization palette and can be renamed there.

Click **Auto Update 3D View**.

Note: The Z height of 0 is the stage floor. Set the height of the camera eye-level with the eye height of a seated audience member in a chair. Set the aspect ratio to 3:2 and select **Top/Plan View**. Adjust the width of the view here by grabbing the outer edge of the cone and moving the handles. Adjust to a full stage view.

Preview your view, zoom in, and save the view using Saved Views in the Tool bar. If you are viewing multiple layers, be sure to add the layers in the Saved Views dialogue. Add a camera or cameras to your project file on the scenery layer.

Setting 3D View

Alternately, you can select the **Flyover tool** from the Basic palette and go to **View>Projection>Perspective**. Use the Flyover tool to manipulate the screen image to one that shows what you want to see. Save the view.

Saved Views

Any screen view can be saved as a Saved View. This might be a perspective view as suggested above or a zoomed location to which you need to frequently return. In the View bar select the Saved Views drop–down, and name and save the view.

Saved Views can be edited from the same location if you find you need to add or delete layers or classes from the view.

Lighting in the 3D World

Like textures, lighting in the 3D world is not always as you might expect from living in the real world. The Spotlight Entertainment Fixtures work as you would expect, but there are other lighting options available for visualization. We're going to look at the lighting options in the Visualization tool set and the View menu.

Think of these lighting options as preliminary tools. Set designers can use these tools to indicate lighting ideas to colleagues. Lighting designers can use these tools to rapidly present early visualizations to directors, producers, and others on the team, Lighting sketches prepared prior to creating the light plot can help a team to see, and agree to, the design direction prior to drafting an entire plot.

Remember, every light adds calculations and increases rendering time, so consider that rendering time when planning your lighting. Renderworks inserts an invisible light when

you render an object (we have been working with that light). When you add a light, that invisible light source is removed.

This section is short but very complex. Mastering lighting takes time.

Lighting Commands

Go to **View>Lighting>Set Lighting Options**.

Set Lighting Options

Ambient light is the extraneous light in any space. If you are working on a final light plot and visualizing you should turn this off. If you want to illustrate a few spots piercing a blue overall wash you may just want to change the default color and adjust the brightness and/or the color temperature.

The Emitter Options allow the user to set specific color temperatures and intensity for ambient light.

The Environmental Lighting (HDRI) options allow you to "turn on" the light in an HDRI layer background, specify using the light source in a different HDRI Background, or not use lighting from a background image.

Light Tools

Go to the Visualization tool set and select the **Light Tool**. Note the options in the Tool bar. You can control your model's inserted lights in the OIP and also in the Visualization palette. In your Vectorworks Preferences you can make the lights invisible in your renderings.

Directional Light Tool

The Directional Light Source is a general light coming from one direction and is represented by a large globe. The placement of these lights and the light they provide is very general. The source moves interactively with the Selection tool and can be controlled numerically from the OIP. While you can change the Z height of the object, it does
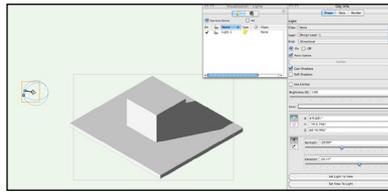
not matter with these lights.

You can change color and intensity in the OIP. Read below about Lit Fog before you jump into a long rendering. Remember you can always cancel out of a rendering if you feel you are waiting too long or can tell early on that you are not yet happy with your results. Press the "esc" key or Command-. to cancel a render.

Use Emitter allows you to specify the light's actual brightness and color temperature; leave deselected to use the light as a simple light source. **Set Light to View** sets the orientation of the light to the current view. Set View to Light sets the orientation of the current view to the light.

Turned on **Display Light Objects** in all views using the Display tab of the application preferences. You will want to turn **Display Light Objects** off when you export your renderings for presentation.

Spot Light

Spot Lights are a work horse. You will find spot lights embedded within the Entertainment Lighting Fixture symbols. In the OIP, you can interactively set the Spread and

Beam (numerically also). Spot lights need to be carefully focused and set to a proper Z height, with an associated Z look-to height. You can move and rotate the units with the Move command and the Rotate tool. Once focused, you can readily duplicate as needed.

You can add lights to symbols, so if you have a lot of columns and want them up lit, you can add to the symbol. By adjusting the light in the symbol; all your columns will be lit the same.

In the OIP, you can use Absolute Positioning to place and focus your lights exactly where you need them.

Try adjusting the focus and placing the light exactly where you like with the Reshape tool.

Distance Falloff is the change of intensity moving along the beam away from the light source. Angle Falloff specifies the intensity change between the beam and the spread.

Point Light

Note: The drop–down menu in the OIP allows you to change one type of light to another and is very useful for our exploration here.

Point Lights serve a great many functions,
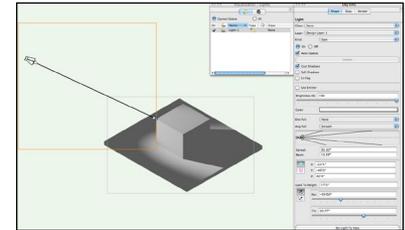
but they can really add to rendering times, as they are just like an uncontrolled or focused lamp sitting in space.
In the Lighthouse Model, there is a very high–powered point light in front of a reflective surface to simulate the light house light.

Line Lights and Area Lights

Line Lights and Area Lights are great sources for creating neon effects, edge lighting, illuminated bars, and the like. To create either, start with a 2D primitive line or shape (either for Line Light, shape for Area Light), and go to **Modify>Convert** and either **Convert to Area Light** or **Convert to Line Light**. Note that you can also import
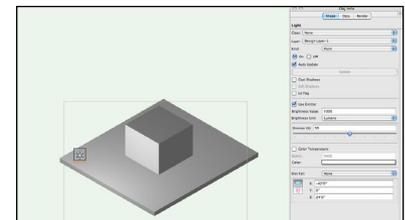
an IES file to define a Line or Area Light.

Line Lights and Area Lights will add considerably to rendering time in large/complex models.

## IES Files and Custom Lights

IES files contain photometric data. Most manufacturers provide IES files for their lighting products online. When you select the Custom Light option in the Tool bar, you can load an IES file and create a light in the 3D world based on commercial photometric data.

Consider that you are able to create a table lamp and look at the fixture with different light sources, possibly tungsten or CFL, before manufacturing.

A Basic Lighting Set-Up

Any basic lighting set-up requires three–point lighting - a Key, a Fill, and a Back Light. This is true on stage, or in film, television, photography, or Vectorworks. Create an object on the ground (this means two objects: the object and the ground) with a black background and a Saved View in perspective. Then return to the Top/Plan View.

From the Visualization tool set, select the Light Tool and the first option on the Tool
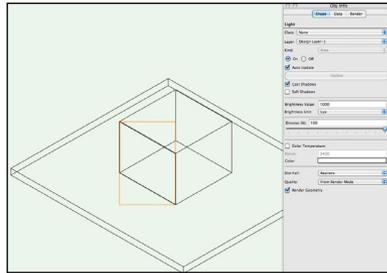
bar-–Directional Light Mode also select the Set Direction Mode (the sixth option in the Tool bar). Your first light should be 45° from the straight on angle of your perspective view. Click on your object and drag to place the light. This is the Key Light and can be named in the Data Tab of the OIP. In the Shape tab of the OIP, set the elevation to 60° and the brightness to 60%.

The Fill Light comes in lower and fills in places missed by the Key. Typically this is a softer light, so click and drag this light to be 45° from the Key Light. In the OIP, set the elevation to 20° and the brightness to 40% for this light, turn shadows off in the OIP.

For the Back Light, select the Mirror tool from the Basic palette and Mirror the Fill Light using the Mirror and Duplicate Mode. Set the elevation of the Back Light to 45° and the brightness to 30%.

Lit Fog Option

Any light–a 3D World light or a theatrical unit–can have the lit fog option checked in the OIP as long as the layer background has a weather option. A small amount of fog can go a long way towards adding a bit of drama to a rendering. Lit fog can greatly increase rendering times.

Exercise

Building on your ten–3D models, add lighting, backgrounds and cameras. Render in Final Quality Renderworks.

Now with your file of 3D objects with textures, add lights to see how they work and how you can optimally illuminate your objects. Be sure to add a floor and possibly some walls using either extruded primitives or the Floor command and Wall tools so you will have some surfaces to cast shadows on or reflect light off of in your renderings. Try all of the different light types. Create beauty. Duplicate layers so you can really explore the various lights on your objects.

Section 8: Presenting Your Drawings

Now you have a 3D model of a set in a theatre with stage lighting in place, but you need to be able to disseminate this information. Vectorworks is also a powerful page layout application. We are going to create Viewports of your model and place them in Sheet Layers for organizing, annotation, and printing.

Viewports and Sheet Layers

Viewports are windows into models with the display of information controlled by class and layer visibilities. Sheet Layers are used to assemble Viewports and create sets of drawings for printing.

While Design Layers can have one scale per layer, Sheet Layers are always in 1:1 scale. Viewports also only have one scale per Viewport, but there can be many Viewports, each with a different scale on any given Sheet Layer.

The Sheet Layers are for publication.

Viewports placed on Sheet Layers, can be modified, annotated, dimensioned, and cropped.

First, we will review the process of creating Viewports and Sheet Layers, then we will create a set of drawings from the Theatre Project.

Creating Viewports

From a Design Layer in any view go to **View>Create Viewport** and you will be presented with the Create Viewport dialog box. Note that you can select the view, as well as which layers and classes are visible.

Select **New Sheet Layer** from the **Create on Layer** drop–down menu.

When viewporting scenic elements, it is possible to create one Viewport on a sheet and then duplicate the viewport by either Alt/Option and dragging, or by copying and pasting. Change the view and rendering mode using the OIP.

Look at the Create Viewport dialogue, and notice that there are many things you can accomplish here. Naming the Viewport will help you to find your information. The Drawing Title is linked to the Drawing Label tool in the Dims/Notes tool set.

In the New Sheet Layer dialogue, the Sheet Title is linked to the Title Block and Drawing Border tools.

The Sheet Layer will take its size from the Default Stationery file. Sheet Layers can be of different sizes, if required. The light plot for this project will not fit well on a 24/36 Arch D sheet, so you should go to **Tools>Organization.** Select the Sheet Layer and click Edit button. Click the Page Setup button and change your Sheet Layer sheet size to US Arch E.

Note: the background color has change to white, this indicates that you are on a Sheet Layer.

Creating Section Viewports

From a Design Layer go to **View>Create Section Viewport**. You can draw the section line through any view at any angle. Click once to stop the line and then, double click on one side of the line to select the view direction. The Create Section Viewport dialog box will open.

Camera Viewports

The view of a sheet layer viewport can
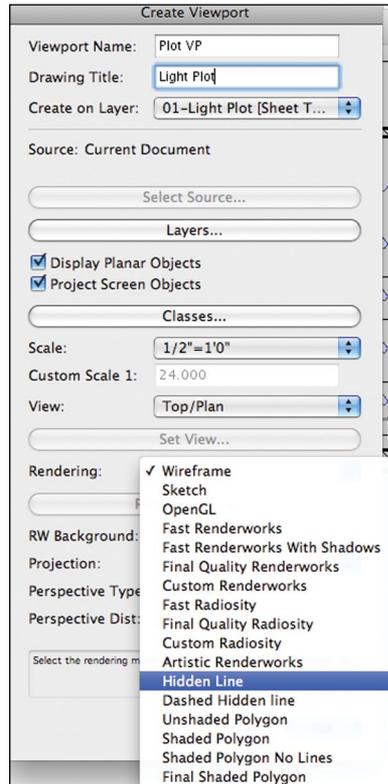
be controlled by a Renderworks Camera. Establish the view with the Renderworks camera on a design layer and then create a sheet layer viewport linked to the camera. The camera view can then only be edited from the viewport.

To link a Renderworks camera to a sheet layer viewport , complete the following steps:

• Create and adjust the Renderworks Camera as described in the Renderworks Camera section. A camera linked to a viewport can be in perspective or orthogonal projection.

   • Select the Renderworks Camera, and then select **View>Create Viewport.**

   • A dialog will ask whether the camera should be used for the viewport's view. Click **Yes**.

The Create Viewport dialog box will open. Enter a viewport name and drawing title, and select the sheet layer to place it on. The view and projection parameters are set by the camera, and therefore appear dimmed;

the camera's render mode does not affect the viewport's render mode.

The viewport is created on the specified sheet layer, with its view, projection, and perspective distance set to that of the Renderworks Camera. In the OIP, the Renderworks Camera status changes to Yes.

The camera becomes part of the viewport and can be edited (or deleted), changing the viewport's view parameters, by editing the camera through the viewport.

Theatre Project–Next Steps

Open your Theatre Project file and create the following Viewports:

   • Renderworks Camera Viewport rendering in Final Quality Renderworks on Sheet Layer 1.

   • Scenery Viewport rendered in Dashed Hidden Line on Sheet Layer 2.

   • Light Plot Viewport on Sheet Layer 3.

   • Stage Right Section Viewport with Lights on Sheet Layer 4. Edit the Section Style Class created when you cut this section.

   • The Wall, in any view on Sheet Layer 5.

   • The Column, also on Sheet Layer 5.

   • The Platform Unit, also on Sheet Layer 5.

Working on the Sheet Layer

Using the Sheet Layers as a workspace, experiment with moving the Viewports around and changing the scale of a Viewport in the OIP. Make sure that all of the scenic elements on Sheet Layer 5 have been set to **Hidden Line Render**. You can select the render mode when creating the Viewport and you can change the mode in the OIP with the Viewport selected on a Sheet Layer.

From the Sheet Layer you can edit the Class Overrides of any Viewport through the OIP.

Drawing Border tool

Drawing Borders and Title Blocks, like the Sheer Layers, are in 1:1 Scale. Add a title block and drawing border to the Sheet Layers. Select the **Sheet Border** tool from the

Dims/Notes tool set and assign one of the default title blocks. Clicking in the drawing should center the sheet border, but if not, adjust using the OIP, setting the center to 0-0-0. Place the border then with the border selected, click on the Title Block button in the OIP. Select Default under Symbols Folders and then click on the preview image
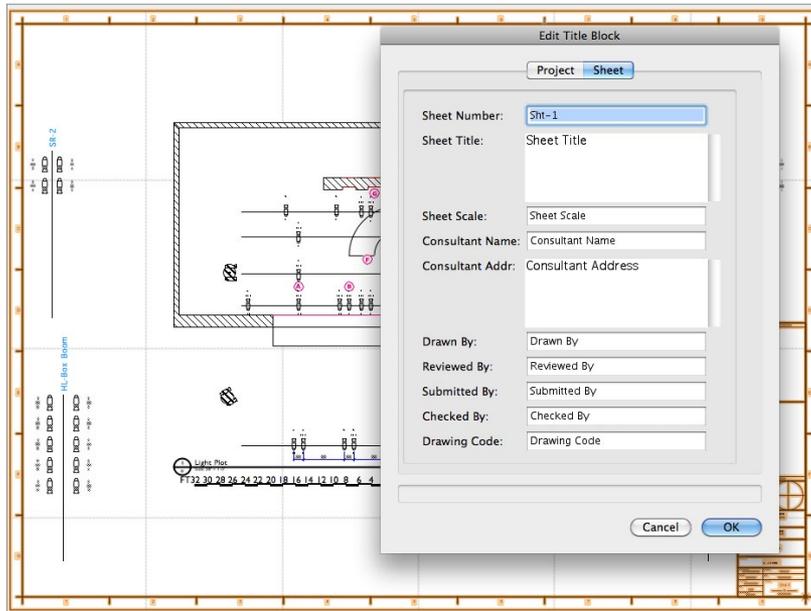
under Symbols to select another default Title Block. You can add a Revision Block, if needed, using the OIP.

Double–click on the title block to access the Edit Title Block dialog box. Which will allow you to customize each sheet and each set of drawings.

Once you have entered the title block data, duplicate the sheet layer by right–clicking on the sheet layer in the Sheet Layer Tab of the Navigation palette, and select **Duplicate**

from the Contextual Menu. Edit the name and delete the viewport on the new sheet layer. Return to the design layer.

Custom Title Blocks

You can create your own custom title blocks. While it is not a complicated process, it is outside of the scope of this book. The process is well explained in the Help application. Title blocks are basic geometric 2D drawings, with critical data records required to simplify data entry and create data associations.

Working in the Viewport

Some information must be added in the Viewport. Dimensions, for example, give page sizes when added outside of the Viewport. Dimensions must be added in the Viewport for them to have world associations with the model. By example, if you have an object that is 4'-0" in 1/4" scale and you dimension the object on the Sheet Layer, you will see a dimension of 1". To get a real world dimension you must enter the Viewport.

Double–clicking on a Viewport reveals the Edit Viewport dialogue where you can choose to enter the Annotation Space, the Crop, the Camera (if applicable), and the Design Layer. You can also access the Viewport from the contextual menu that appears when you right–click on the Viewport.
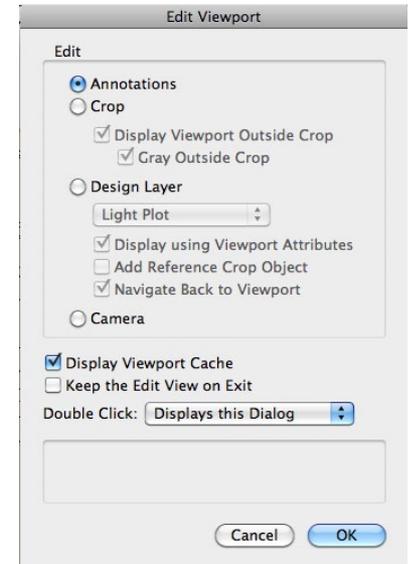
Adding Dimensions

Dimensions are added to objects in the Annotation Space of the Viewport. Take a look at the Dims/Notes tool set. There are several dimensioning tools: constrained, un-constrained, angles, and radial dimensions. Some of these tools are also located in the Basic palette of the Spotlight Workspace. Select the **Constrained Dimension** tool and look in the Tool bar to see what modes are available.
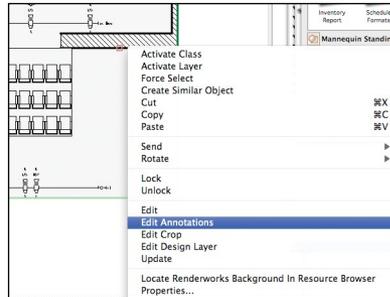
Make sure that you are still in the Annotation Space of the Viewport. Leaving the annotation space and working directly on the Sheet Layer is a very common mistake. Remember that the sheet layer is 1:1 scale, so if you dimension on the sheet layer the Dimension tools measure the distance on the page. In 1/2" scale, instruments on 18" [.457m] centers are actually 3/4" [19.05mm] apart.

You have several modes and a preference selection for your constrained dimensions.

Add a Center Line and Plaster Line to your Plans and Plots in the Annotation Space. Adjust the line weights and dash styles by selecting the lines and making modifications in the Attributes palette. Save your choices as Classes in your Stationery document.

Exit the Annotation Space by clicking on the **Exit Annotation** button in the upper right of your window. Note that the border shifts from yellow (or your user selected preference), back to gray.

Scale Bar Tool

The Scale Bar tool in the Dims/Notes tool set is an important feature. Adding a Scale Bar to plans and sections allows a ready reference for anyone looking at the drawing. On plans, a Scale Bar can help a stage manager in rehearsal. Recipients of your electronic documents in PDF format can use the graphic scale to see if there has been a shift in scale after printing.

Add a Scale Bar to your drawings and also place a figure symbol on all elevations and sections.

Drawing Labels

Add Drawing Labels to each view. The Drawing Label tool is in the Dims/Notes tool set. Before inserting the first Drawing Label, set your tool preferences for text sizes. Remember, the design of your documents is a critical part of your presentation and communication. The Drawing Labels are as-sociated with the information you provided when you created the Viewport. You can also edit this information in the OIP.

Viewport Cropping

Entering the Crop Space of the Viewport allows you to eliminate extraneous informa-tion or focus the viewer as needed. Any 2D shape can be a crop–one per Viewport. Create a 2D shape over the model and go to **View>Create Viewport.** A dialogue will ask if you want to use the shape as a crop.
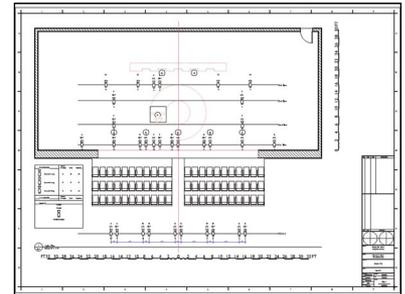
You can crop an existing viewport by double clicking on the Viewport, selecting Crop, and create your crop shape here. The crop's visibility is controlled in the OIP.

Key to Instrumentation

In your Light Plot viewport, go to **Spotlight> Reports>Key To Instrumentation**. Add it to the annotation space.

Working with Text

The Text menu in Vectorworks looks and acts pretty much as any text menu in any application. With text selected, you can manipulate that text via the Text Menu. You can also manipulate Vectorworks text via the OIP.

Default fonts, sizes, and styles can be assigned via the Text menu when nothing is selected in the drawing area.

When text is sized, it is in relationship to the layer scale. If the layer scale is changed, the text size also changes. So 14 point text created on a 1/2" scale layer becomes 7 point text if the layer scale is changed to 1/4" scale.
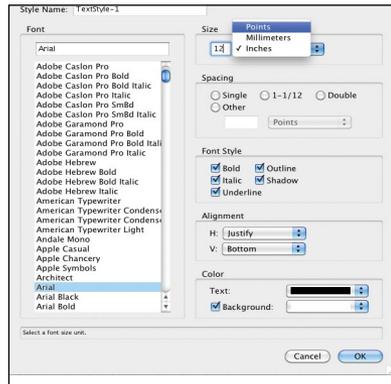
The Modify>Scale Objects command and the Active Layer Scale dialog both have a scale text option so you can chose to keep the text size relative to the layout i.e. adjust

point size proportionally to the size change, or keep the text sizes absolute; i.e. The text will appear differently on the page after any scale changes.
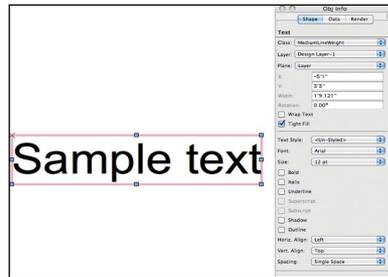
Text Styles

Text Styles are resources created and accessed through the Resource Browser. Text Styles are applied to Text in the OIP Right-click in the Resource Browser and Select **New Resource> New Text Style** from the Contextual menu. The Text Style dialogue will open and you can easily set different parameters for different types of text.

A Text Style that creates 14 point text will always insert 14 point text without regard to the layer scale. If styled text has been inserted and the layer scale is changed, the size of the text become dis-associated from the style and the sizes changes, just as it does with unstyled text. In this case, the style can be reapplied.

Lighting Paperwork

Create a new sheet layer; set the page size to a standard letter size, and locate the Instrument Schedule in the Resource Browser. Double–click on the schedule in the Resource Browser to add it to the drawing, and then you can double-click on the schedule in the drawing to edit it.

If you are a Lightwright user, Vectorworks also allows for interactive sharing of data with Lightwright. The export setup is located at **File>Document Settings>Spotlight Preferences** (see page 68 for details).

Printing

To print, go to **File>Export>Export PDF (Batch)**, select sheets of similar size, export, and print from your PDF viewer.

It is always best to export and print rather than printing directly from Vectorworks. Add a blank sheet layer with a border and title block to your stationery file.

Section 9: Conclusion

This Getting Started Guide is a beginning. There is enough information included here for a designer or a technician to document an entertainment project. This guide should also get a team off the ground when collaborating on a project.

Like all professional pursuits ongoing study will be required. As you create new things or confront new challenges, new resources will be required. Explore the application, it is rich in resources. Explore the links that follow, the Vectorworks community is diverse and we all have a lot to learn from one another.

Additional Resources

Nemetschek Vectorworks
Nemetschek Vectorworks .... vectorworks.net
Nemetschek K-Base..kbase.vectorworks.net
Vectorworks on Facebook ....facebook.com/vectorworks
Vectorworks on Youtube ....youtube.com/vectorworks

Training
United States ....www.vectorworks.net/training
International ....www.vectorworks.net/international

Applications
Lightwright ....mckernon.com
ESP Vision... espvision.com

Plug-ins
OZcad Vectorworks plug-ins ....ozcad.com.au

Panzer CAD...panzercad.com
Vectorbits...vectorbits.com
Joshua Benghiat Lighting tools.. benghiatlighting.com
Soft Symbols ....fieldtemplate.com
Vector Depot...vectordepot.com
AutoPlot tools .... autoplotvw.com
Interior CAD... extragroup.biz
Landru Design Vectorworks plug-ins..landrudesign.com

Online Communities
Vectorworks Community Board ....techboard.nemetschek.net
Vectorworking.. vectorworking.com
Planet Vectorworks... planet.vectorworks.net
Vector Depot..vectordepot.com

Blogs
Kevin Lee Allen Design Blog ....klad.com/blog
Jonathan Pickup...archoncad.blogspot.com/
Konstrukshon Blog .... blog.konstrukshon.com

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Thanks also to Lighting Designer Lucas Benjaminh Krech (http://www.lucaskrech.com) for the inclusion of his Lighthouse Project. I first became aware of Lucas and his work when he blogged (http://www.lucaskrech.com/blog) about being challenged by the Lighthouse Project as included in the 2010 Getting Started Guide

I hope this work will inspire your own exploration of Vectorworks.

About the Author

Kevin Lee Allen is an award–winning scenic designer who works in theatre, film, television, museums, and corporate environments; including architainment, exhibits, and special events. Notable projects include work for Fox News, the United States Government, CNN and CNN International, a virtual interview with Benjamin Franklin and productions of *Romeo & Juliet, The Tempest,* and *Democracy Now!* His design sketches are held in private collections and in the permanent collection of the Library of Congress.

Mr. Allen has been a Vectorworks user since MiniCAD Version 3 and has been using the program as a 3D modeler since that time. He has taught Vectorworks on the university level since 2006 and has given Vectorworks lectures at the Kennedy Center American College Theatre Festival Region 2 Festivals.

Kevin Lee Allen's work can be seen at *http://klad.com* and he blogs at *http://klad.com/blog.* Sometimes he blogs about Vectorworks.